Laparoscopic surgery in great adrenal malignant masses.
[Article in English, Spanish]
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OBJECTIVE: The aim of this article is to describe the surgical technique of laparoscopic resection in malignant tumors greater than 10 cm.

METHODS: We present two cases, a 63 year old woman with a left adrenal heterogeneous mass of 11 cm in maximum diameter and an 80 year old man with a left adrenal heterogeneous mass 13 cm in maximum diameter. In both cases excision was performed laparoscopically using 4 trocars and the Alexis® wound retractor for specimen extraction.

RESULTS: For the 63 year old woman, the histological result was malignant epithelioid angiomyolipoma, while in the case of the 80 year old man was large cell neuroendocrine carcinoma with possible pulmonary origin.

CONCLUSIONS: We believe that laparoscopic surgery of large masses of malignant behavior depends on the capsular integrity and their relationship to adjacent structures rather than tumor size or the internal characteristics of tumor on imaging tests.

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Surgical Treatment after Failed Primary Correction of Urogenital Sinus in Female Patients with Virilizing Congenital Adrenal Hyperplasia: Are Good Results Possible?
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PURPOSE: Genital reconstruction in female patients with virilizing congenital adrenal hyperplasia (CAH) is very challenging. Our aim was to evaluate the techniques employed to treat complications after failure of primary urogenital sinus (UGS) surgery, as well as the result of these reoperations.

PATIENTS AND METHODS: Twenty girls with virilizing CAH who were previously submitted to genitoplasty in our service and elsewhere had recurrent UGS stenosis
and vaginal introitus stenosis that required surgical treatment. The main symptoms were recurrent urinary tract infection (UTI) in nine, dyspareunia in six, and hematocolpos in three (two associated with sepsis). The anatomical findings were the persistence of UGS with stenosis in 17 patients and vaginal introitus stenosis in 3. The mean age at procedure was 15.2 years, averaging 13.1 years after the first surgery. The surgical techniques employed were isolated perineal flap in 17 patients and perineal flap with partial mobilization of UGS in 3. The mean follow-up after the procedure was 4.8 years (varying from 1 to 17 years).

RESULTS: Vaginal dilations were performed after surgery in 15 patients. Good functional and anatomical results were obtained in 15 patients, with vaginal introitus amenable to dilators of 3.0 cm in diameter. Five patients with high vaginal insertion had recurrent vaginal stenosis and required a surgical revision. No patients presented menstrual obstruction or UTI after surgery. Eight of the 15 adult patients are sexually active.

CONCLUSION: The reoperation to treat failed primary UGS treatment using Y-V flap and partial mobilization techniques associated with vaginal dilations, promoted good anatomical, and functional results with low morbidity in 75% of the patients.

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Contemporary minimally invasive surgery for adrenal masses: it’s not all about (pure) laparoscopy.
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Robotic assisted versus pure laparoscopic surgery of the adrenal glands: a case-control study comparing surgical techniques.
PURPOSE: The role of the da Vinci Robotic System (®) in adrenal gland surgery is not yet well defined. The goal of this study was to compare robotic-assisted surgery with pure laparoscopic surgery in a single center.

METHODS: One hundred and 16 patients underwent minimally invasive adrenalectomies in our department between June 1994 and December 2014, 41 of whom were treated with a robotic-assisted approach (robotic adrenalectomy, RA). Patients who underwent RA were matched according to BMI, age, gender, and nodule dimensions, and compared with 41 patients who had undergone laparoscopic adrenalectomies (LA). Statistical analysis was performed using the Student’s t test for independent samples, and the relationship between the operative time and other covariates were evaluated with a multivariable linear regression model. P < 0.05 was considered significant.

RESULTS: Mean operative time was significantly shorter in the RA group compared to the LA group. The subgroup analysis showed a shorter mean operative time in the RA group in patients with nodules ≥6 cm, BMI ≥ 30 kg/m² and in those who had previous abdominal surgery (p < 0.05). Results from the multiple regression model confirmed a shorter mean operative time with RA with nodules ≥6 cm (p = 0.010). Conversion rate and postoperative complications were 2.4 and 4.8 % in the LA group and 0 and 4.8 % in the RA group.

CONCLUSIONS: In our experience, RA shows potential benefits compared to classic LA, in particular on patients with nodules ≥6 cm, BMI ≥ 30 kg/m², and with previous abdominal surgery.

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Peritoneal metastases from adrenal cortical carcinoma treated by cytoreductive surgery and hyperthermic intraperitoneal chemotherapy.
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PURPOSE: Adrenal cortical carcinoma is a rare cancer that often presents in an advanced stage. Not only systemic metastases but also local recurrence and peritoneal metastases prevent long-term survival in these patients.

METHODS: A profoundly symptomatic patient with extensive peritoneal metastases and local recurrence was treated using cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) with melphalan as the chemotherapy agent.

RESULTS: Relative sparing of the small bowel within the abdomen and pelvis allowed a visible complete resection of all cancer. The HIPEC with melphalan was used to control microscopic residual disease. Similar surgical technology used in this patient could be used to prevent local recurrence and peritoneal metastases in patients at the time of resection of the primary adrenal cortical carcinoma.

CONCLUSIONS: Rare diseases may have peritoneal metastases as a component of disease progression and profit from treatment with CRS plus HIPEC. The clinical features suggesting a favorable outcome from this combined treatment are relative sparing of small bowel and its mesentery, absence of disease outside the abdomen, low-grade disease, or limited extent of high-grade disease.

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BACKGROUND: Surgical difficulty in laparoscopic adrenalectomy for pheochromocytoma increases with tumor size. We compared single surgeon outcomes of laparoscopic adrenalectomy for pheochromocytomas in patients with tumors smaller or greater than 4 cm to assess safety of the procedure.

METHODS: A retrospective review was performed of laparoscopic adrenalectomies for pheochromocytoma by a single surgeon over a 3-year period. All patients underwent lateral transperitoneal surgery. Operative and outcome data was retrieved and compared for tumors >4 cm versus smaller tumors.

RESULTS: We performed 28 laparoscopic adrenalectomies on 24 patients including four simultaneous bilateral surgeries. Fifteen tumors were greater than 4 cm in size (mean 6.3 cm) while 13 were smaller (mean 2.9 cm). Both groups had similar operating time (138 vs. 116 min; P=0.2) and blood loss (181 vs. 143 mL; P=0.41). The small tumor group had four Clavien-Dindo grade 1 and one grade 3a
complication while the large tumor group had three grade 1 complications. There were no conversions to open surgery. Eighteen patients (75%) did not require any anti-hypertensive medications post-operatively.

CONCLUSIONS: Tumor size does not impact outcomes of laparoscopic adrenalectomy for pheochromocytomas. Larger tumors are associated with similar operative time, blood loss and complications as smaller ones.

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Adrenal insufficiency in neonates after cardiac surgery with cardiopulmonary bypass.
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BACKGROUND: Cardiopulmonary bypass (CPB) may lead to adrenal insufficiency (AI). Emerging evidence supports association of AI with morbidity after cardiac surgery.

AIMS: The aim of this study was to define AI incidence in neonates undergoing complex cardiac surgery with CPB and its association with intraoperative post-CPB outcomes.

METHODS: Forty subjects enrolled in a prior randomized control trial who received preoperative methylprednisolone as part of our institutional neonatal bypass protocol were included. No intraoperative steroids were given. ACTH stimulation tests were performed: preoperatively and 1 h after separation from CPB. AI was defined as <9 μg·ml(-1) increase in cortisol at 30 min post cosyntropin 1 mcg. Clinical outcomes were collected up to 90 min after CPB.

RESULTS: 2/40 (5%) subjects had preoperative AI vs 13/40 (32.5%) post-CPB AI, P ≤ 0.001. No significant difference was observed in age, gestational age, weight, CPB time, circulatory arrest, or STAT category between subjects with or without post-CPB AI. ACTH decreased from preoperative values 127.3 vs 35 pg·ml(-1) [median difference = 81.8, 95% CI = 22.7-127.3], while cortisol increased from 18.9 vs 75 μg·dl(-1) [median difference = 52.2, 95% CI = 36.3-70.9]. Post-CPB AI was associated with increased median colloid resuscitation, 275 vs 119 ml·kg(-1) [median difference = 97.8, 95% CI = 7.1-202.2]; higher median peak lactate, 9.4 vs 6.9 mg·dl(-1) [median difference = 3.2, 95% CI = 0.04-6.7]; median post-CPB lactate, 7.9 vs 4.3 mg·dl(-1), [median difference 3.6, 95% CI = 2.1-4.7], and median lactate on admission to CICU, 9.4 vs 6.0 mg·dl(-1) [median difference = 3, 95% CI = 1.1-4.9]. No difference was observed in blood pressure or vasoactive
inotrope score at any time point measured in operating room (OR). Higher initial post-CBP cortisol correlated with decreased cosyntropin response.

CONCLUSIONS: Neonatal cardiac surgery with CPB and preoperative methylprednisolone leads to AI as determined by low-dose ACTH stimulation test in one-third of patients. AI is associated with increased serum lactate and colloid resuscitation in OR. Impact of preoperative methylprednisolone on results is not defined. Benefit of postoperative steroid administration in neonates with post-CBP AI warrants further investigation.

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Surgeon-Authored Virtual Laparoscopic Adrenalectomy Module Is Judged Effective and Preferred Over Traditional Teaching Tools.
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OBJECTIVE: The study assesses user acceptance and effectiveness of a surgeon-authored virtual reality (VR) training module authored by surgeons using the Toolkit for Illustration of Procedures in Surgery (TIPS).
METHODS: Laparoscopic adrenalectomy was selected to test the TIPS framework on an unusual and complex procedure. No commercial simulation module exists to teach this procedure. A specialist surgeon authored the module, including force-feedback interactive simulation, and designed a quiz to test knowledge of the key procedural steps. Five practicing surgeons, with 15 to 24 years of experience, peer reviewed and tested the module. In all, 14 residents and 9 fellows trained with the module and answered the quiz, preuse and postuse. Participants received an overview during Surgical Grand Rounds session and a 20-minute one-on-one tutorial followed by 30 minutes of instruction in addition to a force-feedback interactive simulation session. Additionally, in answering questionnaires, the trainees reflected on their learning experience and their experience with the TIPS framework.
RESULTS: Correct quiz response rates on procedural steps improved significantly postuse over preuse. In the questionnaire, 96% of the respondents stated that the TIPS module prepares them well or very well for the adrenalectomy, and 87% indicated that the module successfully teaches the steps of the procedure. All participants indicated that they preferred the module compared to training using purely physical props, one-on-one teaching, medical atlases, and video recordings.
CONCLUSIONS: Improved quiz scores and endorsement by the participants of the TIPS adrenalectomy module establish the viability of surgeons authoring VR training.
Evaluating the learning curve for retroperitoneoscopic adrenalectomy in a high-volume center for laparoscopic adrenal surgery.
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BACKGROUND: Laparoscopic adrenalectomy is an effective method for benign adrenal tumor removal. In the literature, both lateral transperitoneal (TLA) and posterior retroperitoneoscopic (RPA) approaches are described. Since 2007, the number of patients increased significantly in our center. Therefore, RPA was introduced in 2011 because of its potential advantages in operating and recovery times. The learning curve of RPA is now evaluated.

METHODS: All data of patients undergoing laparoscopic adrenalectomy from 2007 until 2014 were prospectively collected. Patients were eligible for RPA with a tumor <7 cm, with BMI < 35 kg/m(2), and with low suspicion of malignancy. The learning curve of RPA was measured by operating time. Furthermore, blood loss, preoperative complications and hospital stay were analyzed. Descriptive statistics were performed using SPSS 20.0.

RESULTS: In the study period, 290 patients underwent surgery, of whom 113 underwent RPA. After starting with RPA, operating times decreased significantly (median 100 min in the first 20 patients to 60 min after 40 patients, p < 0.05). There was a significant difference in operating times (median 108 vs. 62 min, p < 0.05) and hospital stay (median 4 vs. 3 days, p < 0.05) in unilateral surgery in favor of RPA, compared to TLA. Also in bilateral surgery, operating times were significantly shorter (median 236 vs. 117 min, p < 0.05). In both groups, few major complications occurred.

CONCLUSION: After the introduction of RPA, a short learning curve was seen for a single surgeon with extensive experience in laparoscopic adrenal surgery. Compared to TLA, RPA has significant advantages in operating times and hospital stay. Therefore, RPA may be the preferred approach for patients with BMI < 35 kg/m(2) and small benign adrenal tumors (<7 cm).
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Pooled analysis for surgical treatment for isolated adrenal metastasis and
OBJECTIVES: This systematic review and pooled analysis investigated outcomes and prognostic factors in Non-small-cell lung cancer (NSCLC) patients who underwent surgical treatment for an isolated adrenal metastasis and the primary NSCLC.

METHODS: A literature search of PubMed, Embase and Cochrane Library databases was conducted for relevant retrospective studies in patients with NSCLC and isolated adrenal metastatic lesions treated with lobectomy or pneumonectomy and adrenalectomy. Outcome measures were overall, 1-, 2- and 5-year survival rates stratified by synchronous versus metachronous adrenal metastasis and according to lymph node status, pathology and relative location of the metastasis to the primary tumour. Kaplan-Meier survival curves were generated and differences in survival were assessed by a log-rank test.

RESULTS: Thirteen studies involving 98 patients were included in this analysis. The median overall survival was 18 months, and the 1-, 2- and 5-year survival rates were 66.5, 40.5 and 28.2%, respectively. Patients with metachronous adrenal metastasis had a significantly better prognosis than patients with synchronous adrenal metastasis (P < 0.05). Patients classified as negative for lymph node metastasis had a significantly better prognosis than patients classified as positive for lymph node metastasis (P < 0.05). Pathology (squamous carcinoma versus adenocarcinoma) and the relative location of the metastasis to the primary tumour (ipsilateral adrenal metastasis or contralateral adrenal metastasis) had no significant influence on prognosis.

CONCLUSIONS: NSCLC patients with isolated adrenal metastasis undergoing surgical treatment for the primary tumour and adrenal metastasis could achieve a significant survival benefit, especially if they have metachronous adrenal metastasis or are negative for lymph node metastasis.

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Adrenal surgery for oligometastatic tumors improves survival in selected cases.
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INTRODUCTION: Oligometastatic cancer prognosis is distinct from polymetastatic cancer prognosis and surgery can improve survival. The objective of this study was to assess the role of adrenalectomy and to look for prognostic or predictive factors for the treatment of patients with oligometastatic solid tumors and adrenal metastasis.

MATERIAL AND METHODS: Patients with oligometastatic solid tumors undergoing adrenalectomy were selected. Clinical data were retrieved from electronic patients records. Progression-free survival (PFS), overall survival (OS) and clinical outcomes were assessed.

RESULTS: Forty patients were analyzed. Median PFS was 7.4 months and PFS was longer for metachronous versus synchronous adrenal metastasis (10.8 versus 4.5 months; P=0.008). Median OS was 22.8 months and OS was better with laparoscopic adrenalectomy versus open adrenalectomy (24.4 versus 11.2 months; P=0.05).

DISCUSSION: Adrenalectomy part of the treatment plan of oligometastatic solid tumors but patients have to be selected. Surgery might be indicated for metachronous metastasis when laparoscopic adrenalectomy is possible.

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A number of trials have examined the peripheral analgesic effect of opioids, known to have an anti-nociceptive effect at the central and/or spinal cord level. This study aimed to evaluate the efficacy of buprenorphine added to 2% lignocaine with adrenaline 1:80,000 in providing postoperative analgesia after lower third molar surgery. Sixty patients were randomized to three groups: group A received lignocaine 2% with adrenaline 1:80,000 for inferior alveolar nerve block (IANB), along with intramuscular (IM) injection of 1ml saline; group B received buprenorphine mixed with lignocaine 2% with adrenaline 1:80,000 for IANB (0.01mg buprenorphine/ml lignocaine with adrenaline), along with 1ml saline IM; group C received lignocaine 2% with adrenaline 1:80,000 for IANB, along with 0.03mg buprenorphine IM. Mean postoperative pain scores (visual analogue scale; when the patient first felt pain) were 6.0 for group A, 1.0 for group B, and 4.4 for group C. The mean duration of postoperative analgesia was 3.5h in groups A and C and 12h in group B. The mean number of postoperative analgesics consumed was 5.8 in groups A and C and 3.9 in group B. The addition of buprenorphine (0.03mg) to 2% lignocaine with adrenaline 1:80,000 significantly reduced the severity of postoperative pain and prolonged the duration of analgesia, thereby decreasing the need for postoperative analgesics.

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were excluded if an underlying adrenal mass was present. For the remaining cases, the CT appearances were evaluated by 2 radiologists quantitatively and qualitatively.

RESULTS: Our search yielded 18 cases of adrenal hemorrhage, of which 5 cases had corresponding CT and no underlying secondary process within the adrenal. All of the adrenal hematomas in this series demonstrated an ovoid morphology and were well defined, with an average maximum diameter of 8.9 cm and highly variable attenuation on noncontrast CT (average attenuation range, 13.1-44.0 Hounsfield units [HU]). Four of the 5 lesions had degrees of peripheral enhancement that was either thin and somewhat uniform or heterogeneous and irregular. None of the lesions demonstrated invasion of the periaortic fat or adjacent organs.

CONCLUSIONS: Adrenal hematomas with a mass-like configuration offer a potential diagnostic dilemma for radiologists and surgeons. Although it is rare that an adrenal hemorrhage is surgically resected, awareness of the potential appearances of these lesions is important to spare patients from unnecessarily aggressive surgery.

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Adrenal Neuroblastoma in an Adult: Effect of Radiotherapy on Local Progression after Surgical Removal.
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Here, we report the case of a 62-year-old man with neuroblastoma, which is extremely rare in adults. His tumor was resected, but it recurred four months later. Radiotherapy reduced tumor size, and the patient remained in good health three years after surgical tumor removal. The residual tumor and the treatments administered to this patient were evaluated. We have also reviewed the literature.

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Surgical quality of minimally invasive adrenalectomy for adrenocortical carcinoma: a contemporary analysis using the National Cancer Database.
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OBJECTIVES: To compare quality outcomes between open (OA) and minimally invasive (MIA) adrenalectomy for adrenocortical carcinoma (ACC).

PATIENTS AND METHODS: In the National Cancer Database, we identified 481 patients with non-metastatic ACC who underwent adrenalectomy from 2010 to 2013. OA and MIA were compared on positive surgical margin (PSM) and lymph node dissection (LND) rates (primary outcomes), and lymph node yield, length of stay (LOS), readmission, and overall survival (secondary outcomes). Using the intention-to-treat principle, minimally-invasive-converted-to-open cases were considered MIA. Logistic regression analysis was used to identify predictors of PSMs and LND. Associations between approach and the outcomes were further assessed by stage and tumour size.

RESULTS: Overall, 161 patients (33.5%) underwent MIA. MIA was used more commonly in older, comorbid patients; for smaller, localised tumours; and at lower-volume centres. In the intention-to-treat analysis, MIA independently predicted PSMs (odds ratio (OR) 2.0, 95% confidence interval (CI) 1.1-3.6; P = 0.03) and no LND (OR 0.1, 95% CI 0.03-0.6; P = 0.01). On subgroup analysis, the association between MIA and PSMs only held true for pT3 disease (48.7% vs 26.7%, P = 0.01). A higher PSM rate was seen for tumours of ≥10 cm managed with MIA vs OA, but this difference was not significant (28.2% vs 18.5%, P = 0.16). Likewise, the association between MIA and no LND was only observed for male patients, tumours ≥10 cm, and cN0 disease. After excluding minimally-invasive-converted-to-open cases, the difference in PSM was less pronounced and non-significant (OR 1.8, 95% CI 0.9-3.4; P = 0.08). MIA was associated with significantly shorter median LOS (3 vs 6 days, P < 0.01) and non-significantly decreased readmissions (4.4% vs 8.8%, P = 0.08) compared to OA without any difference in lymph node yield or overall survival.

CONCLUSION: For organ-confined disease, MIA offers comparable surgical quality to OA, while expediting inpatient recovery. OA is associated with superior outcomes for locally advanced disease.

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No Postoperative Adrenal Insufficiency in a Patient with Unilateral Cortisol-Secreting Adenomas Treated with Mifepristone Before Surgery. Saroka RM(1), Kane MP(1), Robinson L(2), Busch RS(2).
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BACKGROUND: Glucocorticoid replacement is commonly required to treat secondary adrenal insufficiency after surgical resection of unilateral cortisol-secreting adrenocortical adenomas. Here, we describe a patient with unilateral cortisol-secreting adenomas in which the preoperative use of mifepristone therapy was associated with recovery of the hypothalamic-pituitary-adrenal (HPA) axis, eliminating the need for postoperative glucocorticoid replacement.

CASE PRESENTATION: A 66-year-old Caucasian man with type 2 diabetes mellitus, hyperlipidemia, hypertension, and obesity was hospitalized for Fournier’s gangrene and methicillin-resistant Staphylococcus aureus sepsis. Abdominal computed tomography scan revealed three left adrenal adenomas measuring 1.4, 2.1, and 1.2 cm and an atrophic right adrenal gland. Twenty-four-hour urinary free cortisol level was elevated (237 µg/24 hours, reference range 0-50 µg/24 hours). Hormonal evaluation after resolution of the infection showed an abnormal 8 mg overnight dexamethasone suppression test (cortisol postdexamethasone 14.5 µg/dL), suppressed adrenocorticotropic hormone (ACTH; <5 pg/mL, reference range 7.2-63.3 pg/mL), and low-normal dehydroepiandrosterone sulfate (50.5 µg/dL, male reference range 30.9-295.6 µg/dL). Because of his poor medical condition and uncontrolled diabetes, his Cushing’s syndrome was treated with medical therapy before surgery. Mifepristone therapy was started and, within five months, his diabetes was controlled and insulin discontinued. The previously suppressed ACTH increased to above normal range accompanied by an increase in dehydroepiandrosterone sulfate levels, indicating recovery of the HPA axis and atrophic contralateral adrenal gland. The patient received one precautionary intraoperative dose of hydrocortisone and none thereafter. Two days postoperatively, ACTH (843 pg/mL) and cortisol levels (44.8 µg/dL) were significantly elevated, reflecting an appropriate HPA axis response to the stress of surgery, and two weeks postoperatively, ACTH was within normal range and a repeat dexamethasone suppression test was normal. Six months postoperatively, ACTH was within normal limits and cortisol was approaching normal. The patient has exhibited no postoperative signs or symptoms of adrenal insufficiency in 12 months.

CONCLUSION: Preoperative mifepristone therapy was associated with apparent recovery of the HPA axis prior to unilateral adrenalectomy in a patient with unilateral adrenal adenomas. Postoperatively, the patient experienced no signs or symptoms of adrenal insufficiency and no glucocorticoid replacement was required.

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Adrenal cystic lesions are uncommon but due to the improved radiologic imaging techniques their appearance seems to increase. MATERIAL AND METHODS: We analyzed the clinical and radiological findings of 10 patients with adrenal cysts and the pathological features of the operative material. Standard dissection procedure and paraffin embedded tissue sections were made, stained by HE and immunohistochemically with CD34, CD 31, Factor 8, Podoplanin, CKWS and AE1/AE3. RESULTS: The mean age of the patients was 40.6 years; female to male ratio was 2.3:1. All the cysts were diagnosed as cystic lesions radiologically except one. The most present clinical symptom was abdominal pain. The diameter of the cysts measured from 2 to 7 cm. Four of the cysts were diagnosed as pseudocysts and six as endothelial. Six cysts were lined by CD34(+) and CD31(+) cells, four were lined by Factor 8(+) and podoplanin(+) cells and four had no lining. CONCLUSION: Endothelial cysts were more common cysts in our study and the immunohistochemical results suggested common vascular origin to all endothelial cysts and supported additional separation of angiomatous and lymphangiomathous adrenal vascular cysts. DOI: 10.1515/prilozi-2015-0078 PMID: 27442396 [PubMed - indexed for MEDLINE]

Surgical approach in adrenal incidentalomas: Report of thirteen cases and review of the literature.
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OBJECTIVE: The rate of adrenal incidentalomas detected in routine diagnostic imaging techniques is approximately 4-7%. Although the lesions are generally benign, carcinoma and functional adenomas can be diagnosed with careful clinical and laboratory evaluation.
MATERIAL AND METHODS: Data of 13 patients who underwent surgery for an adrenal mass between January 2010-June 2014 were analyzed retrospectively.
RESULTS: Seven (54%) patients were male, 6 (46%) were female, and the mean age was 38.2. The clinical diagnosis was pheochromacytoma in 5 patients (38.4%), non-functional adenoma in 5 (38.4), and metastatic lesion, Cushing syndrome, and adrenal carcinoma each in one patient (7.6%). Conventional open adrenalectomy was performed in 8 patients, while 5 patients underwent laparoscopic adrenalectomy.
CONCLUSION: Adrenal incidentalomas should be carefully evaluated for hormonal activity even if asymptomatic, and non-functional lesions should be considered as suspicious-for-malignancy. Laparoscopic adrenalectomy has become the gold standard for patients with a mass less than 6 cm, and without infiltration to adjacent organs.
DOI: 10.5152/UCD.2015.3004
The aim of this study was to provide an evidence-based systematic review of the use of laparoscopic and robotic adrenalectomy in the treatment of adrenal disease as part of the International Consultation on Urological Diseases and European Association of Urology consultation on Minimally Invasive Surgery in Urology. A systematic literature search (January 2004 to January 2014) was conducted to identify comparative studies assessing the safety and efficacy of minimally invasive adrenal surgery. Subtopics including the role of minimally invasive surgery for pheochromocytoma, adrenocortical carcinoma (ACC) and large adrenal tumours were examined. Additionally, the role of transperitoneal and retroperitoneal approaches, as well as laparoendoscopic single-site (LESS) and robotic adrenalectomy were reviewed. The major findings are presented in an evidence-based fashion. Large retrospective and prospective data were analysed and a set of recommendations provided by the committee was produced. Laparoscopic surgery should be considered the first-line therapy for benign adrenal masses requiring surgical resection and for patients with pheochromocytoma. While a laparoscopic approach may be feasible for selected cases of ACC without adjacent organ involvement, an open surgical approach remains the 'gold standard'. Large adrenal tumours without preoperative or intra-operative suspicion of ACC may be safely resected via a laparoscopic approach. Both transperitoneal and retroperitoneal approaches to laparoscopic adrenalectomy are safe. The approach should be chosen based on surgeon training and experience. LESS and robotic adrenalectomy should be considered as alternatives to laparoscopic adrenalectomy but require further study.

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INTRODUCTION: Etomidate is usually preferred in the induction of cardiac compromised patients due to its relative cardiovascular stability. However, the use of this drug has been limited as etomidate induces suppression of cortisol biosynthesis as a result of blockade of 11-beta-hydroxylation in the adrenal gland, mediated by the imidazole radical of etomidate. This study was carried out to observe the effect of Vitamin C on adrenal suppression after etomidate induction in patients undergoing cardiac surgery.

MATERIALS AND METHODS: A total of 78 patients were randomly distributed into two groups. Group-I received oral Vitamin C (500 mg) twice daily and Group-II received antacid tablet as placebo twice daily instead of Vitamin C for 7 consecutive days prior to surgery till morning of surgery. Patients of both the groups induced with etomidate (0.1-0.3 mg/kg). Blood cortisol was estimated at different points of time till 24 th postinduction hour/blood lactate, glucose, hemodynamic parameters, and perioperative outcomes were assessed.

RESULTS: Data of seventy patients (n = 35 in each group) were finally analyzed. Cortisol level is statistically significantly higher in Group-I (69.51 ± 7.65) as compared to Group-II (27.74 ± 4.72) (P < 0.05) in the 1 st postinduction hour. In Group-II, cortisol was consistently lower for 1 st 24 postinduction hour. Total adrenaline requirement was statistically significantly high in Group-II. Time of extubation, length of Intensive Care Unit stay arrhythmia was similar in both the groups.

CONCLUSION: Vitamin C effectively inhibits etomidate-induced adrenal suppression in cardiac patients, thereby etomidate can be used as a safe alternative for induction in cardiac surgery under cardiopulmonary bypass when pretreated with Vitamin C.

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PMID: 27397444 [PubMed - in process]
from the Nationwide Inpatient Sample, 2003-2009. Surgeon volumes included (adrenalectomies/year): low-volume (1), intermediate-volume (2-6), and high-volume (≥7).

RESULTS: A total of 7045 patients were included. Surgeries performed by low-volume surgeons were associated with a higher risk of postoperative complications [OR: 1.66, 95% CI: (1.23, 2.24)]. During the study period, if all operations performed by low-volume surgeons were selectively referred to intermediate-volume surgeons, a 7.7% cost savings would have been incurred. Potential savings were even higher (8.1%) if the operations had been performed by the high-volume surgeons. With the conservative assumption that there are 5000 adrenalectomies per year in the United States, the high-volume surgeons would produce savings of $8.8 million over a span of 14 years.

CONCLUSION: A surgeon's expertise is associated with favorable outcomes. Our model estimates that considerable cost savings are attainable with appropriate referrals to high volume endocrine surgeons.

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Synchronous renal cell carcinoma metastasis to the contralateral adrenal gland and pancreas: A case report with 7-year follow-up subsequent to surgical therapy.
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Metastatic renal cell carcinoma (RCC) disseminates to a number of organ sites and few patients demonstrate long-term survival following surgery. However, synchronous metastasis of RCC to the contralateral adrenal gland and pancreas is rare. In the present report, a case of synchronous RCC metastasis to the contralateral adrenal gland and pancreas in a 55-year-old patient, with an 116×92×61 mm right renal tumor and a 96×79×57 mm left adrenal lesion, is described. In April 2007, right nephrectomy was performed to treat the RCC, left adrenalectomy was performed to treat the adrenal tumor and the pancreatic metastases were resected. The patient remained alive at the 7-year follow-up appointment.
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PMCID: PMC4888228
PMID: 27313756 [PubMed]

Epub 2016 Jun 11.
Treatment of primary aldosteronism (PA) aims at preventing or correcting hypertension, hypokalemia and target organ damage. Patients with lateralized PA and candidates for surgery may be managed by laparoscopic adrenalectomy. Partial adrenalectomy and non-surgical ablation have no proven advantage over total adrenalectomy. Intraoperative morbidity and mortality are low in reference centers, and day-surgery is warranted in selected cases. Spironolactone administered during the weeks preceding surgery controls hypertension and hypokalemia and may prevent postoperative hypoaldosteronism. In most cases, surgery corrects hypokalemia, improves control of hypertension and reduces the burden of pharmacologic treatment; in about 40% of cases, it resolves hypertension. However, success in controlling hypertension and reversing target organ damage is comparable with mineralocorticoid receptor antagonists. Informed patient preference with regard to surgery is thus an important factor in therapeutic decision-making.

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Evaluation of the complications in transperitoneal laparoscopic renal and adrenal surgery with Clavien-Dindo classification.

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OBJECTIVE: To evaluate our complications in renal and adrenal transperitoneal laparoscopic surgeries with Clavien-Dindo classification.

MATERIAL AND METHODS: Two hundred and eight patients to whom renal and adrenal laparoscopic surgeries were performed between January 2008 and June 2015 were included the study. One hundred and twenty one (58.2%) patients were female and 87 (41.8%) of them were male. Laparoscopic procedures were performed as radical nephrectomy (n=49; 23.6%), simple nephrectomy (n=56; 26.9%), and partial nephrectomy (n=7; 3.4%), renal cyst decortication (n=27; 13%), pyelopasty (n=14; 6.7%) and adrenalectomy (n=55; 26.4%). Complications were classified according to Clavien-Dindo classification.

RESULTS: The mean age of the patients was 48.01±14.9 years. The mean duration of hospital stay was 3.5±1.9 days. According to European Scoring System for Laparoscopic Operations the procedures were graded based on procedural difficulty as simple (n=27; 12.9%), difficult (n=172; 82.8%), and highly difficult (n=9; 4.3%). Complications were observed in 13 (6.3%) interventions. One of these occurred during very hard and 14 during difficult procedures. According to Clavien-Dindo Classification; Grades 1, 2, and 3 A complications developed in 3 (1.4%), 9 (4.3%), and 1(0.5%) patient, respectively.

CONCLUSION: Laparoscopic surgery is an efficient procedure in well-chosen patients for renal and adrenal diseases with low complication rates.

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The effect of dexmedetomidine added to preemptive (2% lignocaine with adrenaline) infiltration on intraoperative hemodynamics and postoperative pain after ambulatory maxillofacial surgeries under general anesthesia.

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BACKGROUND: Lignocaine + adrenaline; a local anesthetic agent; frequently used for perilesional infiltration, maintains the stable hemodynamics and decreases the postoperative pain after maxillofacial surgery. α2 agonists have peripheral analgesic effects. This prospective study was to evaluate the effectiveness of perilesional dexmedetomidine administered preincisionally in addition to conventional lignocaine adrenaline combinations for reconstructive maxillofacial
surgery in an ambulatory care setting.

MATERIALS AND METHODS: 76, American Society of Anesthesiologists I-II patients scheduled for unilateral traumatic maxillofacial surgeries were randomly allocated into group DL (n = 38) receiving 15 cc of 2% lignocaine + adrenaline (1:200,000) mixed with 1 μg/kg dexmedetomidine and group PL receiving 15 cc of 2% lignocaine + adrenaline with normal saline (placebo) via local wound infiltration 5 min prior to skin incision. Perioperative hemodynamics, time to first analgesic use, total analgesic need, bleeding, and side effects were recorded for each patient.

RESULTS: Dosage of supplemental propofol; total perioperative, postoperative, and postanesthesia care unit (PACU) fentanyl consumption was significantly lower (P = 0.0001, P= 0.0001, P= 0.0001, P= 0.004, respectively) in dexmedetomine treated group than placebo. Rescue analgesic requirement was significantly earlier in group PL than group DL. Group DL patients suffered from significantly less (P = 0.02) bleeding and surgeon's satisfaction score was also high in this group. Discharge from PACU was significantly earlier in group DL. Intraoperative hemodynamic parameters were significantly lower in group DL (P < 0.05) without any appreciable side effects.

CONCLUSION: Thus, prior dexmedetomidine local infiltration at the site of maxillofacial trauma has significantly reduced bleeding from wound site; perioperative fentanyl, propofol consumption, and subsequently ensured earlier discharge from PACU, better surgeon's satisfaction score with better hemodynamic control and lesser side effects.

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Intraocular irrigating solution containing 1 μg/mL adrenaline is widely used during cataract surgery to maintain pupil dilation. Prepared intraocular irrigating solutions are recommended for use within 6 h. After the irrigating solution is administered for dilution, the adrenaline may become oxidized, and this may result in a decrease in its biological activity. However, the stability of adrenaline in intraocular irrigating solution is not fully understood. The aim of this study was to evaluate the stability of adrenaline in clinically used irrigating solutions of varying pH. Six hours after mixing, the adrenaline percentages remaining were 90.6%±3.7 (pH 7.2), 91.1%±2.2 (pH 7.5), and 65.2%±2.8 (pH 8.0) of the initial concentration. One hour after mixing, the percentages remaining were 97.6%±2.0 (pH 7.2), 97.4%±2.7 (pH 7.5), and 95.6%±3.3 (pH 8.0). The degradation was especially remarkable and time dependent in the solution at pH 8.0. These results indicate that the concentration of adrenaline is decreased after preparation. Moreover, we investigated the influence of sodium bisulfite on
adrenaline stability in irrigating solution. The percentage adrenaline remaining
at 6 h after mixing in irrigating solution (pH 8.0) containing sodium bisulfite
at 0.5 µg/mL (concentration in irrigating solution) or at 500 µg/mL
(concentration in the undiluted adrenaline preparation) were 57.5 and 97.3%,
respectively. Therefore, the low concentration of sodium bisulfite in the
irrigating solution may be a cause of the adrenaline loss. In conclusion,
 intraocular irrigation solution with adrenaline should be prepared just prior to
its use in surgery.
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Teaching Laparoscopic Adrenalectomy to Surgical Residents.
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INTRODUCTION: Laparoscopic adrenalectomy is the surgical treatment for various
adrenal diseases. The procedure is a common surgical practice for urologists and
general surgeons and requires fundamental laparoscopic skills, nowadays common in
the surgical education of residents in these practices. The aim of this study is
to assess whether laparoscopic adrenalectomy differs in outcome between certified
and trained surgeons and surgical residents and whether the learning curve
changes the endpoint of the surgery.
MATERIALS AND METHODS: A cohort retrospective study, including all adult patients
who underwent laparoscopic adrenalectomy between June 2008 and June 2014, was
conducted. Patients' demographic, clinical, and surgical data were recorded and
analyzed.
RESULTS: Fifty-three patients were included in the database (21 men, 32 women)
with a mean age of 54 years (range 17-77). The cause for surgery was most
commonly a benign adrenal tumor (27 patients, 50.9%) followed by large
nonfunctioning adrenal tumors (16 patients, 30.1%), and adrenal cancer (8
patients, 15%). Eighteen patients (33.9%) were operated by residents (4-6 years
into the residency) and 35 patients by a certified senior surgeon (66.1%).
Left-sided adrenalectomy was preferred to right-sided adrenalectomy for resident
tutoring (P = .03). Overall, intraoperative complications were seen in 6 patients
(11.3%) and postoperative complications were seen in 9 patients (16.9%). There
were no differences in operation time (P = .36), intraoperative complications
(P = .76), postoperative complications (P = .96), and length of stay (P = .34)
between the patients operated by senior residents and certified surgeons.
CONCLUSION: Laparoscopic adrenalectomy is a complex surgical procedure that
should be a part of the surgical training of surgery residents, as it is safe in

Minimally Invasive Stereotactical Radio-ablation of Adrenal Metastases as an Alternative to Surgery.
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Purpose: The purpose of this study was to study the clinical outcome for patients with metastases of the adrenal gland treated with stereotactic body radiation therapy.

Materials and Methods: Forty-six patients were studied retrospectively. The dose prescription was 40Gy in 4 fractions. Dosimetric analysis was performed using the dose volume histograms while clinical outcome was assessed using actuarial analysis with determination of the overall survival (OS) and local control (LC) rates.

Results: The planning objectives were met for all patients. With a median follow-up period of 7.6 months, at the last follow-up 42 (91.3%) patients were alive and 4 had died because of distant progression. The actuarial mean OS was 28.5±1.6 months, the median was not reached. One-year and 2-year OS were 87.6±6.1%, respectively. None of the risk factors was significant in univariate analysis. Actuarial mean LC was 14.6±1.8 months (95%C.I: 11.0-18.2) and median LC was 14.5±2.0 months (95% CI: 10.5-18.5). One-year and 2-year LC were 65.5±11.9% and 40.7±15.8%, respectively. A mild profile of toxicity was observed in the cohort of patients. Forty (86.9%) patients showed no complication (grade 0); two patients reported asthenia, 6 (13.1%) patients reported either pain, nausea, or vomiting. Of these 6 patients, 5 (10.9%) patients were scored as grade 1 toxicity while 1 (2.2%) patient was scored as grade 2.

Conclusion: SBRT treatment provided an adequate clinical response in the management of adrenal gland metastases.

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Epidemiology of Traumatic Adrenal Injuries Requiring Surgery.
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OBJECTIVE: To analyze adrenal injuries using the National Trauma Data Bank. Adrenal trauma is rare and current literature is lacking in data from large case series.

METHODS: A retrospective analysis of the National Trauma Data Bank from the years 2007-2011 was performed. Patient demographics, Injury Severity Score (ISS), mechanism of injury, type of trauma, associated injuries, and development of shock were assessed. Multivariable models were used to determine association with outcomes, such as characterization of injury, need for adrenalectomy, intensive care unit admission, and death.

RESULTS: Of the 1,766,606 trauma cases recorded, 7791 involved 1 or both adrenal glands (0.44%). Common associated injuries were to the ribs (50.9%), thorax (50.0%), and liver (41.6%). Eighty adrenal injuries required surgery (80/7791, 1.0%), none of which were isolated adrenal injuries (0/120, P = .63). Higher ISS (P = .009), Black race (P = .031), penetrating injury (P < .001), and splenic (P < .001) and intestinal injuries (P = .018) were associated with need for adrenalectomy. No isolated adrenal injuries were associated with death (12% vs 0%, P < .0001). Older age (P < .001), higher ISS (P < .001), chronic kidney disease (P = .009), penetrating injuries (P < .001), and injuries to the aorta/vena cava (P = .008), peripheral vasculature (P < .0001), thorax (P = .029), brain/spinal cord (P < .001), and abdominal polytrauma (P = .005) were associated with mortality.

CONCLUSIONS: Adrenal injuries are rare, comprising 0.44% of recorded traumatic injuries. Isolated adrenal injuries were not fatal and did not require surgery, and thus should be managed conservatively. Detection of adrenal injury in polytrauma patients is key, particularly penetrating trauma and concurrent splenic and/or intestinal injuries, as these patients are more likely to require adrenalectomy.

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Subcostal Port Placement for Lateral Transperitoneoscopic Adrenalectomy: Assessment of Surgical Efficacy.
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The purpose of this study was to evaluate the safety and efficacy of the modified lateral transperitoneal (MLTP) approach in comparison with the traditional lateral transperitoneal (LTP) and lateral retroperitoneal (LRP) approach. From January 2008 to December 2012, 287 patients underwent laparoscopic adrenalectomy, and the MLTP, LTP and LRP approaches were used in 93, 96 and 98 patients. The patients' demographics and surgical outcomes from the three approaches were reviewed and compared. There were no significant differences in the general demographic or postoperative recovery variables among the three groups. However, the average volume of blood lost was lower for the MLTP group than for the other two groups. Additionally, the average operative time was significantly shorter in the MLTP group than in the LTP group and slightly shorter than in the LRP group, but the differences were not statistically significant. This study shows that the MLTP approach is a safe and effective procedure which is associated with shorter operative time and lower volumes of blood loss.

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Surgical outcomes and complications of reconstructive surgery in the female congenital adrenal hyperplasia patient: What every endocrinologist should know.
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Surgical management of classical congenital adrenal hyperplasia (CAH) in 46, XX females has evolved significantly. Virilization of the genitalia of 46, XX females with CAH begins prenatally as a result of excess fetal androgen production. Improved understanding of anatomy and surgical outcomes has driven changes in surgical techniques as well as the timing of surgery. For endocrinologists treating these patients, it is important to understand the outcome of genitoplasty, identify patients who need further treatment and direct these patients to experienced surgeons. We performed a literature search on PubMed of publications addressing CAH and genital reconstruction published in the English language from 1990 to the present. In accordance with our institutional review board, we performed a retrospective analysis of clitoroplasty and/or vaginoplasty procedures performed by a single surgeon at our institution from 1996 to 2015. We found that genital reconstruction in 46, XX CAH patients is associated with few immediate post-operative, infectious, and urinary
complications. Vaginal stenosis is a common complication of vaginal reconstruction and requires evaluation by an experienced surgeon. Clitoral pain or decreased sensation can be associated with clitoral recession and clitorectomy. Outcomes in sexual satisfaction and gender identity can also be impacted by surgical technique and success. Long term follow up and patient reported feedback are crucial to our understanding and management of this special group of patients. Improved awareness and understanding of the complications of genital surgery will allow endocrinologists to know what to ask patients and be ready to provide them with a resource with the understanding and experience to help them improve their quality of life.

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Steroids Improve Hemodynamics in Infants With Adrenal Insufficiency After Cardiac Surgery.
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OBJECTIVE: To investigate whether steroid replacement therapy improved hemodynamics in infants after surgery for congenital heart disease only when they develop adrenal insufficiency. The authors retrospectively investigated adrenal function and evaluated hemodynamic responses to steroid replacement therapy in infants after surgery for congenital heart disease.
DESIGN: Retrospective, cohort study.
SETTING: Intensive care unit in the National Cerebral and Cardiovascular Center Hospital in Japan.
PATIENTS: Thirty-two neonates and infants<3 months old who underwent cardiovascular surgery.
INTERVENTIONS: The patients were divided into 2 groups based on corticotropin stimulation test results: group AI with adrenal insufficiency (baseline cortisol<15 µg/dL or incremental increase after testing of<9 µg/dL, with baseline cortisol of 15-34 µg/dL); and group N with normal adrenal function. The corticotropin stimulation test was performed by injecting 3.5 µg/kg of tetracosactide acetate. Hydrocortisone (1 mg/kg) was administered every 6 hours,
and hemodynamics were compared before and after steroid administration between the groups.

MEASUREMENTS AND MAIN RESULTS: Seven patients were classified into group Al, and demonstrated a mean blood pressure increase from 53±8 mmHg before treatment to 68±9 mmHg 18 hours after steroid administration (p<0.01). Urine output also increased, from 2.7±1.0 mL/kg/h to 4.8±1.9 mL/kg/h (p<0.05). In group N, neither mean blood pressure nor urine output increased after steroid administration.

CONCLUSIONS: After surgery for congenital heart disease, one-fifth of infants developed adrenal insufficiency. Steroid replacement therapy improved hemodynamics only in the subgroup with adrenal insufficiency.

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The insulin tolerance test (ITT) is the gold standard for diagnosing adrenal insufficiency (AI) after pituitary surgery. The ITT is unpleasant for patients, requires close medical supervision and is contraindicated in several comorbidities. The aim of this study was to analyze whether tumor size, remission rate, preoperative, and early postoperative baseline hormone concentrations could serve as predictors of AI in order to increase the diagnostic accuracy of morning serum cortisol. This prospective study enrolled 70 consecutive patients with newly diagnosed pituitary adenomas. Thirty-seven patients had nonfunctioning pituitary adenomas (NPA), 28 had prolactinomas and 5 had somatotropinomas. Thyroxin (T4), thyrotropin (TSH), prolactin, follicle-stimulating hormone (FSH), luteinizing hormone (LH), testosterone, and insulin-like growth factor 1 (IGF-1) were measured preoperatively and on the sixth postoperative day. Serum morning cortisol was measured on the third postoperative day (CORT3) as well as the sixth postoperative day (CORT6). Tumor mass was measured preoperatively and remission was assessed 3 months after surgery. An ITT was performed 3 to 6 months postoperatively. Remission was achieved in 48% of patients and AI occurred in 51%. Remission rates and tumor type were not associated with AI. CORT3 had the best predictive value for AI (area under the curve (AUC) 0.868, sensitivity 82.4%, specificity 83.3%). Tumor size, preoperative T4, postoperative T4, and TSH were also associated with AI in a multivariate regression model. A combination of all preoperative and postoperative variables (excluding serum cortisol) had a
sensitivity of 75.0% and specificity of 77.8%. The predictive power of CORT3 substantially improved by adding those variables into the model (AUC 0.921, sensitivity 94.1%, specificity 78.3%, PPV 81.9%, NPV of 92.7%). In a subgroup analysis that included only female patients with NPA, LH had exactly the same predictive value as CORT3. The addition of baseline LH to CORT3, increased sensitivity to 100.0%, specificity to 88.9%, PPV to 90.4%, and NPV to 100.0%. Besides CORT3, tumor size, thyroid hormones, and gonadotropins can serve as predictors of AI. LH in postmenopausal female patients with NPA has similar diagnostic accuracy as CORT3. Further studies are needed in order to validate the scoring system proposed by this study.

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A resected case of liver metastases from extra-adrenal retroperitoneal paraganglioma with von Recklinghausen's disease 16 years after the initial surgery.
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The patient was a 46-year-old man who had undergone resection for a bulky retroperitoneal tumor 16 years previously during a follow-up for von Recklinghausen's disease. Histopathological examination of the resected specimen showed that the tumor was an extra-adrenal paraganglioma. After the surgery, he had survived without any recurrence of the tumor. However, 16 years after the initial surgery, liver tumors were identified, and he was referred to our hospital for further investigation and treatment. Abdominal imaging modalities showed three masses in the left lateral segment of the liver. Fluorodeoxyglucose-positron emission tomography/computed tomography showed an abnormal uptake of fluorodeoxyglucose corresponding to the mass lesions. The patient was diagnosed with a metastatic paraganglioma based on histopathological examination of a liver mass biopsy. The patient underwent left lateral sectionectomy of the liver. Histopathological examination of the resected specimen revealed proliferating cells with basophilic cytoplasm and oval densely stained nuclei arranged in an alveolar pattern, which was similar to the findings of the initial resection specimen. Immunohistochemical staining was positive for synaptophysin and chromogranin A. Based on these findings, the resected tumors were histopathologically diagnosed with liver metastases from the retroperitoneal paraganglioma. We concluded that this is an extremely rare case of liver...
metastases occurring long after the initial resection of extra-adrenal peritoneal paraganglioma with von Recklinghausen’s disease.

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A Comparative Study Between Bupivacaine with Adrenaline and Carbonated Bupivacaine with Adrenaline for Surgical Removal of Impacted Mandibular Third Molar.
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OBJECTIVES: To compare the effectiveness of bupivacaine with adrenaline with that of carbonated bupivacaine with adrenaline on pain, onset of anesthesia and duration of anesthesia following surgical removal of impacted mandibular third molar.
STUDY DESIGN: All the patients who underwent surgical removal of impacted mandibular third molar and who fulfilled our inclusion and exclusion criteria from 1st June 2013 to 30th June 2014 were included in our study. Patients who were diagnosed as having impacted mandibular third molar were randomly allocated to two groups namely group A (bupivacaine with adrenaline), group B (carbonated bupivacaine with adrenaline). Pain during deposition of local anesthetic, onset of anesthesia and duration of anesthesia were compared between the two groups. The collected data were subjected to statistical analysis by Chi Square test, Mann-Whitney U test.
RESULTS AND CONCLUSION: The efficacy of carbonated bupivacaine with adrenaline is more compared with bupivacaine with adrenaline in decreasing pain on deposition of local anesthetic solution and in rapid onset of anesthesia. The duration of anesthesia for carbonated bupivacaine with adrenaline and bupivacaine with adrenaline had no significant difference. The use of carbonated bupivacaine with adrenaline will reduce the patient discomfort both intra-operatively and post-operatively.
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Robotic assisted adrenalectomy: Surgical techniques, feasibility, indications, oncological outcome and safety.
Nowadays robotic assisted adrenalectomy has become an alternative to conventional laparoscopic adrenalectomy. However, evidence on the possible advantages and drawbacks of robotic assisted adrenalectomy remains still limited. This manuscript aimed to review evidence on robotic assisted adrenalectomy in terms of surgical technique, feasibility, indications, oncological outcome and safety. Existing evidence, although limited, suggests that robotic assisted adrenalectomy is feasible and safe. However, the number of patients submitted to robotic assisted adrenalectomy is limited with the majority of them being operated for benign disease. There are only a few case reports of robotic assisted adrenalectomy performed for adrenocortical carcinoma, oncocytoma or metastasis. Partial adrenalectomy seems to be a promising application of robotic assisted adrenalectomy especially for the treatment of hereditary pheochromocytomas. Robotic assisted adrenalectomy overcoming the technical limitations of laparoscopic surgery could possibly elicit a mild surgical response instead of the well described surgical response. Surgical response affects surgical morbidity and mortality as well as oncological outcome of malignant disease. If this hypothesis is proved correct, robotic assisted adrenalectomy could be possibly indicated in the treatment of disease. In conclusion, robotic assisted adrenalectomy is feasible and safe. Further research is needed on the oncological outcome of this minimally invasive technique as well as on its effect on surgical stress response.

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Impact of novel techniques on minimally invasive adrenal surgery: trends and outcomes from a contemporary international large series in urology.
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OBJECTIVE: To evaluate contemporary international trends in the implementation of minimally invasive adrenalectomy and to assess contemporary outcomes of different minimally invasive techniques performed at urologic centers worldwide.

METHODS: A retrospective multinational multicenter study of patients who underwent minimally invasive adrenalectomy from 2008 to 2013 at 14 urology institutions worldwide was included in the analysis. Cases were categorized based on the minimally invasive adrenalectomy technique: conventional laparoscopy (CL), robot-assisted laparoscopy (RAL), laparoendoscopic single-site surgery (LESS), and mini-laparoscopy (ML). The rates of the four treatment modalities were determined according to the year of surgery, and a regression analysis was performed for trends in all surgical modalities.

RESULTS: Overall, a total of 737 adrenalectomies were performed across participating institutions and included in this analysis: 337 CL (46% of cases), 57 ML (8%), 263 LESS (36%), and 80 RA (11%). Overall, 204 (28%) operations were performed with a retroperitoneal approach. The overall number of adrenalectomies increased from 2008 to 2013 (p = 0.05). A transperitoneal approach was preferred in all but the ML group (p < 0.001). European centers mostly adopted CL and ML techniques, whereas those from Asia and South America reported the highest rate in LESS procedures, and RAL was adopted to larger extent in the USA. LESS had the fastest increase in utilization at 6%/year. The rate of RAL procedures increased at slower rates (2.2%/year), similar to ML (1.7%/year). Limitations of this study are the retrospective design and the lack of a cost analysis.

CONCLUSIONS: Several minimally invasive surgical techniques for the management of adrenal masses are successfully implemented in urology institutions worldwide. CL and LESS seem to represent the most commonly adopted techniques, whereas ML and RAL are growing at a slower rate. All the MIS techniques can be safely and effectively performed for a variety of adrenal disease.

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Adrenal tumors: An experience of 10 years in a single surgical unit.
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INTRODUCTION: Most of the adrenal masses are discovered incidentally by imaging techniques for reasons unrelated to adrenal diseases. Treatment is based on various factors such as, nature of adrenal mass, age of presentation, size of tumor, and the functional status of tumor. We report a series of 14 consecutive cases of adrenal tumors treated in a single surgical unit in our hospital.

AIM: The aim of this study was to evaluate the clinical profile and outcome of treatment of adrenal tumors treated in a surgical unit.

MATERIALS AND METHODS: It is a retrospective study data of 14 cases of adrenal tumors treated in a single surgical unit in University Hospital over 10 years have been analyzed. Various parameters such as gender, age, size of tumor, functional status, histopathology, type of management, and outcome have been reviewed.

RESULTS: A total of 14 patients with adrenal masses were seen over a 10 year period (1997-2006). All were referred cases, either from endocrinology or medicine wards. There were seven female and seven male patients. Mean age of patients was 48.6 years (range 14-60 years). Mean size of tumor was 8.0 cm (5.9 cm for benign tumors and 9.7 cm for malignant tumors). There were six cases of adrenal carcinoma, four cases of adrenal myelolipoma, two cases of pheochromocytoma, and one each case of adrenal hyperplasia and histoplasmosis. There were only two functional tumors. All, except two malignant cases were treated operatively. A total of 5 year survival was 100% in benign cases and 27% in malignant tumors.

CONCLUSION: Adrenal tumors need to be assessed for their functional status and malignant potential prior to treatment. Surgical excision is usually curative for benign lesion. Among malignant tumors the benefits of surgery depend on local extent and metastatic status of tumors.

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Diverse proportion in composite pheochromocytoma-ganglioneuroma may induce varied clinical symptom: comparison of two cases.
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Composite pheochromocytoma-ganglieneuroma is extremely rare. We described two
cases of composite pheochromocytomas in the adrenal medullar. Case 1 was a 70-year-old male presenting with lower abdominal pain and normal blood electrolytes. Case 2 was a 48-year-old female with palpitation and back tenderness. Biochemical investigations showed hypocalcium, hypokalemia and high level of vma. The histological images and the immunohistochemical staining demonstrated the two cases composed of pheochromocytoma and ganglioneuromoma components. Ganglioneuroma component in case 2 accounted for more proportion than that in case 1. We speculated that the varied clinical symptoms were related with the diverse proportions in composite pheochromocytome-ganglioneuroma.

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Outcomes of laparoscopic adrenalectomy Conventional technique versus laparo-endoscopic single-site surgery.
[Article in English, Spanish]
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OBJECTIVE: Perform a comparative analysis of the outcomes of conventional laparoscopic adrenalectomy (LC) and the newly introduced laparo-endoscopic single-site surgery (LESS) over ten years.
MATERIAL AND METHOD: We retrospectively reviewed the experience of a single surgeon from our medical centre with laparoscopic adrenalectomy, either through LC or LESS, with 75 patients between August 2005 and June 2015. Here we describe: age, sex, size, lateralization, preoperative diagnosis, total operating time, intraoperative bleeding, conversion to open surgery, mean hospital stay, intra- and postoperative complications and histopathology report. We used Fischer’s and the Chi-squared tests to compare categorical data and Student’s T-test for a comparison of the means with a normal distribution. Statistical significance was determined when p<0.05.
RESULTS: LC was performed in 51 patients, and LESS in 24 patients. No statistical significance was found for total operating time (LC: 103.9±13.21min vs. LESS: 101.46±13.65min; p=0.07), estimated bleeding (LC: 258.82±136.92cc vs. LESS: 131.25±36.74cc; p=0.46), intraoperative complications (5 cases in LC, none in LESS; p=0.47), nor for postoperative complications (two in LC vs. one in LESS; p=0.69), as catalogued according to the modified Clavien classification system. We detected a statistical significance difference in the comparisons of the mean hospital stay, which was reduced in LESS (LC: 3.55±0.69 days vs. LESS: 2.21±0.31 days; p=0.01).
CONCLUSIONS: Adrenalectomy with LC is the approach of choice for surgical
treatment of adrenal pathologies. The LESS technique is safe, improves the cosmetic results, and does not increase mortality if performed by experienced teams.


Adrenal surgery in England: better outcomes in high-volume practices.
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AIMS AND BACKGROUND: Adrenal surgery is performed by a variety of surgical specialities in differing environments and volumes. International data suggest that there is a correlation between adrenal surgery volume and outcomes but there are no UK data to support this or UK surgical guidelines. A multidisciplinary team representing the stakeholders in adrenal disease is preparing a national guidance on adrenal surgery. A review of the outcomes for adrenal surgery in England was performed to correlate outcomes with the volume of surgeon practice.

METHODS: Hospital Episode Statistics (HES) data for the National Health Service (NHS) in England in the tax year 2013-2014 were examined for adrenal surgery. Length of hospital stay and rate of postoperative readmission were assessed as surrogate quality markers and a comparison made between 'high-' and 'low-' volume surgeons.

RESULTS: A total of 795 adult adrenalectomies were performed by 222 different surgeons with a range of between 1 and 34 adrenalectomies performed per surgeon. Only thirty-six (16%) adrenal surgeons performed 6 or more adrenalectomies. A total of 186 surgeons (84%) performed a median of one adrenalectomy a year. Length of stay and readmission rate within thirty days of operation was 60% longer and 47% higher, respectively, when performed by low-volume surgeons.

CONCLUSION: The current provision of adrenal surgery in the UK is not in the best interests of patients and is not cost-effective for the NHS. Adrenal surgery is best performed by higher volume surgeons in centres with dedicated adrenal multidisciplinary teams expert in all aspects of care of the adrenal patient.

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OBJECTIVE: To report on 30-day adverse event rates and timing of complications following adrenal surgery; further, to investigate the impact of specialty (general surgery vs urology) on these outcomes using a large prospective multi-institutional data registry.

MATERIALS AND METHODS: Within the American College of Surgeons National Surgical Quality Improvement Program (2005-2012), patients undergoing adrenalectomy were identified (CPT-codes: 60540, 60545, 60650). Outcomes evaluated included complications, blood transfusion, length of stay, reintervention, readmission, and mortality. Complications were further evaluated in relation to discharge status (pre-/postdischarge). Multivariable regression models assessed association between specialty and 30-day morbidity/mortality.

RESULTS: During the study period, 4844 patients underwent adrenalectomy (95.7% general surgery). The overall complication rate was 7.5% (n = 363); 43.2% of the complications occurred postdischarge with a substantial proportion of major complications, including cardiac, pulmonary, renal, neurologic, septic, and deep venous thrombosis/pulmonary embolism also occurring postdischarge (29.9%). The overall blood transfusion, reintervention, readmission, and mortality rates were 3.9%, 2.0%, 6.4%, and 0.6%, respectively. In adjusted analyses, specialty did not have an effect on any of the outcomes (P > .05 all).

CONCLUSION: One in 13 patients suffers a complication postadrenalectomy. Approximately 40% of these complications occur postdischarge, primarily within the first 2 weeks of surgery. Accurate knowledge regarding 30-day adverse event rates and timing of complications that this study provides may facilitate improved patient-physician communication and encourage early patient follow-up in
this critical window. Lastly, specialty does not seem to affect outcomes in American College of Surgeons National Surgical Quality Improvement Program participant hospitals.

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Adrenohepatic fusion: Adhesion or invasion in primary virilizant giant adrenal carcinoma? Implications for surgical resection. Two case report and review of the literature.
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INTRODUCTION: Adrenohepatic fusion means union between the adrenal gland and the liver, intermingling its parenchymas. It is not possible to identify this condition by image tests. Its presence implies radical and multidisciplinary approach.

PRESENTATION OF CASES: We report two female cases of 45 and 50 years old with clinical virilization and palpable mass on the abdominal right upper quadrant corresponding to adrenocortical carcinoma with hepatic fusion. The contrast-enhanced tomography showed an indistinguishable mass involving the liver and the right adrenal gland. In the first case, the patient had a two-time operation, the former removing only the adrenal carcinoma, and the second performing a radical surgery after an early relapse. In the second case, a radical right en bloc adrenohepatectomy was performed. Both cases were pathologically reported as liver-infiltrating adrenal carcinoma. Only in the second case the surgery was radical effective as first intention to treat, with 3 years of disease-free survival.

DISCUSSION: ACC is a rare entity with poor prognosis. The major indicators of malignancy are tumour diameter over 6cm, local invasion or metastasis, secretion of corticosteroids, virilization and hypertension and hypokalaemia. The parenchymal fusion of the adrenal cortical layer can be misdiagnosed as hepatocellular carcinoma with adhesion with the Glisson capsule. AHF in such cases may be misinterpreted during surgery, what may impair its resectability, and therefore the survival. The surgical treatment must be performed en bloc, often using liver vascular control. Postoperative treatment must be offered immediately after surgery.

CONCLUSION: We report two consecutive rare cases of adrenohepatic fusion in giant right adrenocortical carcinoma, not detectable by imaging, what has important implications for the surgical decision-making. As radical surgery is the best choice to offer a curative treatment, it has to be performed by a multidisciplinary well-assembled team, counting with endocrine and liver surgeons, and transplant surgeons in case of vena cava involvement, in order to maximize the disease-free survival.

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Bilateral adrenal haemorrhage should be considered as a differential diagnosis in patients presenting with non-specific symptoms and hypotension postoperatively. DOI: 10.1177/2054270415609837
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Fast track surgery vs. conventional management in the perioperative care of retroperitoneal laparoscopic adrenalectomy.
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OBJECTIVE: It has been demonstrated that fast track (FT) surgery can accelerate the recovery of the patients in limited urologic procedures, but there are no reports regarding FT surgery within retroperitoneal laparoscopic adrenalectomy (RLA). This study aims at evaluating the impact of FT surgery on recovery after RLA.

METHODS: One hundred patients in our centre are randomly assigned to FT group and conventional group. The patients who have undergone RLA receive either conventional care or an FT recovery program. Surgical outcome, complications, gastrointestinal function, visual analogue scale (VAS) general state and VAS pain scores are compared between the two groups. In addition, white blood cell count, serum interleukin-6 and C-reactive protein levels are measured. Patients are discharged home when they meet discharge criteria.

RESULTS: Compared with the conventional group, the time of first flatus (18.97±8.45 vs. 37.66±17.17 h), initiation of normal diet (18.76±4.94 vs. 53.15±15.99 h), the time of first ambulation (19.64±6.23 vs. 51.89±18.19 h), length of post-operation hospital stay (2.35±0.87 vs. 5.23±1.62 d), duration of drainage (18.19±5.19 vs. 68.10±18.06 h) and catheter (17.19±4.49 vs. 60.83±25.53 h) are markedly shorter in FT group (P<0.01). Post-operative coughing pain scores at 2 h (1.00±0.61 vs. 1.42±1.18), 12 h (0.96±0.78 vs. 2.00±1.40), 24 h (1.10±0.97 vs. 4.22±1.53) and resting pain scores at 12 h (0.64±0.56 vs. 1.44±0.91), 24 h (0.66±0.63 vs. 1.22±0.86) are consistently lower in the FT group. The level of CRP, IL-6 at 2 h and 24 h post-operation are lower than that of control group, and white blood cell count is lower than conventional group at 24 h after surgery (P<0.01). FT patients have a overall higher level of post-operative VAS general state than conventional groups (P<0.01). Age, sex, tumor size and side, BMI, ASA score, operation time, blood loss and complications are similar in both groups.

CONCLUSIONS: FT surgery within RLA shortens the length of post-operative hospital stay without increasing the postoperative complication, lowers patients’ VAS pain scores, and reduces inflammatory response intensity and improves the general
Different values of urinary fractionated metanephrines after unilateral adrenalectomy for pheochromocytoma according to time intervals after surgery. Cho YY(1), Kim YN(1), Kim JH(2), Jeong BC(3), Lee SY(4), Kim JH(5).
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BACKGROUND: After adrenalectomy, urinary fractionated metanephrine concentrations are expected to be reduced. However, there are few studies suggesting cut-offs for adrenalectomy patients.

METHODS: Urinary metanephrine and normetanephrine concentrations in adrenalectomy patients and two controls were compared and hormonal concentrations were evaluated via time intervals after surgery.

RESULTS: The median urinary metanephrine level after unilateral adrenalectomy was lower than that of the non-pheochromocytoma controls but comparable to healthy controls. Urinary normetanephrine concentrations did not differ between adrenalectomy patients and non-pheochromocytoma controls, although both group had levels higher than those of healthy controls. The median urinary normetanephrine level in the immediate postoperative period was higher than in the later period.

CONCLUSIONS: Urinary metanephrine concentrations were lower after adrenalectomy, but urinary normetanephrine concentrations were not changed compared with the non-pheochromocytoma controls. However, urinary normetanephrine concentrations in the patient group were higher than levels in the healthy controls.

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Effect of Retroperitoneal Lavage with Normal Saline Containing Adrenaline on
OBJECTIVE: To determine the effect of lavage with adrenaline solution on CO2 absorption during retroperitoneal laparoscopic surgery.

MATERIALS AND METHODS: Sixty patients scheduled to undergo retroperitoneal laparoscopic surgery were divided into an AD group (lavage with normal saline containing adrenaline [1:500,000], n = 30) and an NS group (lavage with normal saline only, n = 30). After the establishment of artificial pneumoperitoneum and before the start of the operation, the retroperitoneal space was irrigated with 300 mL of normal saline with or without adrenaline, depending on the group. The lavage fluid was aspirated after 3 minutes. Heart rate (HR), mean arterial pressure (MAP), blood oxygen saturation (SpO2), partial pressure of O2 (PaO2), partial pressure of CO2 (PaCO2), and end-tidal CO2 partial pressure (PETCO2) were recorded before the lavage (T0) and at 10, 30, 60, 90, and 120 minutes (T1-T5, respectively) after the lavage. The CO2 output (VCO2) was calculated, and the incidence of intraoperative arrhythmia and postoperative complications (e.g., headache, palpitations, irritation) was determined.

RESULTS: HR, MAP, SpO2, PaO2, PaCO2, PETCO2, and VCO2 at T0 did not significantly differ between the groups (P > .05). HR, PaCO2, PETCO2, and VCO2 at T1-T5 were lower in the AD group than in the NS group (P < .05). The incidence of intraoperative arrhythmia and postoperative complications was lower in the AD group than in the NS group (P < .05).

CONCLUSIONS: Lavage with normal saline containing adrenaline (1:500,000) reduced CO2 absorption during retroperitoneal laparoscopic surgery, prevented hypercapnia, and decreased intra- and postoperative complications.

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Adrenal incidentalomas and subclinical Cushing syndrome: indications to surgery and results in a series of 26 laparoscopic adrenalectomies.

BACKGROUND: Casual detection of an adrenal mass, the so called incidentaloma (Al) requires an in-depth analysis of imaging phenotype together with hormonal investigation, in order to evaluate both its potential malignancy and the occurrence of a preclinical condition of hypercortisolism (Subclinical Cushing Syndrome, SCS). Aim of the present work is to evaluate surgical indications and results of surgery in patients harbouring an AI with inapparent hypercortisolism.

METHODS: The study has been carried on in a series of 26 Laparoscopic Adrenalectomies (LA) performed from January 2009 and January 2015. Indications to
surgery included Al (11 cases), Cushing’s syndrome (7 cases), suspected metastases (5 cases) and Conn’s disease (3 cases). Six patients with Al had a SCS associated with variable forms of a metabolic syndrome: they were evaluated in detail analysing cortisol secretion and values of Arterial Hypertension, Diabetes Mellitus and BMI before and after surgery.

RESULTS: As far as SCS is concerned, LA was completed in 5 patients (one case converted). Pathology revealed 5 adenomas and one nodular hyperplasia. Four cases required oral cortisone administration at the discharge. At a mean follow-up of 33 months cortisol secretion returned to normal range in all patients; an improvement of metabolic condition was observed in 60, 25, and 50 per cent of hypertensive, diabetic and obese patients respectively.

CONCLUSION: Indications to LA in case of Al and SCS is strongly supported by the presence of an associated metabolic syndrome. In spite of a limited number, our experience confirms the favourable results of surgery in such patients.

KEY WORDS: Adrenal incidentaloma, Laparoscopic adrenalectomies, Subclinical Cushing syndrome.
dell’ACTH serico, l’ipertensione arteriosa, il DM e l’indice di massa corporea sono stati controllati a distanza e confrontati con i valori pre-operatori. Il follow up è risultato in media di 33 mesi. Nel controllo a distanza tutti i pazienti erano in buone condizioni cliniche; i valori del cortisolo ematico e del cortisolo libero urinario si sono normalizzati in tutti i pazienti, mentre due di essi presentavano valori dell’ACTH più alti della norma. In 3 casi su 5 di ipertensione arteriosa si è osservata una riduzione di valori pressori e un miglior controllo farmacologico. Un caso su 4 di DM ha avuto un miglioramento del controllo glicemico. In 3 casi su 6 il BMI si è ridotto anche se con valori non significativi. Nell’esperienza personale i pazienti affetti da SCS associata all’incidentaloma hanno avuto una normalizzazione del quadro ormonale e mediamente un miglioramento della sindrome metabolica. Quest’ultima rappresenta quindi un’ulteriore indicazione alla chirurgia anche nella prospettiva della riduzione del rischio cardiovascolare. La SL è la procedura di scelta in rapporto alla minore entità del trauma e ai precoci tempi di recupero.

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after 50 mg-captopril loading. CT revealed bilateral adrenocortical tumours of 10 and 12 mm in diameter on the right and left sides, respectively. S-AVS confirmed excess aldosterone secretion from a tumour segment vein and suppressed secretion from a non-tumour segment vein bilaterally, leading to the diagnosis of bilateral APA. The patient underwent simultaneous bilateral sparing adrenalectomy. Histopathological analysis of the resected adrenals together with decreased blood pressure and PAC of 5.2 ng dl(-1) confirmed the removal of bilateral APA. S-AVS was reliable to differentiate bilateral APA from IHA by direct evaluation of intra-adrenal hormone production.

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Postoperative rhabdomyolysis following robotic renal and adrenal surgery: a cautionary tale of compounding risk factors.
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This study aimed at reviewing a contemporary series of patients who underwent robotic renal and adrenal surgery by a single surgeon at a tertiary referral academic medical center over a 6-year period, specifically focusing on the unique and serious complication of post-operative rhabdomyolysis of the dependent lower extremity. The cases of 315 consecutive patients who underwent robotic upper tract surgery over a 6-year period from August 2008 to June 2014 using a standardized patient positioning were reviewed and analyzed for patient characteristics and surgical variables that may be associated with the development of post-operative rhabdomyolysis. The incidence of post-operative rhabdomyolysis in our series was 3/315 (0.95%). All three affected patients had undergone robotic nephroureterectomy. Those patients who developed rhabdomyolysis had significantly higher mean Body Mass Index, Charlson Comorbidity Index, and median length of stay than those who did not. The mean OR time in the rhabdomyolysis group was noted to be 52 min longer than the non-rhabdomyolysis group, though this value did not reach statistical significance. Given the trends of increasing obesity in the United States and abroad as well as the continued rise in robotic upper tract urologic surgeries, urologists need to be
increasingly vigilant for recognizing the risk factors and early treatment of the unique complication of post-operative rhabdomyolysis.

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Head docking for single stage robotic cortical sparing adrenalectomy for bilateral pheochromocytoma.
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The optimal operative approach in a patient with bilateral pheochromocytoma is controversial. Subtotal minimal invasive cortical sparing adrenalectomy is gaining interest in many centers. We describe a novel technique for single stage approach for cortical sparing adrenalectomy for bilateral pheochromocytoma using head docking in order to offer good exposure of bilateral upper peritoneum without requiring patient or robot repositioning.

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Effect of unilateral adrenalectomy on acute immobilization stress response in rats.
Ibrahim IY, Abdel-Hakim SM, Nazmy WH, Saad AH, Ali FF.

OBJECTIVES: The aim of the present study was to investigate the differential effect of unilateral adrenalectomy, right vs. left, in response to acute immobilization stress (IS) in rats.

METHODS: Adult male rats were subjected to unilateral right or left adrenalectomy or sham operation (control). Two weeks later, the rats were sacrificed either immediately or 3 hours after IS exposure. Plasma samples were used for determination of catecholamines (CAs), adrenocorticotropic hormone (ACTH), corticosterone (CORT), sodium, potassium, and glucose levels. After terminating the experiment, both or remaining adrenals were removed, weighed, and used for estimation of CAs and nitric oxide (NO) levels.
RESULTS: Under basal conditions, either right or left adrenal kept all the tested parameters near to the control levels, except the adrenal weight and CAs content. These were significantly higher in the remaining right than left adrenal. However, the remaining right adrenal responded better to IS exposure than the remaining left one in the term of compensatory adrenal growth and plasma parameters which were all kept insignificantly different from those of IS intact group.

CONCLUSION: Our data indicate that the adrenal glands may substitute each other under basal conditions. However, the right adrenal seems to be dominant during exposure to acute immobilization stress.

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Open Versus Laparoscopic Adrenalectomy for Adrenocortical Carcinoma: A Meta-analysis of Surgical and Oncological Outcomes.
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PURPOSE: This study was designed to determine the role of laparoscopic adrenalectomy (LA) in the surgical management of adrenocortical carcinoma (ACC).

METHODS: A systematic literature review was performed on January 2, 2015 using PubMed. Article selection proceeded according to PRISMA criteria. Studies comparing open adrenalectomy (OA) to LA for ACC and including at least 10 cases per each surgical approach were included. Odds ratio (OR) was used for all binary variables, and weight mean difference (WMD) was used for the continuous parameters. Pooled estimates were calculated with the fixed-effect model, if no significant heterogeneity was identified; alternatively, the random-effect model was used when significant heterogeneity was detected. Main demographics, surgical outcomes, and oncological outcomes were analyzed.

RESULTS: Nine studies published between 2010 and 2014 were deemed eligible and included in the analysis, all of them being retrospective case-control studies. Overall, they included 240 LA and 557 OA cases. Tumors treated with laparoscopy were significantly smaller in size (WMD -3.41 cm; confidence interval [CI] -4.91, -1.91; p < 0.001), and a higher proportion of them (80.8 %) more at a localized
I-II stage compared with open surgery (67.7 %) (odds ratio [OR] 2.8; CI 1.8, 4.2; p < 0.001). Hospitalization time was in favor of laparoscopy, with a WMD of -2.5 days (CI -3.3, -1.7; p < 0.001). There was no difference in the overall recurrence rate between LA and OA (relative risk [RR] 1.09; CI 0.83, 1.43; p = 0.53), whereas development of peritoneal carcinomatosis was higher for LA (RR 2.39; CI 1.41, 4.04; p = 0.001). No difference could be found for time to recurrence (WMD -8.2 months; CI -18.2, 1.7; p = 0.11), as well as for cancer specific mortality (OR 0.68; CI 0.44, 1.05; p = 0.08).

CONCLUSIONS: OA should still be considered the standard surgical management of ACC. LA can offer a shorter hospital stay and possibly a faster recovery. Therefore, this minimally invasive approach can certainly play a role in this setting, but it should be only offered in carefully selected cases to avoid jeopardizing the oncological outcome.

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BACKGROUND: Although laparoscopic transperitoneal adrenalectomy (LTA) has become a standard operative approach to patients with benign adrenal masses, some authors have suggested that LTA should be avoided in obese patients, patients who have had previous abdominal surgery, and in cases of bilateral adrenalectomy. We sought to determine whether LTA in these clinical situations is associated with worse outcomes.

METHODS: Consecutive patients who underwent LTA at a tertiary care center (1/2002-8/2014) were reviewed retrospectively. Study endpoints included operative time, duration of stay, conversion to open procedure, and postoperative complications. Statistical analyses were performed by use of Wilcoxon rank sum test, Kruskal-Wallis test, Fisher exact test, \( \chi^2 \) test, and binary logistic regression analyses.

RESULTS: A total of 365 patients had a planned LTA, 6 of whom were converted to an open adrenalectomy. Obesity, history of previous abdominal surgery, and bilateral adrenalectomy were not associated with greater conversion rates or postoperative complications. Male sex, tumor size ≥ 4 cm and obesity (body mass index ≥ 30 kg/m\(^2\)) were significant factors associated with increased operative
Bilateral adrenalectomy, age, and pheochromocytomas were associated with increased hospital stays.

CONCLUSION: Obesity, history of prior abdominal surgery and bilateral adrenalectomy should not be used to discourage experienced adrenal surgeons from performing LTA.

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Preoperative surgical simulation of laparoscopic adrenalectomy for neuroblastoma using a three-dimensional printed model based on preoperative CT images.
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BACKGROUND: Three-dimensional (3D) printed models based on computed tomography (CT) images facilitate the visualization of complex structures and are useful for understanding the surgical anatomy preoperatively. We developed a preoperative surgical simulation method using a 3D printed model based on CT images obtained prior to laparoscopic adrenalectomy for adrenal neuroblastomas (NBs).
MATERIALS AND METHODS: The multi-detector CT images were transferred to a 3D workstation, and 3D volume data were obtained by reconstructing the sections. A model was made with a 3D printer using acrylic ultraviolet curable resin. The adrenal tumor, kidney, renal vein and artery, inferior vena cava, aorta, and outer body were fabricated. The pneumoperitoneum, insertion of trocars, and laparoscopic view were all attainable in this model. We used this model for three cases with adrenal NB.
RESULTS: We used this model to discuss the port layout before the operation and to simulate the laparoscopic view and range of forceps movement. All three cases with NB were completely resected without any surgical complications.
CONCLUSIONS: The surgical simulation using 3D printed models based on preoperative CT images for adrenal NB was very useful for understanding the patient’s surgical anatomy and for planning the surgical procedures, especially for determining the optimal port layout.
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58. Medicine (Baltimore). 2015 Sep;94(39):e1397. doi: 10.1097/MD.0000000000001397. Radioguided Adrenal Surgery: Access in Complex Situations: Technical Notes. Deus J(1), Millera A, Andrés A, Prats E, Gil I, Suarez M, Salcini JL, Lahoz M. Author information: (1)From the Department of Surgery, University Hospital, Zaragoza, Spain (JD, AM, IG, MS); Department of Nuclear Medicine, University Hospital, Zaragoza, Spain (AA, EP); Department of Podiatry, University of Sevilla, Spain (JLS); and Department of Human Anatomy and Histology, University of Zaragoza, Spain (ML).

The laparoscopic adrenalectomy is considered as the procedure of choice for the treatment of adrenal hyperplasia and tumor lesions. However, some special situations may limit the use of this method due to the difficulty to locate the gland and perform the lesion excision. We analyze 2 patients of a left adrenal tumor, explaining how they have overcome the difficulties in both situations. The first case was a patient with a history of intra-abdominal surgery and the other patient suffered from severe obesity. We performed with the use of the gamma probe, and the 2 cases, was of great help to access and glandular localization. The help of gamma probe test was achieved in the surgical bed, that removal was complete. The use of the portable gamma probe facilitated the access to the left adrenal gland as well as conducting the glandular excision without delay, despite the difficulties due to the intra abdominal surgery caused by the previous surgery, and in the case of severe obesity. DOI: 10.1097/MD.0000000000001397 PMCID: PMC4616850 PMID: 26426608  [PubMed - indexed for MEDLINE]


Recent advances in technology and the need to decrease surgical morbidity have led a rapid progress in laparoscopic adrenalectomy (LA) over the past decade. Robotics is attractive to the surgeon owing to the 3-dimensional image quality, articulating instruments, and stable surgical platform. The safety and efficacy of robotic adrenalectomy (RA) have been demonstrated by several reports. In addition, RA has been shown to provide similar outcomes compared to LA. Development of adrenal surgery has involved the description of several surgical approaches including the anterior transperitoneal, lateral transperitoneal (LT) and posterior retroperitoneal (PR). Among these, the most frequently preferred technique is LT adrenalectomy, primarily due to the surgeon's familiarity of the operative field, wider working space and visibility. The LT technique is suitable for the resection of larger, unilateral tumors and in scenarios where conversion to an open transperitoneal approach is warranted, it offers a lesser burden. Also, the larger view of the entire abdominal cavity and excellent exposure of
both adrenal glands and surrounding structures provided by the LT technique render it safe and feasible in pediatric and pregnant individuals.

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Comparison of different postoperative pain managements in patients submitted to transperitoneal laparoscopic renal and adrenal surgery.
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PURPOSE: We compared the effects of local levobupivacaine infiltration, intravenous paracetamol, intravenous lornoxicam treatments on postoperative analgesia in patients submitted to transperitoneal laparoscopic renal and adrenal surgery.

MATERIALS AND METHODS: Sixty adult patients 26 and 70 years who underwent laparoscopic renal and adrenal surgery were randomized into three groups with 20 patients each: Group 1 received local 20 mL of levobupivacaine 0.25% infiltration to the trocar incisions before skin closure. In group 2, 1g paracetamol was given to the patients intravenously 30 minutes before extubation and 5 g paracetamol was given intravenously in the 24 postoperative period. In group 3, 8 mg lornoxicam i.v. was given 30 minutes before extubation and 8 mg lornoxicam i.v. was given in the 24 postoperative period. In the postoperative period, pain scores, cumulative tramadol, and additional pethidine consumption were evaluated.

RESULTS: Postoperative pain scores significantly reduced in each group (p < 0.05). Although pain levels of the groups were not significantly different at 1, 2, 4, 8, 12 and 24 hours postoperatively, cumulative tramadol consumptions were higher in group 1 than the others. (Group 1 = 370.6 ± 121.6 mg, Group 2: 220.9 ± 92.5mg, Group 3 = 240.7 ± 100.4 mg.) (p < 0.005). The average dose of pethidine administered was significantly lower in groups 2 and 3 compared with group 1 (Group 1: 145 mg, Group 2: 100mg, Group 3: 100mg) (p = 0.024).

CONCLUSIONS: Levobupivacaine treated group required significantly more intravenous tramadol when compared with paracetamol and lornoxicam groups in patients submitted to transperitoneal laparoscopic renal and adrenal surgery.
PMCID: PMC4756994
PMID: 26401858 [PubMed - indexed for MEDLINE]

A patient with Alzheimer's disease complicated by elderly-onset Cushing's syndrome who had undergone surgical treatment for adrenocorticotropic
Cushing’s syndrome (CS) is a rare disorder, especially in older people. Loss of brain volume and neurocognitive impairment of varying degrees has been demonstrated in patients with CS. However, there is a large difference between the median age of presentation of CS and that of Alzheimer’s disease. We herein report a case of a patient with Alzheimer's disease complicated by elderly-onset CS who had undergone surgical treatment for adrenal hyperplasia. Surgical correction of hypercortisolism seems to have slowed the progression of brain volume loss and cognitive dysfunction and improved psychiatric symptoms such as visual hallucination, restlessness, and psychomotor excitement. These improvements have remarkably reduced the burden on the patient's caregivers. The present case suggests that subclinical CS may be present, particularly in rapidly progressive dementia, and that surgical treatment of CS for neuropsychiatric symptoms is useful.

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Comparison of dexamethasone and clonidine as an adjuvant to 1.5% lignocaine with adrenaline in infraclavicular brachial plexus block for upper limb surgeries.
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BACKGROUND AND AIMS: The role of clonidine as an adjuvant to regional blocks to hasten the onset of the local anesthetics or prolong their duration of action is proven. The efficacy of dexamethasone compared to clonidine as an adjuvant is not known. We aimed to compare the efficacy of dexamethasone versus clonidine as an adjuvant to 1.5% lignocaine with adrenaline in infraclavicular brachial plexus block for upper limb surgeries.

MATERIAL AND METHODS: Fifty three American Society of Anaesthesiologists-I and II patients aged 18-60 years scheduled for upper limb surgery were randomized to three groups to receive 1.5% lignocaine with 1:200,000 adrenaline and the study drugs. Group S (n = 13) received normal saline, group D (n = 20) received
dexamethasone and group C (n = 20) received clonidine. The time to onset and peak effect, duration of the block (sensory and motor) and postoperative analgesia requirement were recorded. Chi-square and ANOVA test were used for categorical and continuous variables respectively and Bonferroni or post-hoc test for multiple comparisons. P < 0.05 was considered significant.

RESULTS: The three groups were comparable in terms of time to onset and peak action of motor and sensory block, postoperative analgesic requirements and pain scores. 90% of the blocks were successful in group C compared to only 60% in group D (P = 0.028). The duration of sensory and motor block in group S, D and C were 217.73 ± 61.41 min, 335.83 ± 97.18 min and 304.72 ± 139.79 min and 205.91 ± 70.1 min, 289.58 ± 78.37 min and 232.5 ± 74.2 min respectively. There was significant prolongation of sensory and motor block in group D as compared to group S (P < 0.5). Time to first analgesic requirement was significantly more in groups C and D as compared with group S (P < 0.5). Clinically significant complications were absent.

CONCLUSIONS: We conclude that clonidine is more efficacious than dexamethasone as an adjuvant to 1.5% lignocaine in brachial plexus blocks.

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Effects of epidural preemptive analgesia on stress reaction in retroperitoneal laparoscopic adrenalectomy surgery: a randomized controlled study.
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OBJECTIVE: To compare the effects of general anesthesia combined with epidural preemptive analgesia with general anesthesia on stress reaction in the retroperitoneal laparoscopic surgery.

METHODS: Forty patients with adrenal tumors undergoing retroperitoneal laparoscopic surgeries were randomly assigned into general anesthesia combined with epidural preemptive analgesia group (GE) and general anesthesia group (G). Each group had 20 cases. In the GE group, before the induction of general anesthesia, T10-T11 epidural puncture was performed and 0.2% bupivacaine 5-10 ml was injected to maintain the anesthesia level at T4. In the G group, normal saline was injected as control. After entry into the operation room (X0), before surgery (X1), 30 min after pneumoperitoneum (X2), 60 min after pneumoperitoneum (X3), 10 min after extubation (X4), the mean arterial pressure (MAP) and heart rate (HR) were recorded. The concentration of plasma endothelin (ET) and calcitonin gene-related peptide (CGRP) were detected. Meanwhile, isoflurane inhalation MAC and intervention situations were recorded.

RESULTS: At X1-X3, MAP in the GE group was significantly lower than that in the G
group (P < 0.05). At X2-X4 HR in two groups was significantly faster than at X1 (P < 0.05). At X4 HR in the GE group was significantly lower than that in the G group (P < 0.05). At X3 and X4, ET and CGRP were significantly lower than those in the G group (P < 0.05). At X2 and X3, ET in the GE group was significantly higher than that at X1 (P < 0.05). At X3, CGRP in the GE group was significantly higher than that at X1 (P < 0.05). At X2, X3 and before pneumoperitoneum, isoflurane MAC in the GE group was significantly lower than that in the G group (P < 0.05). At X2 and X3, isoflurane MAC in two groups was significantly higher than that during pneumoperitoneum (P < 0.05).

CONCLUSION: Compared with general anesthesia, general anesthesia combined with epidural preemptive analgesia can effectively alleviate patients’ stress reaction under retroperitoneal laparoscopic surgery.

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MANAGEMENT OF ENDOCRINE DISEASE: Outcome of adrenal sparing surgery in heritable pheochromocytoma.

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The management of hereditary pheochromocytoma has drastically evolved in the last 20 years. Bilateral pheochromocytoma does not increase mortality in MEN2 or von Hippel-Lindau (VHL) mutation carriers who are followed regularly, but these mutations induce major morbidities if total bilateral adrenalectomy is performed. Cortical sparing adrenal surgery may be proposed to avoid definitive adrenal insufficiency. The surgical goal is to leave sufficient cortical tissue to avoid glucocorticoid replacement therapy. This approach was achieved by the progressive experience of minimally invasive surgery via the transperitoneal or retroperitoneal route. Cortical sparing adrenal surgery exhibits <5% significant recurrence after 10 years of follow-up and normal glucocorticoid function in more
than 50% of the cases. Therefore, cortical sparing adrenal surgery should be systematically considered in the management of all patients with MEN2 or VHL hereditary pheochromocytoma. Hereditary pheochromocytoma is a rare disease, and a randomized trial comparing cortical sparing vs classical adrenalectomy is probably not possible. This lack of data most likely explains why cortical sparing surgery has not been adopted in most expert centers that perform at least 20 procedures per year for the treatment of this disease. This review examined recent data to provide insight into the technique, its indications, and the results and subsequent follow-up in the management of patients with hereditary pheochromocytoma with a special emphasis on MEN2.

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Pheochromocytomas are rare tumours originating in chromaffin cells, representing 0.1-1% of all secondary hypertension (HT) cases. The majority are benign and unilateral, characterised by the production of catecholamines and other neuropeptides. Mainly located in the adrenal gland, they are more frequent between the 3rd and 5th decades of life; however, 10-25% can be associated with genetic familial syndromes (multiple endocrine neoplasia type 2 (MEN 2), type 1 neurofibromatosis and Von-Hippel-Landau disease in younger ages. The authors present a rare case of secondary HT due to a pheochromocytoma in a 15-year-old patient, whose metanephrine assay confirmed the diagnosis, and abdominal ultrasound and CT localised the tumour in the adrenal gland. HT was controlled with a and β blockers, with posterior retroperitoneal laparoscopic surgical intervention and subsequent resolution of HT. Age and concomitant hyperparathyroidism compelled genetic testing for the exclusion of MEN 2, which was negative.
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If single adrenal metastasis surgery is well admitted, no recommendation exists about the management of a renal vein tumor thrombus, even though the actual consensual attitude consists in a nephrectomy associated to an adrenalectomy. We report, here, the case of a 74-year-old man with a suspected adrenal metastasis of a lung carcinoma associated with a left adrenal and renal vein tumor thrombus treated by adrenalectomy and renal vein thrombectomy and ipsilateral kidney sparing. The postoperative computed tomography scan showed no thrombus in the left renal vein. Doppler ultrasound performed 1 month after adrenalectomy proved a good left renal vein flux. At 36 months of follow-up, the patient is alive without signs of recurrence.


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Objective: Because of the received wisdom within our setting that claims that local anesthesia should not be used with adrenalin in hand surgery; we conducted a study using lidocaine with adrenalin, to demonstrate its safety, utility and efficacy.

Methods: We conducted a prospective study in which, in wrist, hand and finger surgery performed from July 2012 onwards, we used local anesthesia comprising a 1% lidocaine solution with adrenalin at 1:100,000. We evaluated the quantity of bleeding, systemic alterations, signs of arterial deficit and complications, among other parameters. We described the infiltration techniques for specific procedures individually.

Results: We operated on 41 patients and chose to describe separately the raising of a lateral microsurgical flap on the arm, which was done without excessive bleeding and within the usual length of time. In only three cases was there excessive bleeding or use of bipolar tweezers. No systemic alterations were observed by the anesthesiologists or any complications relating to ischemia and necrosis in the wounds or in the fingers, and use of tourniquets was not necessary in any case.

Conclusions: Use of lidocaine with adrenalin in hand surgery was shown to be a safe local anesthetic technique, without complications relating to necrosis. It
provided efficient exsanguination of the surgical field and made it possible to perform the surgical procedures without using a pneumatic tourniquet, thereby avoiding its risks and benefiting the patient through lower sedation.

Publisher: Por causa do dogma existente em nosso meio de que não deve ser usada anestesia local com adrenalina na cirurgia da mão, fizemos um estudo com o uso de lidocaína com adrenalina para demonstrar sua segurança, utilidade e eficácia. Fizemos um trabalho prospectivo no qual, a partir de julho de 2012, usamos como anestesia local uma solução de lidocaína 1% com adrenalina 1:100.000 nas cirurgias em punho, mão e dedos e avaliamos a quantidade de sangramento, as alterações sistêmicas, os sinais de déficit arterial e as complicações, entre outros parâmetros. Descrevemos as técnicas de infiltração de procedimentos específicos individualmente. Operamos 41 pacientes e optamos por descrever separadamente um levantamento de retalho microcirúrgico lateral do braço, que ocorreu sem sangramento excessivo e no tempo habitual. Em apenas três casos houve sangramento e uso de pinça bipolar excessivos. Não houve alterações sistêmicas verificadas pelos anestesiologistas ou complicações relacionadas à isquemia e necrose nas feridas ou nos dedos e em nenhum caso foi necessário o uso do torniquete. O uso de lidocaína com adrenalina na cirurgia da mão mostrou-se técnica anestésica local segura, sem complicações relacionadas à necrose, forneceu campo cirúrgico exsangue eficiente, permitiu os procedimentos cirúrgicos sem uso do torniquete pneumático, evitou seus riscos e beneficiou os pacientes com menor sedação.

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Is there a role for segmental adrenal venous sampling and adrenal sparing surgery in patients with primary aldosteronism?
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OBJECTIVE AND DESIGN: Adrenal venous sampling (AVS) is critical to determine the subtype of primary aldosteronism (PA). Central AVS (C-AVS)--that is, the collection of effluents from bilateral adrenal central veins (CV)--sometimes does not allow differentiation between bilateral aldosterone-producing adenomas (APA) and idiopathic hyperaldosteronism. To establish the best treatment course, we have developed segmental AVS (S-AVS); that is, we collect effluents from the tributaries of CV to determine the intra-adrenal sources of aldosterone overproduction. We then evaluated the clinical utility of this novel approach in the diagnosis and treatment of PA.

METHODS: We performed C-AVS and/or S-AVS in 297 PA patients and assessed the accuracy of diagnosis based on the results of C-AVS (n=138, 46.5%) and S-AVS (n=159, 53.5%) by comparison with those of clinicopathological evaluation of resected specimens.

RESULTS: S-AVS demonstrated both elevated and attenuated secretion of aldosterone from APA and non-tumorous segments, respectively, in patients with bilateral APA and recurrent APA. These findings were completely confirmed by detailed histopathological examination after surgery. S-AVS, but not C-AVS, also served to identify APA located distal from the CV.

CONCLUSIONS: Compared to C-AVS, S-AVS served to identify APA in some patients, and its use should expand the pool of patients eligible for adrenal sparing surgery through the identification of unaffected segments, despite the fact that S-AVS requires more expertise and time. Especially, this new technique could enormously benefit patients with bilateral or recurrent APA because of the preservation of non-tumorous glandular tissue.

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BACKGROUND: Adrenal venous sampling (AVS) is the definitive evaluation for primary aldosteronism (PA). Pre-AVS cross-sectional imaging does not reduce the need for AVS. The goal of this study was to examine whether performing AVS prior to imaging could decrease the use of imaging in the evaluation of PA at a high volume, experienced center.

METHODS: We performed a retrospective analysis of all AVS procedures (n = 337) done for PA from 2001-2013. Patients whose cross-sectional imaging reports were unavailable (n = 90) or AVS was non-diagnostic (n = 12) were excluded. AVS was performed using modified Mayo technique. Univariate analysis utilized the χ² test and fisher's exact test.

RESULTS: Of the 235 patients analyzed, 63% (n = 148) were male. The mean age was 55 ± 11 years. AVS was non-lateralizing in 43% (n = 101); these patients might have avoided imaging with an AVS-first approach. Imaging and AVS were concordant in 52% (n = 123). In patients ≤40yo (n = 23), 35% (n = 8) had no lateralization on AVS, and might have avoided imaging in an AVS-first approach. Imaging and AVS were concordant in 52% (n = 12) of patients ≤ 40yo, versus 52% (n = 111) of patients > 40 yo (P = 0.987).

CONCLUSION: An AVS-first, imaging-second approach could have avoided CT/MRI in 43% of patients. At a high volume, experienced center, performing AVS first on patients with PA may reduce unnecessary cross-sectional imaging studies.

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BACKGROUND: Laparoscopic adrenalectomy (LA) is a safe and minimally invasive operation for benign adrenal tumours. The purpose of this study was a retrospective analysis of outcomes following laparoscopic lateral transabdominal
adrenalectomy performed for benign adrenal tumours responsible for various endocrinological disorders and non-functioning tumours.

METHODS: A total of 100 laparoscopic adrenalectomy were carried out between January 2007 and March 2013 via the lateral transabdominal approach. The analysed factors included demographic data of patients, indication for surgery, tumour size and side, intraoperative and postoperative outcome of laparoscopic lateral transabdominal adrenalectomy including duration of surgery, length of hospital stay, the complication rate, as well as the conversion rate to open adrenalectomy.

RESULTS: There were 34 patients with non-functioning tumours (Group 1) and 66 with functioning tumours (Group 2). The intraoperative and postoperative outcomes were not significantly different in the cases among the analysed groups of patients. The median operative time was 101 ± 4.3 (range, 30-210) minute in group 1 and 95 ± 5.9 (range, 30-190) minute in group 2, there was not statistically significant (p = 0.56). The median duration of the postoperative hospital stay in the group 1 was bigger than group 2, this did not differ significantly (p = 0.08). Peroperative complications were occured in 9 (9%) patients, observing 6 (9%) patients in Group 1 and 3 (8.8%) patients in Group 2. There was not statistically significant (p = 0.96). In the postoperative period, three patients in group I, 1 patient in group II developed complications, this difference was not statistically significant (p = 0.69). The conversion to open surgery was found in 9 (9%) patients.

CONCLUSION: This study shows that laparoscopic lateral transabdominal adrenalectomy is a safe, effective, and technically feasible procedure in the treatment of both functioning and nonfunctioning benign tumours of the adrenal gland.

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MORNING SERUM CORTISOL LEVEL AFTER TRANSSHENOIDAL SURGERY FOR PITUITARY ADENOMA PREDICTS HYPOTHALAMIC-PITUITARY-ADRENAL FUNCTION DESPITE INTRAOPERATIVE DEXAMETHASONE USE.
OBJECTIVE: Perioperative glucocorticoid (GC) is rarely needed in patients undergoing transsphenoidal surgery (TSS). We instituted a steroid-sparing protocol in the settings of intraoperative dexamethasone use. We evaluated the safety of using a cut off cortisol level of 14 μg/dL on postoperative day (POD)-1 and -6 after dexamethasone use during the surgery. We also analyzed the efficacy of serial morning cortisol levels for weaning GC replacement.

METHODS: The charts of 48 adult patients who received dexamethasone 4 mg intraoperatively were reviewed. Morning cortisol levels were measured on POD-1. Patients with cortisol ≥14 μg/dL were discharged without CG replacement. Morning cortisol level was checked routinely on POD-6, and GC replacement was initiated when the level was <14 μg/dL. Serial cortisol levels were measured in patients requiring GC after the first postoperative week.
RESULTS: Overall, 67% patients had POD-1 cortisol ≥14 μg/dL and did not require GC on discharge. After POD-6, 83% of patients were not on GC replacement. A cosyntropin stimulation testing (CST) was only performed in 3 patients. There were no hospital admissions for adrenal crisis during the postoperative period.

CONCLUSION: A steroid-sparing protocol with POD-1 and -6 morning cortisol levels can be safely and effectively used in the settings of intraoperative dexamethasone administration. It leads to avoidance of GC in more than two-thirds of patients on discharge and more than 80% of patients after the first postoperative week. We found that dynamic adrenal testing could be omitted in the majority of patients by using serial morning cortisol levels to assess the hypothalamic-pituitary-adrenal (HPA) axis.

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Comparative outcomes of lateral transperitoneal adrenalectomy versus posterior retroperitoneoscopic adrenalectomy in consecutive patients: A single surgeon's experience.
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BACKGROUND: Among several minimally invasive adrenalectomy techniques, lateral transperitoneal adrenalectomy (LTA) is the procedure of choice for benign adrenal tumors; however, posterior retroperitoneoscopic adrenalectomy (PRA) is an alternative that is increasing in popularity. This study compared the outcomes of these two approaches.

METHODS: Since a single surgeon started adrenalectomy, LTA had been performed exclusively until PRA was adopted and became the standard treatment. Therefore, the consecutive patients were allocated into two groups according to the date of surgery: the first group received LTA and the second group received PRA.

RESULTS: LTA was performed in 29 patients and PRA in 19 patients. There was no difference in sex, age, body mass index, clinical diagnosis, and tumor size between the LTA and the PRA group. The PRA group showed less blood loss (117.0 mL vs. 58.5 mL, p = 0.035) and tended to have a shorter operating time (92.2 minutes vs. 78.1 minutes, p = 0.054) and less pain score on postoperative Day 1 (3.8 vs. 3.0, p = 0.095) and Day 2 (3.2 vs. 2.5, p = 0.051). The mean operation time was
significantly shorter for patients in the PRA group undergoing right adrenalectomy (109.2 minutes vs. 80.5 minutes, p = 0.009), but those undergoing left adrenalectomy had a similar operating time to the LTA group (83.2 minutes vs. 74.8 minutes, p = 0.380).

CONCLUSION: PRA is a good alternative operative technique for an endocrine surgeon who is experienced in the transperitoneal approach.

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PURPOSE: This study presents a technical report of a standardized approach to the perinephric area in a series of pediatric patients, demonstrating that whatever renal or suprarenal surgery is planned, this can be approached and accomplished laparoscopically with an identical or very similar port triangulation, thus facilitating the learning curve within the same surgical team.

PATIENTS AND METHODS: All patients undergoing renal and adrenal gland surgery with a minimally invasive approach in the period from October 2008 to November 2013 were retrospectively reviewed and included in the study. Technical details and clinical outcomes are described.

RESULTS: In total, 68 patients matched the inclusion criteria and were therefore retrospectively examined. No major intraoperative complication occurred. Two patients developed recurrent pelvic-ureteric junction obstruction and were managed with double J stent positioning and laparoscopic dismembered pyeloplasty, respectively. Two patients presenting with adrenal mass experienced a moderate bleeding that could be treated conservatively.

CONCLUSIONS: Thanks to the reproducibility of the procedure and on the grounds of the presented experience, we support the proposal that the transperitoneal laparoscopic approach to the kidney and the adrenal gland could represent a relatively easy and safe way to quickly achieve confidence and skill in the management of related diseases.
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Composite pheochromocytoma of the adrenal gland: a case series.

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BACKGROUND: Composite pheochromocytoma is a rare pathological condition characterized by elements of both pheochromocytoma and neurogenic tumors. However, detailed clinical outcomes of this tumor have not been fully shown. From 2007 to 2013, we experienced three cases of adrenal composite pheochromocytoma. In this report, we investigate the clinicopathological features of these three cases of composite pheochromocytoma and compare them with previously reported cases.

CASE PRESENTATIONS: Cases 1 and 2 were a 29-year-old Japanese woman and a 59-year-old Japanese man, respectively. They underwent laparoscopic left adrenalectomy, and pathological examination revealed composite pheochromocytoma-ganglioneuroma. Case 3 was a 53-year-old Japanese man who had been receiving hemodialysis for 17 years. He underwent laparoscopic right adrenalectomy, and pathological examination revealed composite pheochromocytoma-ganglioneuroblastoma. Although the Ki67-positive rates varied from 1.0 to 6.2% among the three cases, no clinical recurrences occurred. Despite the relatively high rate of Ki67 positivity, complete tumor resection resulted in favorable clinical outcomes.

CONCLUSION: We experienced three cases of adrenal composite pheochromocytoma. Although the clinical findings and treatment outcomes of composite pheochromocytoma were similar to those of ordinary pheochromocytoma, further studies of the biological behavior and genetic profiles of composite pheochromocytoma are necessary to achieve a better understanding of this tumor.

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8D.04: CLINICAL BENEFITS OF ADMINISTERING SUPER-SELECTIVE SEGMENTAL ADRENAL VENOUS SAMPLING AND PERFORMING ADRENAL SPARING SURGERY IN THE PATIENTS WITH PRIMARY ALDOSTERONISM.


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OBJECTIVE: Adrenal venous sampling (AVS) has been well known to play pivotal roles in clinical differential diagnosis of unilateral aldosterone producing adenoma (APA) from bilateral idiopathic hyperaldosteronism (IHA). However, it is also true that a central vein AVS or c-AVS which collects the blood from right and left central adrenal veins can by no means discriminate bilateral APA from BHA. There have been no published studies reporting the reliable clinical differential diagnosis between bilateral APA and IHA, especially IHA cases with bilateral non-functioning adenomas (NFA), which has been considered practically impossible in clinical differential diagnosis. As an attempt to this clinical dilemma, segmental AVS (S-AVS), which could evaluate segmental effluents from adrenal tributary veins, has been recently developed.

DESIGN AND METHOD: We have performed S-AVS in these patients above following C-AVS, via the insertion of a microcatheter in up to three intra-adrenal first-degree tributary veins on bilateral adrenals.

RESULTS: S-AVS did enable us to evaluate the intra-adrenal localization of corticosteroidogenesis. These data did indicate that S-AVS should be performed in the PA patients who had increased aldosterone levels in bilateral central vein and demonstrated space occupying lesions in the bilateral adrenals in order to avoid bilateral adrenalectomy or long lasting medical treatment toward persistent PA. In addition to the situations above, we have administrated S-AVS to the following patients; those who had clinically suspected APA but not sufficiently high lateralization indexes according to the results of C-AVS, very young ones with higher clinical probability of recurrence and those who could benefit from partial adrenalectomy by demonstrating the sites of specific steroidogenesis. However, it is also entirely true that S-AVS is more expensive, time-consuming and labor-intensive compared to C-AVS. (Figure is included in full-text article.) The angiography during S-AVS (A, B), the coronal CT image (C), and the data in external iliac vein (EIV), each central vein (1, 4) and each tributary vein (2, 3, 5, 6) of 66 year-old male patient with bilateral APAs.

CONCLUSIONS: We should carefully select the candidate patients who should undergo S-AVS, which will give a benefit to themselves by demonstrating intra-adrenal steroidogenesis for a safer preserving adrenalectomy.

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Cushing's disease (CD), or pituitary-dependent Cushing's syndrome, is a severe endocrine disease caused by a corticotroph pituitary tumor and associated with increased morbidity and mortality. The first-line treatment for CD is pituitary surgery, which is followed by disease remission in around 78% and relapse in around 13% of patients during the 10-year period after surgery, so that nearly one third of patients experience in the long-term a failure of surgery and require an additional second-line treatment. Patients with persistent or recurrent CD require additional treatments, including pituitary radiotherapy, adrenal surgery, and/or medical therapy. Pituitary radiotherapy is effective in controlling cortisol excess in a large percentage of patients, but it is associated with a considerable risk of hypopituitarism. Adrenal surgery is followed by a rapid and definitive control of cortisol excess in nearly all patients, but it induces adrenal insufficiency. Medical therapy has recently acquired a more important role compared to the past, due to the recent employment of novel compounds able to control cortisol secretion or action. Currently, medical therapy is used as a presurgical treatment, particularly for severe disease; or as postsurgical treatment, in cases of failure or incomplete surgical tumor resection; or as bridging therapy before, during, and after radiotherapy while waiting for disease control; or, in selected cases, as primary therapy, mainly when surgery is not an option. The adrenal-directed drug ketoconazole is the most commonly used drug, mainly because of its rapid action, whereas the glucocorticoid receptor antagonist, mifepristone, is highly effective in controlling clinical comorbidities, mainly glucose intolerance, thus being a useful treatment for CD when it is associated with diabetes mellitus.

Pituitary-directed drugs have the advantage of acting at the site responsible for CD, the pituitary tumor. Among this group of drugs, the dopamine agonist cabergoline and the somatostatin analog pasireotide result in disease remission in a consistent subgroup of patients with CD. Recently, pasireotide has been approved for the treatment of CD when surgery has failed or when surgery is not an option, and mifepristone has been approved for the treatment of Cushing’s syndrome when associated with impairment of glucose metabolism in case of the lack of a surgical indication. Recent experience suggests that the combination of different drugs may be able to control cortisol excess in a great majority of patients with CD.

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PURPOSE: Adrenal scintigraphy with 131I-6β-iodomethylnorcholesterol is considered by several authors the gold standard for assessing tumors with subclinical hypercortisolemia. However, most of the described series consist mainly of cases with unilateral lesions. The aim of our study was to assess whether scintigraphy is useful in choosing the adrenalectomy side in the case of bilateral adrenal tumors with subclinical hypercortisolemia.

METHODS: The study focused on 15 consecutive patients with benign bilateral adrenal tumors and subclinical hypercortisolemia. The scintigraphy with 131I-6β-iodomethylnorcholesterol was performed. Fourteen patients underwent unilateral adrenalectomy; the gland with predominant uptake on scintigraphy was removed. Cortisol and ACTH concentrations were measured one and six months after surgery. Post-dexamethasones cortisolemia was assessed six months after surgery. To date, the patients have been under postoperative observation for 1-4 years.

RESULTS: Four patients showed unilateral uptake of radiotracer, and nine patients showed predominant accumulation of radiotracer in one of the adrenal glands. The smaller tumor was predominant in 2 cases. Percentage of activity on the predominant side correlates positively with the difference between tumors' diameters. Unilateral uptake of radiotracer predicts long-lasting postoperative insufficiency of the second adrenal gland. Excision of predominating tumor led to cessation of hypercortisolemia in all patients.

CONCLUSIONS: The corticoadrenal scintigraphy is useful in choosing the side for operation in the case of bilateral adrenal tumors with subclinical hypercortisolemia.

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Adrenal tuberculosis mimicking a malignancy by direct hepatic invasion: emphasis on adrenohepatic fusion as the potential route.
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A 64-year-old female with primary adrenal insufficiency presented with a right adrenal mass showing quantitative nonadenoma features on dedicated adrenal computed tomography (CT). CT showed direct invasion of the mass to the adjacent hepatic parenchyma, and high uptake was noted on 18F-fluorodeoxyglucose positron emission tomography/CT. Laparoscopy revealed gross invasion of the adrenal lesion into the liver, which led to the en bloc resection including the involved liver. Polymerase chain reaction analysis of the surgical specimen revealed adrenal tuberculosis.

Laparoscopic hand-assisted adrenal sparing surgery for a giant adrenal myelolipoma: A case report.
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INTRODUCTION: Adrenal myelolipoma is a rare, benign tumor. Surgical resection is advocated in case of symptomatic, large size (> 4cm), increase of size on follow-up and atypical appearance on imaging. Laparoscopic adrenalectomy is currently the gold standard operation for managing benign adrenal mass. However, to date, laparoscopic entire resection of ipsilateral adrenal gland with the tumor have been mainly reported in the literature. Under clinical circumstances, adrenal sparing surgery underused as first-line therapy for adrenal tumors.

CASE PRESENTATION: We present a case of adrenal myelolipoma involving the right adrenal gland of a 45-year-old woman who presented with right-sided flank pain. On radiologic and endocrine evaluation, she was diagnosed with a giant adrenal myelolipoma (> 8cm). Right hand-assisted laparoscopic partial adrenalectomy was performed, and postoperative recovery was uneventful. Finally, histological examination confirmed adrenal myelolipoma. On follow-up computed tomography, there was no residual tumor and the remaining right adrenal gland.

CONCLUSION: Our report suggests that hand-assisted laparoscopic partial adrenalectomy could be considered for appropriate removal of adrenal myelolipoma, even in giant adrenal myelolipoma.

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Hypertensive crisis caused by electrocauterization of the adrenal gland during hepatectomy.
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BACKGROUND: Hypertensive crisis (i.e., systolic blood pressure over 300 mmHg) is very rare during operation except pheochromocytoma, but it can be a fatal and embarrassing to surgeons and anesthesiologists. The right adrenal gland can be electrocauterized during a right hemi-hepatectomy. We report a case of hypertensive crisis during right hemi-hepatectomy in which the right adrenal gland was stimulated by monopolar electrocautery in a patient with normal neuroendocrine function.

CASE PRESENTATION: A 73-year-old man with hepatocellular carcinoma was scheduled to undergo right hemi-hepatectomy. Three hours into the surgery, the patient’s blood pressure increased abruptly from 100/40 to over 350/130 mmHg (the maximum measurement pressure of the monitor; 350 mmHg). The surgeon had cauterized the right adrenal gland using monopolar electrocautery to separate the liver from the adrenal gland immediately prior to the event. Approximately 3 minutes after suspending the operation, blood pressure returned to baseline levels. After the event, the operation was successfully completed without any complication.

Hormonal studies and iodine-123 meta-iodobenzylguanidine scintigraphy revealed no neuroendocrine tumor such as a pheochromocytoma.

CONCLUSION: Operations such as hepatectomy that stimulate the adrenal gland may lead to an unexpected catecholamine surge and result in hypertensive crisis, even if neuroendocrine function of the adrenal gland is normal.

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Germline PRKACA amplification causes variable phenotypes that may depend on the extent of the genomic defect: molecular mechanisms and clinical presentations.

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Department of Pediatrics.
OBJECTIVE: We have recently reported five patients with bilateral adrenocortical hyperplasia (BAH) and Cushing's syndrome (CS) caused by constitutive activation of the catalytic subunit of protein kinase A (PRKACA). By doing new in-depth analysis of their cytogenetic abnormality, we attempted a better genotype-phenotype correlation of their PRKACA amplification.

DESIGN: This study is a case series.

METHODS: Molecular cytogenetic, genomic, clinical, and histopathological analyses were performed in five patients with CS.

RESULTS: Reinvestigation of the defects of previously described patients by state-of-the-art molecular cytogenetics showed complex genomic rearrangements in the chromosome 19p13.2p13.12 locus, resulting in copy number gains encompassing the entire PRKACA gene; three patients (one sporadic case and two related cases) were observed with gains consistent with duplications, while two sporadic patients were observed with gains consistent with triplications. Although all five patients presented with ACTH-independent CS, the three sporadic patients had micronodular BAH and underwent bilateral adrenalectomy in early childhood, whereas the two related patients, a mother and a son, presented with macronodular BAH as adults. In at least one patient, PRKACA triplication was associated with a more severe phenotype.

CONCLUSIONS: Constitutional chromosomal PRKACA gene amplification is a recently identified genetic defect associated with CS, a trait that may be inherited in an autosomal dominant manner or occur de novo. Genomic rearrangements can be complex and can result in different copy number states of dosage-sensitive genes, e.g., duplication and triplication. PRKACA amplification can lead to variable phenotypes clinically and pathologically, both micro- and macro-nodular BAH, the latter of which we speculate may depend on the extent of amplification.

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Surgical results of reduced port laparoscopic adrenalectomy using a multichannel port in comparison with conventional laparoscopic adrenalectomy.
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BACKGROUND: We introduced a modified laparoscopic technique, dual-incision laparoscopic adrenalectomy (DILA), using a newly designed multichannel trocar, and we evaluated its perioperative outcomes and operative costs and compared them to those of conventional laparoscopic adrenalectomy (CLA).

METHODS: We retrospectively reviewed the medical records of 127 patients who underwent CLA with four trocars or DILA with two trocars at Seoul St. Mary's Hospital, Seoul, Korea between October 2007 and September 2014. We analyzed the patients' surgical outcomes and perioperative morbidities.

RESULTS: DILA was performed in 45 patients and CLA in 82 patients. There were no significant differences in operative time (DILA: 77.1 ± 28.4 minutes vs. CLA: 76.6 ± 28.0 minutes, p = 0.595) or estimated blood loss during surgery (DILA: 150.0 ± 85.5 mL vs. CLA: 175.5 ± 50.5 mL, p = 0.697). There were no differences in postoperative hospital stay, visual analog scale pain score, or postoperative complication rates between the two groups. However, the operative cost was significantly lower in the DILA group (DILA 813,603 ± 48,600 Korean won vs. CLA 968,368 ± 56,456 Korean won, p < 0.001).

CONCLUSION: This study demonstrated that DILA is a safe and feasible surgical approach for adrenal diseases. DILA may reduce the operative cost significantly compared with CLA.

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Surgical treatment of potentially primary malignant adrenal tumors: an unresolved issue.
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Although the great majority of incidentalomas are adrenocortical adenomas, a number of them, depending on the size and radiological characteristics of the lesions, will turn out to be carcinomas. These tumors may present as suspicious on initial evaluation and potentially malignant or malignant on histology. Adrenocortical carcinoma is a rare and aggressive malignancy with evolving diagnostic and therapeutic approaches. Laparoscopic surgery has become the gold standard for surgery of benign adrenal tumors. Despite the extensive experience gained in laparoscopic adrenalectomy, controversy still remains in the management
of adrenal tumors with high suspicion or evidence of malignancy. The aim of this review is to update the existing information regarding the diagnostic approach and surgical management of suspicious and potentially malignant primary adrenal tumors. The interpretation of radiologic characteristics is a cornerstone in pre-operative assessment of large adrenal masses, since open surgery remains the preferred procedure when malignancy is suspected in large tumors with possible local invasion. Despite the improvement of imaging techniques, they lack sufficient accuracy to exclude primary malignancy in tumors from 4 cm to 10 cm in size. An initial laparoscopic approach can be used in this group of patients, but early conversion to open technique is mandatory if curative resection cannot be performed. Adrenal tumors >10 cm of malignant potential should be treated by the open approach from the start. Solitary adrenal metastasis from another primary malignancy is usually amenable to laparoscopic surgery. Patients with suspected adrenal cancer should be referred to tertiary centers that perform laparoscopic and open adrenal surgery with minimal morbidity and mortality.

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Congenital adrenal hyperplasia: current surgical management at academic medical centers in the United States.
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Comment in

PURPOSE: Controversy exists on the necessity for and timing of genitoplasty in girls with congenital adrenal hyperplasia. Our knowledge of surgical preferences is limited to retrospective series from single institutions and physician surveys, which suggest a high rate of early reconstruction. We evaluated current surgical treatment for congenital adrenal hyperplasia at academic centers.
MATERIALS AND METHODS: We queried the Faculty Practice Solutions Center database to identify all female patients younger than 18 years with a diagnosis of congenital adrenal hyperplasia between 2009 and 2012. Procedures were identified by CPT codes for vaginoplasty, clitoroplasty and other genital procedures. Reconstruction type, age at surgery and surgeon volume were analyzed.
RESULTS: We identified 2,614 females in the database with a diagnosis of congenital adrenal hyperplasia who were seen at a total of 60 institutions. Of infants younger than 12 months between 2009 and 2011 as few as 18% proceeded to surgery within a 1 to 4-year followup. Of those referred to a pediatric urologist 46% proceeded to surgery. Of patients who underwent surgery before age 2 years clitoroplasty and vaginoplasty were performed in 73% and 89%, respectively, while 68% were treated with a combined procedure. A medium or high volume surgeon was involved in 63% of cases.
CONCLUSIONS: Many patients with congenital adrenal hyperplasia in the database did not proceed to early reconstructive surgery. Of those referred to surgeons, who were possibly the most virilized patients, about half proceeded to early surgery and almost all underwent vaginoplasty as a component of surgery. About two-thirds of the procedures were performed by medium or high volume surgeons, indicative of the surgical centralization of disorders of sexual development.

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Poorly-controlled acromegaly accompanied by subclinical adrenal Cushing’s syndrome after surgery for multiple endocrine tumors.
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A 48-year-old woman diagnosed with acromegaly 21 years earlier presented at our hospital with a left adrenal tumor. Her medical history included breast cancer, thyroid cancer and an incompletely resected growth hormone (GH)-producing pituitary adenoma. Endocrinological and radiological examinations revealed subclinical adrenal Cushing's syndrome. She subsequently underwent left adrenalectomy, followed by glucocorticoid replacement therapy. Her GH and insulin-like growth factor-1 levels were insufficiently controlled, and pegvisomant was administered in addition to octreotide acetate. Following adrenalectomy, a giant hepatic hemangioma and papillary thyroid carcinoma in the residual right lobe developed, indicating the high risk of tumor development in patients with acromegaly.
DOI: 10.2169/internalmedicine.54.2782
PMID: 25786452  [PubMed - indexed for MEDLINE]

Single-Session CT-Guided Percutaneous Microwave Ablation of Bilateral Adrenal Gland Hyperplasia Due to Ectopic ACTH Syndrome.
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Bilateral adrenalectomy is currently the only available treatment for adrenocorticotropin hormone (ACTH)-dependent Cushing syndrome (ectopic ACTH syndrome) that is refractory to pharmacologic therapy. We describe two patients with refractory ectopic ACTH syndrome who were treated with CT-guided percutaneous microwave ablation of both hyperplastic adrenal glands in a single session: one was not a surgical candidate, and the other had undergone unsuccessful surgery. Following the procedure, both patients achieved substantial decreases in serum cortisol, symptomatic improvement, and decreased anti-hypertensive medication requirements.

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PMID: 25762486 [PubMed - indexed for MEDLINE]

Adrenal renal fusion confusion: a case report of an adrenal cortical adenoma with adrenal-renal fusion.
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We report a case of laminaria hypersensitivity treated with diphenhydramine and corticosteroids. A literature review identified 10 previously reported cases, with 8 recognized as anaphylaxis, and good outcomes with corticosteroids and antihistamines despite limited epinephrine utilization. Laminaria hypersensitivity is likely IgE mediated with an increased anaphylaxis risk with prior exposure.
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Adrenal-preserving surgery of adrenal tumours.
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Currently, laparoscopic adrenalectomy is seen as more than just the preferred method, in fact as a routine procedure, always bearing in mind, however, the developed restraints on its usage. The size of the tumour, recurrent disease, and the existing invasive process all remain factors which determine the indications for operation. The situation is similar in cases of qualifying for sparing (non-radical) operations on adrenal glands. The basic challenge in terms of qualification, choice of technique and the range of operation of adrenal lesions remains: obtaining a reliable preoperative diagnosis, the localisation of lesions including their ectopic location, the evaluation of the imaging phenotype, as well as a proper pre-surgical preparation. Maintaining one third of properly vascularised adrenal mass allows one to avoid a substitutive therapy, with the possible necessity of its application in stressful situations. The first partial adrenalectomy has been conducted on a patient with a bilateral pheochromocytoma, in order to retain the glucocorticoid adrenal functions. The recommendations for its administration remain: hereditary pheochromocytoma of at least 2cm diameter, unilateral adenoma of at least 5cm diameter in Cushing's syndrome without any concomitant lesions in the oposite adrenal gland, and unilateral adenoma in Conn's syndrome. It seems that non-radical resection should always be considered for patients at risk of bilateral adrenalectomy in cases of concomitant lesions in both adrenals.

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It has been known for decades that lowering the circulating glucocorticoid (GC) concentration as in Addison's disease or after removing the adrenals results in thymus enlargement, largely due to thymocyte expansion. This has been attributed to the loss of the proapoptotic effects on thymocytes by adrenal GCs. Here, we test this concept and report that ACTH directly controls thymic growth post-adrenalectomy (ADX) independent of the proapoptotic effect of GCs. This was supported by the finding that ADX caused thymus enlargement and a 1.7-fold (P < 0.001) increase in thymocyte number in GR(LckCre) mice resistant to GC-induced thymocyte apoptosis, similar to the increase seen in wild-type mice (2.2-fold; P < 0.01). We show by immunostaining that melanocortin receptor subtype 2, which selectively binds ACTH, is partly expressed on the thymic epithelium. Furthermore, ACTH in comparison to vehicle induced a 2.0-fold (P < 0.01) increase in fetal thymic organ culture thymocyte numbers in vitro and enhanced 2.2-fold (P < 0.05) the expression of delta-like ligand 4, a factor that supports T-cell development. Additionally, adrenalectomized GR(LckCre) mice treated with ACTH
under conditions that repressed endogenous ACTH secretion showed increased thymocyte cellularity (1.9-fold; P < 0.01) and splenic naive T-cell numbers (2.5-fold; P < 0.001) compared to when treated with PBS. Altogether, our results show that ACTH directly controls thymocyte homeostasis independent of GCs. These results revise the old paradigm behind compensatory thymus growth following ADX, now demonstrating that ACTH has a central role in regulating thymocyte expansion when systemic GC concentration is low.

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A study of promethazine hydrochloride and pentazocine intramuscular sedation along with 2 % lidocaine hydrochloride and adrenaline and comparison to placebo along with 2 % lidocaine hydrochloride and adrenaline for surgical extraction of mandibular third molar.
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BACKGROUND AND OBJECTIVES: The main objective is to study and compare the sedative and analgesic effects of intramuscular injection fortwin-phenergan along with local anesthetic and normal saline placebo along with local anesthetics in mandibular third molar surgery. We also assessed and compared the postoperative experience of the patient in relation to the pain intensity, time to first analgesic taken and total number of analgesics consumed over a period of 48 h in the two groups.

MATERIALS AND METHODS: Patients who came to the Department of Oral and Maxillofacial Surgery, The Regional Dental College; with complaints regarding mandibular third molar were chosen for the treatment. Patients were evaluated using Corah Dental Anxiety Scale (CDAS) and those patients having a score of CDAS 13 and above were selected. Sixty patients were selected out of which 30 patients formed group 1 and another 30 patients group 2. The patients were randomly divided with flip method into group 1 (study group) and or group 2 (controlled group).

RESULTS: Our study results showed that the operating conditions for both the groups at the end of surgery were similar without significant difference. Most of the surgical procedures were graded as excellent and good in both the groups except that difficulty was encountered in two patients from group 1 and one from group 2.

CONCLUSION: It could be concluded that particular drugs do not have much influence on the surgical procedure in our study, but it was found that patients
from group 1 were more cooperative as compared to group 2 when difficulty was encountered during the surgical procedure.

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PMID: 25729232 [PubMed]

An analysis of different therapeutic options in patients with Cushing's syndrome due to bilateral macronodular adrenal hyperplasia: a single-centre experience.
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CONTEXT: Bilateral macronodular adrenal hyperplasia (BMAH) is a rare form of Cushing's syndrome (CS). A variety of in vivo tests to identify aberrant receptor expression have been proposed to guide medical treatment. Unilateral adrenalectomy (UA) may be effective in selected patients, but little is known about recurrence during follow-up.

OBJECTIVE: To describe a series of patients with BMAH and CS treated by different approaches, with a particular focus on the benefit of UA.

DESIGN AND PATIENTS: We retrospectively assessed 16 patients with BMAH and CS (11 females, five males), analysing the in vivo cortisol response to different provocative tests. Twelve of the 16 patients underwent UA and were monitored over the long term.

RESULTS: Based on in vivo test results, octreotide LAR or propranolol was administered in one case of food-dependent CS and two patients with a positive postural test. A significant improvement in biochemical values was seen in all patients but with limited clinical response. UA was performed in 12 patients, producing long-term remission in three (106 ± 28 months; range: 80-135), recurrence in eight (after 54 ± 56 months; range 12-180) and persistence in one other. Four patients subsequently underwent contralateral adrenalectomy for overt CS, one received ketoconazole, and four other patients remain under observation for subclinical CS.

CONCLUSIONS: Medical treatment based on cortisol response to provocative tests had a limited role in our patients, whereas UA was useful in some of them. Although recurrence is likely, the timing of onset is variable and close follow-up is mandatory to identify it.

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DOI: 10.1111/cen.12763
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Surgical resection of metastases to the adrenal gland: a single center experience.


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BACKGROUND: Only limited data exist on the treatment and outcome of adrenal metastases that derive from different primary tumor entities. Due to the lack of evidence, it is difficult to determine the indication for surgical resection.

METHODS: We assessed the outcome of 45 patients (28 men, 17 women) with adrenal metastases who underwent surgery (1990-2014). The median age at the time of adrenal surgery was 62 years (range 44-77 years). We were able to evaluate follow-up data of 41 patients.

RESULTS: Primary tumor types were liver n = 12 (hepatocellular carcinoma n = 9, cholangiocellular carcinoma n = 2, sarcoma n = 1), upper GI tract n = 5 (esophagus n = 2, stomach n = 3), lung n = 9, kidney n = 6, neuroendocrine tumors n = 3, colon n = 2, ovarian n = 2, melanoma n = 2, others n = 4. The overall median survival time was 14 months (95 % CI 8.375-19.625). The survival rates at 1, 2, 5, and 10 years were 60, 31, 21, and 11 %, respectively. There were statistically significant differences in the survival time according to the resection status (R0 vs. R1/R2) (p < 0.001) and the type of the primary tumor (p = 0.009), while the metachronous or synchronous occurrence of adrenal metastases did not affect the prognosis.

CONCLUSIONS: Resection of adrenal metastases can improve the survival if patients are carefully selected, the tumor is completely resected, and the intervention is integrated into a multidisciplinary oncologic treatment strategy.

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Adrenal and hepatic aspergillosis in an immunocompetent patient.

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Invasive aspergillosis, an infection most frequently induced by Aspergillus fumigatus and Aspergillus flavus, typically occurs in immunocompromised patients and is usually transmitted through inhalation of Aspergillus spores. As the lungs are by far the most common site involved in invasive aspergillosis and invasive aspergillosis in immunocompetent hosts is very rare, there have been a few case
reports of extra-pulmonary, disseminated invasive aspergillosis in immunocompetent persons. Herein, we report a case of an adult, male, immunocompetent patient with disseminated invasive aspergillosis that successively spread from the right adrenal gland to the left hepatic lobe. The patient was successfully treated through surgical excisions of his adrenal and hepatic masses followed by voriconazole therapy. To our knowledge, this is the first case report of invasive aspergillosis affecting the adrenal glands.

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Transplantation of bovine adrenocortical cells encapsulated in alginate.
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Current treatment options for adrenal insufficiency are limited to corticosteroid replacement therapies. However, hormone therapy does not replicate circadian rhythms and has unpleasant side effects especially due to the failure to restore normal function of the hypothalamic-pituitary-adrenal (HPA) axis. Adrenal cell transplantation and the restoration of HPA axis function would be a feasible and useful therapeutic strategy for patients with adrenal insufficiency. We created a bioartificial adrenal with 3D cell culture conditions by encapsulation of bovine adrenocortical cells (BACs) in alginate (enBACs). We found that, compared with BACs in monolayer culture, encapsulation in alginate significantly increased the life span of BACs. Encapsulation also improved significantly both the capacity of adrenal cells for stable, long-term basal hormone release as well as the response to pituitary adrenocorticotropic hormone (ACTH) and hypothalamic luteinizing hormone-releasing hormone (LHRH) agonist, [D-Trp6]LHRH. The enBACs were transplanted into adrenalectomized, immunodeficient, and immunocompetent rats. Animals received enBACs intraperitoneally, under the kidney capsule (free cells
or cells encapsulated in alginate slabs) or s.c. enclosed in oxygenating and immunoisolating βAir devices. Graft function was confirmed by the presence of cortisol in the plasma of rats. Both types of grafted encapsulated cells, explanted after 21-25 d, preserved their morphology and functional response to ACTH stimulation. In conclusion, transplantation of a bioartificial adrenal with xenogeneic cells may be a treatment option for patients with adrenocortical insufficiency and other stress-related disorders. Furthermore, this model provides a microenvironment that ensures 3D cell-cell interactions as a unique tool to investigate new insights into cell biology, differentiation, tissue organization, and homeostasis.

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Recovery rate of adrenal function after surgery in patients with acromegaly is higher than in those with non-functioning pituitary tumors: a large single center study.
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PURPOSE: To compare hypothalamus-pituitary-adrenal (HPA) axis integrity at diagnosis and recovery after transsphenoidal surgery (TSS), in acromegaly patients, compared with tumor size matched non-functioning adenoma (NFA) patients.
METHODS: A retrospective 7-year evaluation of acromegaly patients, who underwent TSS with 52 weeks follow-up at a single institution, was undertaken. 50 acromegaly with complete follow-up data at all points and 50 NFA patients were matched for tumor size; HPA axis was similarly assessed pre-operatively and at 6, 12 and 52 weeks post-operatively. Recovery of HPA axis and gender specific prevalence of adrenal insufficiency (AI), were analyzed in both groups. We also studied AI in acromegaly patients requiring medical therapy post-operatively vs those in remission after surgery.
RESULTS: AI remained less prevalent in acromegaly vs NFA (acromegaly, p = 0.01; NFA, p = 0.15) at 52 weeks after surgery, although the prevalence of AI decreased in both groups from baseline by 52 weeks. Additionally, recovery from baseline AI was significantly greater by 52 weeks in acromegaly patients over NFA patients (p = 0.001). Recovery of HPA axis in acromegaly patients remained significant (p = 0.03) despite the need for medical therapy. AI at baseline was proportionately more prevalent in acromegalic males at baseline (p = 0.002) but no gender difference was apparent at 52 weeks (p = 0.35). Conversely, in NFA patients, no gender difference was apparent pre-operatively (p = 0.49), but AI was more prevalent in males at 52 weeks (p = 0.001).
CONCLUSION: In the longest comparative study to date using a standard assessment modality, HPA axis recovery was more frequent in acromegaly compared to NFA.
patients, independent of tumor size, cavernous sinus invasion (CSI), and body mass index (BMI). HPA axis integrity must be carefully and periodically monitored in acromegaly patients during short- and long-term follow-up to prevent overtreatment with glucocorticoids.

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BACKGROUND: Adrenal gland trauma (AGT) is potentially devastating if unrecognized during the treatment of trauma patients. Because of the adrenal glands' rich vascularity, they often hemorrhage upon traumatic impact. However, there has been no conclusion about the indications for intervention in cases of hemorrhage after AGT.

METHODS: We conducted a prospective collection with a retrospective review in a Level I trauma center in Taiwan. This study enrolled all of the patients who suffered from AGT from May 2008 to May 2013. We retrieved and analyzed the patient demographic data, clinical presentation, AGT grade, injury severity score, management, hospital stay, and mortality.

RESULTS: The cohort consisted of 60 patients. The mean age was 31.0 ± 15.9 years. There were 32 patients (53.3 %) with extravasated AGT, which was associated with a high injury severity score, a high possibility of associated lung injury, and more than one accompanying trauma. Most of the patients could be treated conservatively. Five of these patients needed surgical hemostasis, and four of them needed angiographic embolization. Extravasation combined with a mean arterial pressure <70 mmHg was a predictor of the need for intervention (relative risk: 9.52, 95 % CI 1.64-55.56, p = 0.011).

CONCLUSION: In conclusion, AGT is a rare injury with a good prognosis. Most AGT patients can be treated conservatively. Extravasation in AGT is not only a sign of hemorrhage, but also an indicator of severe associated injuries. However, extravasation in AGT does not always require further treatment. When intractable hypotension simultaneously occurs, further treatment should be considered.

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PMID: 25613549  [PubMed - indexed for MEDLINE]

Adrenocortical carcinoma is a rare neoplasm in children. Heterosexual precocious puberty could be the initial presentation of a rare adrenocortical neoplasm in the pediatric age group. Features of heterosexual precocious puberty in a girl should alert the possibility of such a rare disease. We report a rare case of adrenocortical carcinoma in a three years and six months old girl who presented with heterosexual precocious puberty of two years duration. Left adrenalectomy was done and histopathology revealed adrenocortical carcinoma.

PMID: 25588290  [PubMed - indexed for MEDLINE]


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Background. Laparoscopic lateral transperitoneal adrenalectomy (LTA) has been the standard method for resecting benign adrenal gland tumors. Recently, however, laparoscopic posterior retroperitoneal adrenalectomy (PRA) has been more popular as an alternative method. This systematic review evaluates current evidence on adrenalectomy techniques, comparing laparoscopic LTA with PRA and laparoscopic adrenalectomy with robotic adrenalectomy. Methods. PubMed, Embase, and ISI Web of Knowledge databases were searched systematically for studies comparing surgical outcomes of laparoscopic LTA versus PRA and laparoscopic versus robotic adrenalectomy. The studies were evaluated according to the PRISMA statement. Results. Eight studies comparing laparoscopic PRA and LTA showed that laparoscopic PRA was superior or at least comparable to laparoscopic LTA in operation time, blood loss, pain score, hospital stay, and return to normal activity. Conversion rates and complication rates were similar. Six studies comparing robotic and laparoscopic adrenalectomy found that outcomes and complications were similar. Conclusion. Laparoscopic PRA was more effective than LTA, especially in reducing operation time and hospital stay, but there was no evidence showing that robotic adrenalectomy was superior to laparoscopic adrenalectomy. Cost reductions and further technical advances are needed for wider application of robotic adrenalectomy.
Fetal adrenal demedullation lowers circulating norepinephrine and attenuates growth restriction but not reduction of endocrine cell mass in an ovine model of intrauterine growth restriction.

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Placental insufficiency is associated with fetal hypoglycemia, hypoxemia, and elevated plasma norepinephrine (NE) that become increasingly pronounced throughout the third trimester and contribute to intrauterine growth restriction (IUGR). This study evaluated the effect of fetal adrenal demedullation (AD) on growth and pancreatic endocrine cell mass. Placental insufficiency-induced IUGR was created by exposing pregnant ewes to elevated ambient temperatures during mid-gestation. Treatment groups consisted of control and IUGR fetuses with either surgical sham or AD at 98 days gestational age (dGA; term = 147 dGA), a time-point that precedes IUGR. Samples were collected at 134 dGA. IUGR-sham fetuses were hypoxemic, hypoglycemic, and hypoinsulinemic, and values were similar in IUGR-AD fetuses. Plasma NE concentrations were ~5-fold greater in IUGR-sham compared to control-sham, control-AD, and IUGR-AD fetuses. IUGR-sham and IUGR-AD fetuses weighed less than controls. Compared to IUGR-sham fetuses, IUGR-AD fetuses weighed more and asymmetrical organ growth was absent. Pancreatic β-cell mass and α-cell mass were lower in both IUGR-sham and IUGR-AD fetuses compared to controls, however, pancreatic endocrine cell mass relative to fetal mass was lower in IUGR-AD fetuses. These findings indicate that NE, independently of hypoxemia, hypoglycemia and hypoinsulinemia, influence growth and asymmetry of growth but not pancreatic endocrine cell mass in IUGR fetuses.

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Adrenomedullary progenitor cells: Isolation and characterization of a multi-potent progenitor cell population.
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The adrenal is a highly plastic organ with the ability to adjust to physiological needs by adapting hormone production but also by generating and regenerating both adrenocortical and adrenomedullary tissue. It is now apparent that many adult tissues maintain stem and progenitor cells that contribute to their maintenance and adaptation. Research from the last years has proven the existence of stem and progenitor cells also in the adult adrenal medulla throughout life. These cells maintain some neural crest properties and have the potential to differentiate to the endocrine and neural lineages. In this article, we discuss the evidence for the existence of adrenomedullary multi potent progenitor cells, their isolation and characterization, their differentiation potential as well as their clinical potential in transplantation therapies but also in pathophysiology.

Bilateral adrenalectomy for Cushing's disease.
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PURPOSE: Review the indications, outcomes, and consequences of bilateral adrenalectomy (BLA) in patients with Cushing's disease.
METHODS: A literature review was performed.
RESULTS: The primary therapy for Cushing's disease is surgery, with medical therapy and radiation therapy relegated to an adjuvant role. BLA is indicated in
cases of persistent disease following pituitary surgery or in situations where rapid normalization of hypercortisolism is required. When performed via the laparoscopic approach, BLA is associated with a significantly reduced morbidity compared to the traditional, open approach. Following BLA, patients are at risk for adrenal crisis and the concern of Nelson’s syndrome. However, BLA leads to a rapid resolution of the signs and symptoms of CS and leads to an improved long-term quality of life.

CONCLUSION: BLA should be considered in the treatment algorithm for patients with persistent CD after failed pituitary surgery, especially in patients who have severe consequences of hypercortisolism or desire pregnancy.

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Laparoendoscopic single-site surgery adrenalectomy - own experience and matched case-control study with standard laparoscopic adrenalectomy.


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INTRODUCTION: At our institution, laparoendoscopic single-site surgery (LESS) has been established as a technique for laparoscopic nephrectomy since 2011, and since 2012 in selected cases for adrenalectomy (AE) as well.

AIM: To compare LESS AE with standard laparoscopic AE (SLAE).

MATERIAL AND METHODS: Between 3/2012 and 7/2014, 35 adrenalectomies were performed. In 18 (51.4%), a LESS approach was chosen. Indications were strictly non-complicated cases (body mass index (BMI) < 34 kg/m(2), tumour ≤ 7 cm, non-malignant aetiology, no previous surgery). All LESS procedures were done by one surgeon. Standard equipment was a 10 mm rigid 0° camera, Triport+, one pre-bent grasper, and a sealing instrument. The approach was pararectal in all cases except one (transumbilical in a slim man). Three patients with LESS were excluded (2 partial AEs only, one adrenal cancer converted to SLAE and then to open surgery). These 15 LESS AE procedures were compared to 15 SLAEs with similar characteristics chosen among 54 SLAEs performed in the period 1/2008-2/2012.

RESULTS: In 8 cases (53.3%) of LESS AE, a 3 mm port was added to elevate the liver/spleen. Mean parameters of LESS AE vs. SLAE (Wilcoxon test): maximal tumour diameter 43.7 mm vs. 36.1 mm (p = 0.28), time of surgery 63.3 min vs. 55.3 min (p = 0.22), blood loss 38.0 ml vs. 38.0 ml (p = 0.38), BMI 26.9 kg/m(2) vs. 28.5
kg/m(2) (p = 0.13), discharge from hospital 5.4 days vs. 3.9 days (p = 0.038). There were no complications in either group.

CONCLUSIONS: The LESS AE is feasible in selected cases, especially small left-sided tumours in thin patients with no history of previous abdominal operations, but requires an additional port in half of the cases.

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PMCID: PMC4280428
PMID: 25561998 [PubMed]
CONCLUSIONS: Time to recovery of adrenal function is dependent on the underlying etiology of CS.

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OBJECTIVES: To characterize the dynamics of the pituitary-adrenal interaction during the course of coronary artery bypass grafting both on and off pump. Since our data pointed to a major change in adrenal responsiveness to adrenocorticotropic hormone, we used a reverse translation approach to investigate the molecular mechanisms underlying this change in a rat model of critical illness.

DESIGN:
CLINICAL STUDIES: Prospective observational study.
ANIMAL STUDIES: Controlled experimental study.

SETTING:
CLINICAL STUDIES: Cardiac surgery operating rooms and critical care units.
ANIMAL STUDIES: University research laboratory.

SUBJECTS:
CLINICAL STUDIES: Twenty, male patients.
ANIMAL STUDIES: Adult, male Sprague-Dawley rats.

INTERVENTIONS:
CLINICAL STUDIES: Coronary artery bypass graft—both on and off pump.
ANIMAL STUDIES: Injection of either lipopolysaccharide or saline (controls) via a jugular vein cannula.

MEASUREMENTS AND MAIN RESULTS:
CLINICAL STUDIES: Blood samples were taken for 24 hours from placement of the first venous access. Cortisol and adrenocorticotrophic hormone were measured every
10 and 60 minutes, respectively, and corticosteroid-binding globulin was measured at the beginning and end of the 24-hour period and at the end of operation. There was an initial rise in both levels of adrenocorticotropic hormone and cortisol to supranormal values at around the end of surgery. Adrenocorticotropic hormone levels then returned toward preoperative values. Ultradian pulsatility of both adrenocorticotropic hormone and cortisol was maintained throughout the perioperative period in all individuals. The sensitivity of the adrenal gland to adrenocorticotropic hormone increased markedly at around 8 hours after surgery maintaining very high levels of cortisol in the face of "basal" levels of adrenocorticotropic hormone. This sensitivity began to return toward preoperative values at the end of the 24-hour sampling period.

ANIMAL STUDIES: Adult, male Sprague-Dawley rats were given either lipopolysaccharide or sterile saline via a jugular vein cannula. Hourly blood samples were subsequently collected for adrenocorticotropic hormone and corticosterone measurement. Rats were killed 6 hours after the injection, and the adrenal glands were collected for measurement of steroidogenic acute regulatory protein, steroidogenic factor 1, and dosage-sensitive sex reversal, adrenal hypoplasia critical region, on chromosome X, gene 1 messenger RNAs and protein using real-time quantitative polymerase chain reaction and Western immunoblotting, respectively. Adrenal levels of the adrenocorticotropic hormone receptor (melanocortin type 2 receptor) messenger RNA and its accessory protein (melanocortin type 2 receptor accessory protein) were also measured by real-time quantitative polymerase chain reaction. In response to lipopolysaccharide, rats showed a pattern of adrenocorticotropic hormone and corticosterone that was similar to patients undergoing coronary artery bypass grafting. We were also able to demonstrate increased intra-adrenal corticosterone levels and an increase in steroidogenic acute regulatory protein, steroidogenic factor 1, and melanocortin type 2 receptor accessory protein messenger RNAs and steroidogenic acute regulatory protein, and a reduction in dosage-sensitive sex reversal, adrenal hypoplasia critical region, on chromosome X, gene 1 and melanocortin type 2 receptor messenger RNAs, 6 hours after lipopolysaccharide injection.

CONCLUSIONS: Severe inflammatory stimuli activate the hypothalamic-pituitary-adrenal axis resulting in increased steroidogenic activity in the adrenal cortex and an elevation of cortisol levels in the blood. Following coronary artery bypass grafting, there is a massive increase in both adrenocorticotropic hormone and cortisol secretion. Despite a subsequent fall of adrenocorticotropic hormone to basal levels, cortisol remains elevated and coordinated adrenocorticotropic hormone-cortisol pulsatility is maintained. This suggested that there is an increase in adrenal sensitivity to adrenocorticotropic hormone, which we confirmed in our animal model of immune activation of the hypothalamic-pituitary-adrenal axis. Using this model, we were able to show that this increased adrenal sensitivity results from changes in the regulation of both stimulatory and inhibitory intra-adrenal signaling pathways. Increased understanding of the dynamics of normal hypothalamic-pituitary-adrenal responses to major surgery will provide us with a more rational approach to glucocorticoid therapy in critically ill patients.

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PMCID: PMC4359905
Surgical management of adrenal cysts: a single-institution experience.
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OBJECTIVE: To analyze surgical methods and evaluate treatment efficacy and safety for managing adrenal cystic lesions.
MATERIALS AND METHODS: All patients presenting with adrenal lesions of the West China Hospital were reviewed retrospectively from January 2003 to April 2013 and 47 were diagnosed as adrenal cysts. Basic information, clinical history, physical examination, laboratory investigations, abdominal ultrasound and enhanced computed tomography were detailed noted. Cysts with different surgical management were analyzed and surgery option, operative time, postoperative complications and after-surgery hospital stay were all noted. The final diagnosis was judged by histopathology. Patients were followed from 3 month to 10 years.
RESULTS: All the 47 patients with a mean age of 43.8 years were managed by surgical intervention. Compared laparoscopic technology with open technology, the laparoscopic has the advantage of a shorter operation time, shorter hospital stay after surgery and enhanced cosmesis. The histopathologic result was: 23 (50%) were endothelial cysts and 16 (35%) were pseudocysts. One patient had evidence to recurrence at the followed-up stage.
CONCLUSION: Adrenal cysts are rare and with the development of imaging techniques many of these are diagnosed incidentally. CT has advantages in detecting the cysts with haemorrhage, intracystic debris, calcification and mixed adrenal mass. Minimally invasive surgery offers equivalent efficacy to traditional open procedures, while providing a shorter operation time, shorter convalescence and improved cosmesis. Patients after surgical resection should be followed up closely especially if functional cysts and histopathology of cystic tumor are present.
PMID: 25498277  [PubMed - indexed for MEDLINE]

Outcomes of adrenalectomy in patients with primary hyperaldosteronism--a single centre experience.
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INTRODUCTION: Primary hyperaldosteronism is a common cause of secondary hypertension. In patients with proven unilateral overproduction of aldosterone adrenalectomy can cure hyperaldosteronism with high probability and a positive effect on hypertension. The aim of the study was to determine the effects of unilateral adrenalectomy on blood pressure and laboratory parameters. The secondary objective was to identify parameters that would allow the prediction of hypertension cure.

METHODS: We performed a cross-sectional analysis of the data of patients who underwent unilateral adrenalectomy for primary aldosteronism at the Department of Urology of University Hospital Olomouc in the years 2000-2011. We assessed the preoperative clinical conditions of patients, the results of biochemical and radiological examinations, course of the surgery and post-operative course including laboratory and clinical parameters during the 12 months postoperatively.

RESULTS: 62 patients underwent adrenalectomy for primary aldosteronism in this period. Four patients were excluded from the study due to surprising histology (myelolipoma in 2, carcinoma in 2), seven patients had incomplete postoperative data. The statistical analysis therefore included 51 patients, of which 57% were females. CT or MRI was performed in all patients; 63% patients underwent superselective catheterization of adrenal veins (AVS). Adrenalectomy was performed in all cases laparoscopically. Histology most often showed adrenal hyperplasia (59%), adenoma was detected in 37% and adenoma on the basis of micronodular hyperplasia in 4%. Twelve months after surgery the antihypertensive drugs were discontinued in 17/51 (33%) and the number or dose of antihypertensive drugs was reduced in 25/51 (49%). Normokalemia and normalization of the aldosterone-renin ratio (ARR) was detected in 92% and 84% of the patients. Performing AVS did not statistically significantly influence the rate of blood pressure control or normalization of ARR, which is probably due to small study size. This study demonstrated a better effect of surgery on blood pressure in younger patients.

CONCLUSIONS: Unilateral adrenalectomy had a positive effect in 82% of the patients operated for primary aldosteronism and lead to either blood pressure normalization or reduction of the antihypertensive medication.

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Germline PRKACA amplification leads to Cushing syndrome caused by 3 adrenocortical pathologic phenotypes.
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We describe the pathology of 5 patients with germline PRKACA copy number gain and Cushing syndrome: 4 males and 1 female, aged 2 to 43 years, including a mother and son. Imaging showed normal or slightly enlarged adrenal glands in 4 patients and a unilateral mass in the fifth. Biochemically, the patients had corticotropin-independent hypercortisolism. Four underwent bilateral adrenalectomy; unilateral adrenalectomy was performed in the patient with the adrenal mass. Pathologically, 3 patients, including the 1 with the tumor (adenoma), had primary pigmented nodular adrenocortical disease with extranodular cortical atrophy and mild intracapsular and extracapsular extension of cortical cells. The other 2 patients had cortical hyperplasia and prominent capsular and extracapsular micronodular cortical hyperplasia. Immunoperoxidase staining revealed differences for synaptophysin, inhibin-A, and Ki-67 (nuclei) in the atrophic cortices (patients 1, 2, and 3) and hyperplastic cortices (patients 4 and 5) and for Ki-67 (nuclei) and vimentin in the extracortical nodules in the 2 groups of patients. β-Catenin stained the cell membrane, cytoplasm, and nuclei of the adenoma. The patients were well at follow-up (1-23 years); 24-hour urinary cortisol excretion was elevated in the patient who had unilateral adrenalectomy.

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cases, suspected malignancy at imaging evaluation (not confirmed by histology) in 4 cases, cystic pheochromocytoma in 1 case. Histology revealed 11 endothelial cysts, 3 pseudocysts, 6 epithelial cysts and 1 cystic pheochromocytoma.

CONCLUSIONS: The presence of CAL, even asymptomatic, requires complete endocrinological evaluation and imaging study. In the presence of large size, endocrine activity or any suspicion of malignancy, patients must be referred to surgery.

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Bilateral adrenal hemorrhagic infarction as a rare cause of acute abdominal pain in the immediate postoperative period of colonic surgery.
[Article in English, Spanish]
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A rare case of unilateral adrenal hyperplasia accompanied by hypokalaemic periodic paralysis caused by a novel dominant mutation in CACNA1S: features and prognosis after adrenalectomy.
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BACKGROUND: Acute hypokalaemic paralysis is characterised by acute flaccid muscle weakness and has a complex aetiological spectrum. Herein we report, for the first time, a case of unilateral adrenal hyperplasia accompanied by hypokalaemic periodic paralysis type I resulting from a novel dominant mutation in CACNA1S. We present the clinical features and prognosis after adrenalectomy in this case.
CASE PRESENTATION: A 43-year-old Han Chinese male presented with severe hypokalaemic paralysis that remitted after taking oral potassium. The patient had suffered from periodic attacks of hypokalaemic paralysis for more than 20 years.
A computed tomography (CT) scan of the abdomen showed a nodular mass on the left adrenal gland, although laboratory examination revealed the patient had not developed primary aldosteronism. The patient underwent a left adrenalectomy 4 days after admission, and the pathological examination further confirmed a 1.1 cm benign nodule at the periphery of the adrenal gland. Three months after the adrenalectomy, a paralytic attack recurred and the patient asked for assistance from the Department of Medical Genetics. His family history showed that two uncles, one brother, and a nephew also had a history of periodic paralysis, although their symptoms were milder. The patient's CACNA1S and SCN4A genes were sequenced, and a novel missense mutation, c.1582C > T (p.Arg528Cys), in CACNA1S was detected. Detection of the mutation in five adult male family members, including three with periodic paralysis and two with no history of the disease, indicated that this mutation caused hypokalaemic periodic paralysis type I in his family. Follow-up 2 years after adrenalectomy showed that the serum potassium concentration was increased between paralyses and the number and severity of paralytic attacks were significantly decreased.

CONCLUSION: We identified a novel dominant mutation, c.1582C > T (p.Arg528Cys), in CACNA1S that causes hypokalaemic periodic paralysis. The therapeutic effect of adrenalectomy indicated that unilateral adrenal hyperplasia might make paralytic attacks more serious and more frequent by decreasing serum potassium. This finding suggests that the surgical removal of hyperplastic tissues might relieve the symptoms of patients with severe hypokalaemic paralysis caused by other incurable diseases, even if the adrenal lesion does not cause primary aldosteronism.

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Effect of intramucosal infiltration of different concentrations of adrenaline on hemodynamics during transsphenoidal surgery.
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BACKGROUND AND AIMS: Neurosurgeons routinely instill vasopressors, with or without local anesthetics, to prepare nasal passages prior to transsphenoidal surgeries. As there is a paucity of data comparing the effect of intramucosal nasal infiltration of different concentrations of adrenaline that is, 1:200,000 and 1:400,000 in patients undergoing transsphenoidal surgery, we conducted this study to evaluate the effect of these two concentrations of adrenaline with 2% lignocaine on hemodynamics as well as bleeding.

MATERIALS AND METHODS: Fifty-two American Society of Anesthesiologists I/II patients, aged 15-70 years, undergoing transsphenoidal surgery for pituitary or sellar masses were enrolled. Prior to surgical incision, nasal septal mucosa was
infiltrated with lignocaine-adrenaline solution, after randomly allocating them to one of the two groups, with patients in Group A receiving intramucosal infiltration using 2% lignocaine with 1:200,000 adrenaline and those in Group B receiving 2% lignocaine with 1:400,000 adrenaline. Following infiltration, hemodynamic parameters were recorded every 1 min for 5 min and thereafter at every 5 min interval.

RESULTS: Fewer patients (3/24 [12.5%]) in Group B had a rise of >50% in systolic blood pressure, from baseline values, after nasal mucosa infiltration as compared with patients in Group A (9/24 [37.5%]). In addition, mean rise in systolic, diastolic and mean arterial pressure was also significantly lower in Group B as compared with Group A.

CONCLUSION: Adrenaline in a concentration of 1:400,000 added to 2% lignocaine for nasal mucosa infiltration produces less hemodynamic response as compared with adrenaline 1:200,000 added to 2% lignocaine while at the same time providing similar operating conditions.

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Clinicopathological correlates of adrenal Cushing's syndrome.
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Endogenous Cushing's syndrome is a rare endocrine disorder that incurs significant cardiovascular morbidity and mortality, due to glucocorticoid excess. It comprises adrenal (20%) and non-adrenal (80%) aetiologies. While the majority of cases are attributed to pituitary or ectopic corticotropin (ACTH) overproduction, primary cortisol-producing adrenal cortical lesions are increasingly recognised in the pathophysiology of Cushing's syndrome. Our understanding of this disease has progressed substantially over the past decade. Recently, important mechanisms underlying the pathogenesis of adrenal hypercortisolism have been elucidated with the discovery of mutations in cyclic AMP signalling (PRKACA, PRKAR1A, GNAS, PDE11A, PDE8B), armadillo repeat containing 5 gene (ARMCS) a putative tumour suppressor gene, aberrant G-protein-coupled receptors, and intra-adrenal secretion of ACTH. Accurate
subtyping of Cushing's syndrome is crucial for treatment decision-making and requires a complete integration of clinical, biochemical, imaging and pathology findings. Pathological correlates in the adrenal glands include hyperplasia, adenoma and carcinoma. While the most common presentation is diffuse adrenocortical hyperplasia secondary to excess ACTH production, this entity is usually treated with pituitary or ectopic tumour resection. Therefore, when confronted with adrenalectomy specimens in the setting of Cushing's syndrome, surgical pathologists are most commonly exposed to adrenocortical adenomas, carcinomas and primary macronodular or micronodular hyperplasia. This review provides an update on the rapidly evolving knowledge of adrenal Cushing's syndrome and discusses the clinicopathological correlations of this important disease.

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Methods for cell-attached capacitance measurements in mouse adrenal chromaffin cell.
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Neuronal transmission is an integral part of cellular communication within the brain. Depolarization of the presynaptic membrane leads to vesicle fusion known as exocytosis that mediates synaptic transmission. Subsequent retrieval of synaptic vesicles is necessary to generate new neurotransmitter-filled vesicles in a process identified as endocytosis. During exocytosis, fusing vesicle membranes will result in an increase in surface area and subsequent endocytosis results in a decrease in the surface area. Here, our lab demonstrates a basic introduction to cell-attached capacitance recordings of single endocytic events in the mouse adrenal chromaffin cell. This type of electrical recording is useful for high-resolution recordings of exocytosis and endocytosis at the single vesicle level. While this technique can detect both vesicle exocytosis and endocytosis, the focus of our lab is vesicle endocytosis. Moreover, this technique allows us to analyze the kinetics of single endocytic events. Here the methods for mouse adrenal gland tissue dissection, chromaffin cell culture, basic cell-attached techniques, and subsequent examples of individual traces measuring singular endocytic event are described.
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Emerging surgical pathways of thoracotomy.
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Thoracic incisions are the portals of choice for accessing thoracic organs. There are instances, however, that more than one incision are required at the same or a later stage, in order to access other, thoracic or extrathoracic, organs for more complicated procedures. Then again, a single thoracic incision may offer more than adequate access to extrathoracic organs and in selected cases becomes valuable surgical approach to organs of the upper abdomen or the contralateral hemithorax. The experience with this technique is discussed.
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PMID: 25381550 [PubMed - indexed for MEDLINE]

The rise in metastasectomy across cancer types over the past decade.
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Comment in

BACKGROUND: Although studies of metastasectomy have been limited primarily to institutional experiences, reports of favorable long-term outcomes have generated increasing interest. In the current study, the authors attempted to define the national practice patterns in metastasectomy for 4 common malignancies with varying responsiveness to systemic therapy.
METHODS: The National (Nationwide) Inpatient Sample was used to estimate the national incidence of metastasectomy for colorectal cancer, lung cancer, breast cancer, and melanoma from 2000 through 2011. Incidence-adjusted rates were determined for liver, lung, brain, small bowel, and adrenal metastasectomies. The average annual percentage change (AAPC) in metastasectomy by cancer type was calculated using joinpoint regression.
RESULTS: Colorectal cancer was the most common indication for metastasectomy (87,407 cases; 95% confidence interval [95% CI], 86,307-88,507 cases) followed by lung cancer (58,245 cases; 95% CI, 57,453-59,036 cases), breast cancer (26,271 cases; 95% CI, 25,672-26,870 cases), and melanoma (20,298 cases; 95% CI, 19,897-20,699 cases). Metastasectomy increased significantly for all cancer types over the study period: colorectal cancer (AAPC, 6.83; 95% CI, 5.7-7.9), lung cancer (AAPC, 5.8; 95% CI, 5.1-6.4), breast cancer (AAPC, 5.5; 95% CI, 3.7-7.3), and melanoma (AAPC, 4.03; 95% CI, 2.1-6.0). Despite an increasing number of
comorbidities in patients undergoing metastasectomy (P<.05 for each cancer type), inpatient mortality rates after metastasectomy fell for all cancer types, most significantly for colorectal (AAPC, -5.49; 95% CI, -8.2 to -2.7) and lung (AAPC, -6.2; 95% CI, -11.7 to -0.3) cancers. The increasing performance of metastasectomy was largely driven by high-volume institutions, in which patients had a lower mean number of comorbidities (P<.01 for all cancer types) and lower inpatient mortality (P<.01 for all cancers except melanoma).

CONCLUSIONS: From 2000 through 2011, the performance of metastasectomy increased substantially across common cancer types, notwithstanding various advances in systemic therapies. Metastasectomy was performed more safely, despite increasing patient comorbidity. High-volume institutions appeared to drive practice patterns.

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Adrenal gland surgery needs a multidisciplinary team including endocrinologist, radiologist, anesthesiologist, and surgeon. The indications for adrenal gland surgery include hormonal secreting and non-hormonal secreting tumors. Adrenal hormonal secreting tumors present to the anesthesiologist unique challenges requiring good preoperative evaluation, perioperative hemodynamic control, corrections of all electrolytes and metabolic abnormalities, a detailed and careful anesthetic strategy, overall knowledge about the specific diseases, control and maintaining of postoperative adrenal function, and finally a good collaboration with other involved colleagues. This review will focus on the endocrine issues, as well as on the above-mentioned aspects of anesthetic management during hormone secreting adrenal gland tumor resection.
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Factors affecting the surgical approach and timing of bilateral adrenalectomy.
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BACKGROUND: Laparoscopic adrenalectomy has gained widespread acceptance. However, the optimal surgical approach to laparoscopic bilateral adrenalectomy has not been clearly defined. The aim of this study is to analyze the patient and intraoperative factors affecting the feasibility and outcome of different surgical approaches to define an algorithm for bilateral adrenalectomy.

METHODS: Between 2000 and 2013, all patients who underwent bilateral adrenalectomy at a single institution were selected for retrospective analysis. Patient factors, surgical approach, operative outcomes, and complications were analyzed.

RESULTS: From 2000 to 2013, 28 patients underwent bilateral adrenalectomy. Patient diagnoses included Cushing’s disease (n = 19), pheochromocytoma (n = 7), and adrenal metastasis (n = 2). Of these 28 patients, successful laparoscopic adrenalectomy was performed in all but 2 patients. Twenty-three out of the 26 adrenalectomies were completed in a single stage, while three were performed as a staged approach due to deterioration in intraoperative respiratory status in two patients and patient body habitus in one. Of the adrenalectomies completed using the minimally invasive approach, a posterior retroperitoneal (PR) approach was performed in 17 patients and lateral transabdominal (LT) approach in 9 patients. Patients who underwent a LT approach had higher BMI, larger tumor size, and other concomitant intraabdominal pathology. Hospital stay for laparoscopic adrenalectomy was 3.5 days compared to 5 and 12 days for the two open cases. There were no 30-day hospital mortality and 5 patients had minor complications for the entire cohort.

CONCLUSIONS: A minimally invasive operation is feasible in 93% of patients undergoing bilateral adrenalectomy with 65% of adrenalectomies performed using the PR approach. Indications for the LT approach include morbid obesity, tumor size >6 cm, and other concomitant intraabdominal pathology. Single-stage adrenalectomies are feasible in most patients, with prolonged operative time causing respiratory instability being the main indication for a staged approach.

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Adrenal-mediated hypertension (AMH) has been increasingly treated by laparoscopic adrenalectomy (LA). Metabolic derangements in patients with AMH could result in perioperative complications and mortality. Long-term operative and clinical...
outcomes after laparoscopic treatment of AMH have not been evaluated using large clinical databases. The institutional National Surgical Quality Improvement Program (NSQIP) data for patients undergoing adrenalectomy for AMH between 2002 and 2012 were reviewed. Patient demographics, perioperative variables, and outcomes were analyzed and compared with national NSQIP adrenalectomy data. Improvement in AMH was recorded when discontinuation or reduction of antihypertensive medication occurred or with a decrease of blood pressure on the preoperative antihypertensive regimen. Ninety-four patients underwent adrenalectomy. There were 48 patients with pheochromocytoma (PHE) and 46 patients with aldosterone-producing adenoma (APA). Eighty-five patients (90%) were taking antihypertensive medications preoperatively compared with 36 patients (38%) postoperatively (P < 0.0001). Patients with PHE were more likely to discontinue all medications compared with the patients with APA (80 vs 20%, respectively, P < 0.0001). Patients with PHE and APA, respectively, took an average of 2.0 and 3.2 antihypertensive medications preoperatively compared with 0.3 and 1.2 postoperatively. There were no conversions to open procedures or 30-day mortality. Our results were 0 per cent for cerebral vascular accident, 0 per cent for myocardial infarction, and 0.5 per cent for transfusions compared with the national NSQIP data of 0.2, 0, and 6.7 per cent, respectively. Patients presenting with significant AMH including PHE and APA can be effectively and safely treated with LA with minimal complications and with a significant number of patients eliminating or decreasing their need for antihypertensive medications.

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Topical feracrylum citrate versus adrenaline as haemostatic agent in hypospadias surgery.
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Comment on
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Long-term survival after surgical treatment of metachronous bilateral adrenal metastases of non-small cell lung carcinoma.
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Background Although resection of the metastases is the treatment of choice for
unilateral solitary adrenal metastasis of non-small cell lung carcinoma (NSCLC), the surgical treatment for bilateral adrenal metastases is quite rare, likely due to the coexistence of multiple synchronous metastases at other sites and/or primary adrenal insufficiency following bilateral adrenalectomy. We herein report a rare case of asynchronous metastasis of NSCLC to the bilateral adrenal glands with long-term survival after bilateral adrenalectomy. Case Report A 70-year-old male underwent right upper lobectomy for lung adenocarcinoma T2aN2M0, stage IIIA following induction chemotherapy. Forty-four months later, right adrenalectomy of a right adrenal tumor was performed, which revealed metastatic lung carcinoma. Following the administration of adjuvant chemotherapy, a metastatic tumor was detected in the left adrenal gland. Although there were no other signs of distant metastasis on radiological examinations, he underwent the chemotherapy due to the risk of adrenal insufficiency. However, on follow-up CT the adrenal lesion was found to have enlarged; therefore, left adrenalectomy was performed. Three years and six months later, he was doing well, with no evidence of recurrence. Conclusions Selected patients with solitary adrenal metastases of NSCLC can benefit from an aggressive treatment approach, even if such metastases are bilateral.

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Preoperative cross-sectional imaging allows for avoidance of unnecessary adrenalectomy during RCC surgery.
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OBJECTIVES: To assess the frequency of adrenal involvement and the reliability of preoperative imaging to predict adrenal involvement in patients treated for cortical renal masses at a single institution.
METHODS: Using a retrospective pathology database, we identified 117 consecutive patients who underwent radical nephrectomy and concomitant ipsilateral adrenalectomy at our institution over the course of 2 decades. Patient demographics, tumor characteristics, and radiographic results were obtained for analysis.
RESULTS: Of 117 patients, only 6 (5.1%) were identified as having adrenal involvement. The average age of the patient was 58.3 years, and the average tumor size was 7.13 cm. The mean tumor size in patients without adrenal involvement was 6.79 cm, whereas in those with adrenal involvement, it was 9.62 cm (P = 0.057). Of 6 patients with adrenal involvement, 5 had imaging studies available for
review, and all 5 demonstrated suspicion for adrenal involvement preoperatively. Among 111 patients without adrenal involvement, 53 (47.7%) had imaging available for review, with only 3 (5.7%) demonstrating suspicion for adrenal involvement. The negative predictive value was 100%, whereas the sensitivity and specificity were 100% and 94.3%, respectively.

CONCLUSIONS: Ipsilateral adrenal involvement in renal cell carcinoma is uncommon and reliably predicted by preoperative cross-sectional imaging. Among all adrenalectomies in this series, nearly 95% were performed unnecessarily. With careful review, preoperative imaging can help avoid unnecessary adrenalectomy during radical nephrectomy in patients with renal cortical tumors.

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*Timing of surgery for feminizing genitoplasty in patients suffering from congenital adrenal hyperplasia.*
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This chapter refers only to female patients with congenital adrenal hyperplasia (CAH). CAH represents the largest subgroup of individuals with 46,XX disorders of sex development. The stimulation of the androgen production leads to a prenatal virilization among these girls. The phenotype is influenced by the severity of the enzyme defect, leading to a virilization of the external genitalia in varying degrees. On the other hand, the affected girls are clearly anatomically female with regularly developed female internal genitalia. Female puberty and potential female fertility are therefore to be expected. The operation to feminize the genitalia includes the separation of the sinus urogenitalis, the creation of a functionally wide enough vagina, the remodeling of the labioscrotal folds to create larger labia, and, if necessary, a reduction clitoroplasty. Considering the lack of scientific evidence, it is not possible to make definitive statements regarding the timing of surgery for girls with CAH. There are no studies that prove whether one- or two-stage surgery provides more or clearer advantages.
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*Long-term study of subclinical Cushing’s syndrome shows high prevalence of extra-adrenal malignancy in patients with functioning bilateral adrenal tumors.*
Author information:
Subclinical Cushing's syndrome (SCS) is characterized by subtle autonomous cortisol secretion from adrenal tumors without specific signs and symptoms of hypercortisolism. Patients with SCS have a high prevalence of "lifestyle-related diseases," such as hypertension, diabetes mellitus, dyslipidemia, and osteoporosis. Long-term follow-up of SCS patients is reportedly indispensable for establishing indications for surgical treatment of SCS. We performed a follow-up survey of 27 patients with SCS (median: 5.3 years) and compared those who had undergone surgical treatment (n=15) with those who had not (n=12). The mean diameter of tumors was 31 mm; 16 (59%) patients had unilateral lesions and 11 (41%) carried bilateral ones. In 67% and 60% of the treatment group, respectively, hypertension and diabetes mellitus improved. We also noticed that eight of 11 (73%) SCS patients with bilateral adrenal tumors had extra-adrenal malignancies in various tissues. Interestingly, among nine SCS patients who had malignancies, eight showed bilateral adrenal uptake in $^{131}$I-aldosterol scintigraphy. The results imply that surgical treatment can reduce cardiovascular risks in SCS patients. Screening for malignancy may be necessary in patients with bilateral adrenal tumors suspected of autonomous hypersecretion of cortisol from both sides.

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Dexamethasone PONV-prophylaxis alters the hypothalamic-pituitary-adrenal axis after transsphenoidal pituitary surgery.
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Comment on
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Dexamethasone and hypothalamic-pituitary-adrenal axis suppression after transsphenoidal pituitary surgery.
Bharadwaj S(1), Venkatraghavan L.
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Comment in
Surgical considerations for removal of giant tumor of the right adrenal.
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BACKGROUND/AIM: Complete surgical removal is the only potentially curative approach for adrenal tumors. Our series of patients affected with giant right adrenal tumors, as well as the open surgical modalities used to obtain a complete tumor resection with safe vascular control were analyzed.

MATERIALS AND METHODS: Nine patients (mean age=57 years) affected with a giant right adrenal tumor who underwent open surgical removal of the mass form the basis of the present analysis. A midline incision was performed. Large mobilization of the liver was performed to obtain good and safe exposure of the vascular pedicles.

RESULTS: An en bloc R0 tumor resection was accomplished in all cases. Histology revealed an adrenal cortical carcinoma in all patients. No local recurrence was noted at a mean follow-up of 14 months.

CONCLUSION: Radical surgery is the only curative approach and is recommended for all patients, whenever technically feasible, through open access in cases of giant right adrenal carcinoma.

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Primary adrenal leiomyosarcoma: a case report and review of the literature.
Bhalla A, Sandhu F, Sieber S.

Primary adrenal leiomyosarcoma has been reported previously in 25 patients. The patient presented herein is the only case where the definitive diagnosis was made with core needle biopsy evaluation. A 45-year-old male presented with pain in the back and right groin. Radiological evaluation demonstrated a heterogeneous 11 cm right adrenal mass, multiple liver masses, and an enlarged aortocaval lymph node. No retroperitoneal mass was identified. Core needle biopsies revealed a malignant mesenchymal neoplasm composed of atypical spindle shaped cells arranged in intersecting fascicles, with high mitotic activity and focal tumor necrosis. Immunohistochemical stains revealed immunoreactivity for smooth muscle actin and desmin. S-100 and c-kit stains were negative. The diagnosis of adrenal
leiomyosarcoma with liver metastasis was rendered. It was an aggressive tumor with clinical presentation at Figure 1. Core needle biopsy, an advanced stage. Definitive diagnosis of this tumor by core needle biopsy can obviate the need for surgical biopsy in patients with advanced disease.

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*The effect of adrenal medullectomy on metabolic responses to chronic intermittent hypoxia.*

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Obstructive sleep apnea causes intermittent hypoxia (IH) and is associated with insulin resistance and type 2 diabetes. IH increases plasma catecholamine levels, which may increase insulin resistance and suppress insulin secretion. The objective of this study was to determine if adrenal medullectomy (MED) prevents metabolic dysfunction in IH. MED or sham surgery was performed in 60 male C57BL/6J mice, which were then exposed to IH or control conditions (intermittent air) for 6 weeks. IH increased plasma epinephrine and norepinephrine levels, increased fasting blood glucose and lowered basal and glucose-stimulated insulin secretion. MED decreased baseline epinephrine and prevented the IH induced increase in epinephrine, whereas the norepinephrine response remained intact. MED improved glucose tolerance in mice exposed to IH, attenuated the impairment in basal and glucose-stimulated insulin secretion, but did not prevent IH-induced fasting hyperglycemia or insulin resistance. We conclude that the epinephrine release from the adrenal medulla during IH suppresses insulin secretion causing hyperglycemia.

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*Does pterygopalatine canal injection with local anaesthetic and adrenaline decrease bleeding during functional endoscopic sinus surgery?*

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OBJECTIVE: To determine the effect of pterygopalatine fossa injection with xylocaine and adrenaline on: surgical field bleeding and blood loss during functional endoscopic sinus surgery for chronic rhinosinusitis, and the duration of the procedure.

METHODS: A prospective, single-blinded, controlled trial was performed in a tertiary care academic centre. A total of 45 patients undergoing functional endoscopic sinus surgery for chronic rhinosinusitis, whose disease was symmetrical based on computed tomography grading, were included. A unilateral pterygopalatine fossa injection with 1 per cent xylocaine and 1:100 000 adrenaline was performed after the induction of anaesthesia. The contralateral side served as the control. The operating surgeon, who was blinded to the injected side, assessed the surgical field using a validated six-item grading system. Blood loss, blood pressure, heart rate and end-tidal carbon dioxide were recorded every 15 minutes for each side separately, and duration of surgery was noted.

RESULTS: There was no statistically significant difference in the surgical field grade between the injected and non-injected sides (p = 0.161). There were no differences in blood loss or duration of surgery.

CONCLUSION: Pterygopalatine fossa injection prior to functional endoscopic sinus surgery did not decrease intra-operative surgical field bleeding, blood loss or duration of surgery.

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PMID: 25166215 [PubMed - indexed for MEDLINE]
MATERIALS AND METHODS: A retrospective database was constructed containing 343 AVS procedures performed over a 10-year period. Each nondiagnostic AVS procedure was reviewed for failure mode and correlated with results of any repeat AVS. Data collected included selectivity index, lateralization index, adrenalectomy outcomes if performed, and details of AVS procedure. All AVS procedures were performed after cosyntropin stimulation, using sequential technique.

RESULTS: AVS was nondiagnostic in 12 of 343 (3.5%) primary procedures and 2 secondary procedures. Failure was right-sided in 8 (57%) procedures, left-sided in 4 (29%) procedures, bilateral in 1 procedure, and neither in 1 procedure (laboratory error). Failure modes included diluted sample from correctly identified vein (n = 7 [50%]; 3 right and 4 left), vessel misidentified as adrenal vein (n = 3 [21%]; all right), failure to locate an adrenal vein (n = 2 [14%]; both right), cosyntropin stimulation failure (n = 1 [7%]; diagnostic by nonstimulated criteria), and laboratory error (n = 1 [7%]; specimen loss). A second AVS procedure was diagnostic in three of five cases (60%), and a third AVS procedure was diagnostic in one of one case (100%). Among the eight patients in whom AVS ultimately was not diagnostic, four underwent adrenalectomy based on diluted AVS samples, and one underwent adrenalectomy based on imaging; all five experienced improvement in aldosteronism.

CONCLUSIONS: A substantial percentage of AVS failures occur on the left, all related to dilution. Even when technically nondiagnostic per strict criteria, some “failed” AVS procedures may be sufficient to guide therapy. Repeat AVS has a good yield.

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BACKGROUND: Endoscopic or open adrenalectomies are performed for variable pathologies. We investigated if adrenal pathology affects perioperative outcomes independent of operative approach.

METHODS: A multi-institutional retrospective review of 345 adrenalectomies was performed. A multivariate analysis was utilized.

RESULTS: Pathology groups included benign non-pheochromocytoma tumors (50.4%),
pheochromocytomas (41%), adrenocortical carcinomas (5.2%), and metastatic tumors (3.4%). Controlling for age, body mass index, tumor size, procedure type, and pathology, pheochromocytomas exhibited greater blood loss (92 mL more, P = .007) and operative times (33 min more, P < .001) than benign non-pheochromocytoma tumors. Metastatic tumors demonstrated longer operative times (53 min more, P = .013). Open adrenalectomy was associated with greater blood loss (396 mL more, P = .001), transfusion requirement (P = .021), operative times (79 min more, P < .001), hospital stay (6.6 days more, P < .001) and complications (P < .001) when compared with endoscopic adrenalectomy.

CONCLUSIONS: The type of adrenal pathology appears to influence blood loss and operative time but not complications in patients undergoing adrenalectomy. Open adrenalectomy remains a major driver of adverse perioperative outcomes.

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Prognostic parameters after surgery for adrenal metastases: a single institution experience.
Paunovic I, Zivaljevic V, Diklic A, Tausanovic K, Stojanic R, Sipetic S.

BACKGROUND: Clinically isolated adrenal metastases are rare and therefore present a therapeutic challenge. We report our experience with surgery of adrenal metastases and analyze factors that may influence postoperative survival.

METHODS: A consecutive series of 31 patients (16 male, 15 female) underwent adrenal surgery for metastases at a single institution over 10-year period (1999-2008). The Kaplan-Meier method and log-rank test were used to determine overall survival. Potential prognostic factors were identified by univariate and multivariate Cox regression analysis.

RESULTS: The primary tumor diagnoses were non-small-cell lung carcinoma (NSCLC) 20, colorectal carcinoma 5, renal cell carcinoma (RCC) 2, malignant melanoma and breast carcinoma, one each. The median survival was 12 months, with one year and five year survival of 21% and 3.4% respectively. According to multivariate analysis independent prognostic factors of favorable survival were disease free interval (DFI) longer than 12 months (Hazard ratio (HR) = 0.28, 95% CI = 0.09-0.90), potentially curative resection (Hazard ratio (HR) = 0.35, 95% CI = 0.12-1.00) and postoperative radiotherapy of adrenal bed (Hazard ratio (HR) = 0.33, 95% CI = 0.12-0.91).

CONCLUSIONS: Overall survival after surgery for adrenal metastases is poor. In multivariate analyses, survival is influenced by DFI, curative resection, and postoperative radiotherapy.

PMID: 25102710  [PubMed - indexed for MEDLINE]

Dopamine-secreting giant adrenal ganglieneuroma: clinical and diffusion-weighted
magnetic resonance imaging findings.
Polat AV, Polat AK, Aslan K, Atmaca H, Karagoz F.

We report a case of a dopamine-secreting giant primary adrenal ganglioneuroma (GN) in a 29-year-old male patient. Although the patient was clinically silent, the 24-hour urine levels of dopamine, normetanephrine, homovanillic acid and vanillyl mandelic acid were elevated. Abdominal ultrasonography and magnetic resonance imaging showed a large solid tumor with calcifications and a slightly lobular edge on the left adrenal gland. A tumor, 13 x 23 x 25 cm in size, was completely resected without morbidity. A 2-year follow-up with computed tomography showed that the postoperative course of the patient was uneventful.

PMID: 25073244  [PubMed - indexed for MEDLINE]

Non-invasive assessment of adrenocortical function in captive Nile crocodiles (Crocodylus niloticus).
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The occurrence of stress-inducing factors in captive crocodilians is a concern, since chronic stress can negatively affect animal health and reproduction, and hence production. Monitoring stress in wild crocodiles could also be beneficial for assessing the state of health in populations which are potentially threatened by environmental pollution. In both cases, a non-invasive approach to assess adrenocortical function as a measure of stress would be preferable, as animals are not disturbed during sample collection, and therefore sampling is feedback-free. So far, however, such a non-invasive method has not been established for any crocodilian species. As an initial step, we therefore examined the suitability of two enzyme-immunoassays, detecting faecal glucocorticoid metabolites (FGMs) with a 11β,21-diol-20-one and 5β-3α-ol-11-one structure, respectively, for monitoring stress-related physiological responses in captive Nile crocodiles (Crocodylus niloticus). An adrenocorticotrophic hormone
(ACTH) challenge was performed on 10 sub-adult crocodiles, resulting in an overall increase in serum corticosterone levels of 272% above the pre-injection levels 5h post-injection. Saline-treated control animals (n=8) showed an overall increase of 156% in serum corticosterone levels 5h post-administration. Faecal samples pre- and post-injection could be obtained from three of the six individually housed crocodiles, resulting in FGM concentrations 136-380% above pre-injection levels, always detected in the first sample collected post-treatment (7-15 days post-injection). FGM concentrations seem comparatively stable at ambient temperatures for up to 72 h post-defaecation. In conclusion, non-invasive hormone monitoring can be used for assessing adrenocortical function in captive Nile crocodiles based on FGM analysis.

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BACKGROUND: A comparative study of topical feracrylum citrate versus adrenaline to minimise haemorrhage-related complications in paediatric hypospadiac patients.
PATIENTS AND METHODS: A total of 108 consecutive paediatric hypospadiac patients (48 in the study group and 60 control - random allocation) were studied. In the study group, 1% feracrylum citrate solution was used and adrenaline (1:100,000) in controls.
RESULTS: Among the study group, average number of blood-soaked gauge pieces were 2.95/patient, correlating with average intraoperative blood loss of 14.74 ml. In controls, average blood-soaked gauge pieces were 4.83/patient corresponding to an average blood loss of 24.13 ml. The average amount of blood loss during surgery in the <5 years was 13.70 ml/patient in the feracrylum group, while the same in the adrenaline group was 23.45 ml. Average duration of surgery was 79 min in the study group, while the same in controls was 94 min/patient. Average number of cauterisations was 0.255/patient in the study group and 0.583/patient among controls. Postoperative haematoma was seen in 8% study group compared with 18% controls. Wound oedema appeared in 4.17% study group and 11.67% controls. Postoperative complications were higher among controls.
CONCLUSIONS: Feracrylum is more efficient and safer topical haemostatic agent than adrenaline. It reduced the frequency of cauterisation and tissue damage, intraoperative blood loss, and postoperative complications.
DOI: 10.4103/0189-6725.137328
PMID: 25047311 [PubMed - indexed for MEDLINE]
Reconstructive surgery for females with congenital adrenal hyperplasia due to 21-hydroxylase deficiency: a review from the Prince of Wales Hospital.

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OBJECTIVES: To present the results of feminising genitoplasty done in female patients with congenital adrenal hyperplasia due to 21-hydroxylase deficiency.

DESIGN: Case series.

SETTING: A tertiary referral centre in Hong Kong.

PATIENTS: Female patients with congenital adrenal hyperplasia undergoing corrective surgery for virilisation between 1993 and 2012.

MAIN OUTCOME MEASURES: The operative result was judged with a scoring system (1-3) for four areas: appearance of clitoris, labia and vagina, plus requirement for revision surgery.

RESULTS: A total of 23 female patients with congenital adrenal hyperplasia with a median age of 17.5 (range, 1.5-33.8) years were identified. Of these individuals, 17 presented in the neonatal period and early infancy, of which four had an additional salt-losing crisis. Six patients—including four migrants from mainland China—were late presenters at a median age of 2 (range, 0.5-14) years. Twenty-two patients had corrective surgery at a median age of 2 (range, 1-14) years.

Clitoral reduction was performed in all, and further surgery in 21 patients. The additional surgery was flap vaginoplasty in 10 patients, a modified Passerini procedure in six, and a labial reconstruction in five; one patient with prominent clitoris was for observation only. Minor revision surgery (e.g. mucosal trimming) was required in three patients; a revision vaginoplasty was done in one individual. Of the 23 patients, 18 (78%) with a median age of 20 (range, 9.3-33.8) years participated in the outcome evaluation: a 'good' outcome (4 points) was seen in 12 patients and a 'satisfactory' (5-9 points) result in five patients.

CONCLUSIONS: Nearly three quarters of our cohort (n=17) presented with classic virilising form of 21-hydroxylase deficiency. Only four (25%) patients experienced a salt-losing crisis. Female gender assignment at birth was maintained for all individuals in this group. 'Good' and 'satisfactory' outcomes of surgery were reported in nearly all participants.

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PMID: 25045882  [PubMed - indexed for MEDLINE]

Changing USA national trends for adrenalectomy: the influence of surgeon and technique.

Monn MF(1), Calaway AC, Mellon MJ, Bahrler CD, Sundaram CP, Boris RS.
OBJECTIVE: To explain differences over time between operative approach and surgeon type for adrenal surgery in the USA.

PATIENTS AND METHODS: A retrospective cohort analysis was performed on all patients undergoing adrenalectomy between 2002 and 2011 using the Nationwide Inpatient Sample. Patients undergoing concurrent nephrectomy were excluded. Surgeon specialty was only available for 2003-2009. Descriptive analyses and multivariable logistic regression models were used to assess variables associated with minimally invasive surgery (MIS) and urologist-performed procedures.

RESULTS: In all, 58,948 adrenalectomies were identified. A MIS approach was used in 20% of these operations. There was a 4% increase in MIS throughout the study period (P < 0.001). Cases performed at teaching hospitals were more likely to be MIS (odds ratio [OR] 1.47, P < 0.001). We were able to identify surgical specialty in 23,746 cases, of which 60% were performed by urologists. Cases performed in the Midwest compared with Northeast were at increased adjusted odds of being performed by urologists (OR 1.38, P = 0.11). Despite most cases being performed by urologists, adrenalectomy by urologists showed a 15% annual decrease over the analysed period (P < 0.001).

CONCLUSIONS: The use of a MIS technique to perform adrenalectomy is increasing at a slower rate compared with most other surgical extirpative procedures. Further investigation to explain the decreased performance of adrenalectomy by urologists is warranted.

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Resident participation and postoperative outcomes in adrenal surgery.
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BACKGROUND: The changing paradigm of surgical residency training has raised concerns about the effects on the quality of training. The purpose of this study is to identify if resident participation in laparoscopic adrenalectomy (LA) and open adrenalectomy (OA) cases is associated with deleterious outcomes.

MATERIALS AND METHODS: This is a retrospective study using the American College of Surgeons National Surgical Quality Improvement Program database. Data from patients undergoing LA and OA from 2005 to 2010 were queried. Preoperative variables as well as intra- and post-operative outcomes for each procedure were
evaluated. Multivariate logistic regression was used to analyze if resident participation was associated with significant differences in outcomes, compared with no resident participation. Subset analysis was done to determine possible differences in outcomes based on the level of resident participating, divided into junior (Post Graduate Year [PGY]1-3), senior (PGY4-5), or fellow (≥PGY6) levels.

RESULTS: A total of 3219 adrenalectomies were performed. Of these, 735 (22.8%) were OAs and 2484 (77.2%) were LAs. Residents were involved in 2582 (80.2%) surgeries, which comprised 1985 (76.9%) LAs and 597 (23.1%) OAs. Senior residents or fellows performed majority of the cases (85.2%). Mean operative time was significantly higher with resident participation in LA (P < 0.0001) and OA group (P < 0.0001). On multivariate analysis, resident participation was not associated with significant differences in the operative outcomes of 30-d mortality or postoperative complications after laparoscopic or OA.

CONCLUSIONS: Although resident participation does increase operative time in LA and OA, this does not appear to be clinically significant and does not result in adverse patient outcomes.

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Bilateral adrenal incidentaloma with subclinical hypercortisolemia: indications for surgery.

INTRODUCTION: According to some authors, a higher incidence of subclinical hypercortisolemia is found among patients with bilateral benign adrenal tumors than in those with unilateral tumors. It is still unknown whether all patients with bilateral adrenal tumors and subclinical hypercortisolemia should undergo surgery, and, if so, which tumor should be removed first.

OBJECTIVES: The aim of the study was to investigate whether unilateral adrenalectomy can lead to resolution of hypercortisolemia in patients with bilateral adrenal tumors and to improvement of their clinical status.

PATIENTS AND METHODS: The study group consisted of 25 patients with bilateral benign adrenal tumors and subclinical hypercortisolemia. In 24 patients, unilateral adrenalectomy was performed. The adrenal gland was selected for removal on the basis of scintigraphy and/or tumor diameter. Cortisol concentrations were measured before the surgery and at 1 and 6 months after the surgery at 8:00 AM, 10:00 PM, and after dexamethasone suppression. The morning blood levels of adrenocorticotropic hormone, dehydroepiandrosterone, 17-hydroxyprogesterone, glycated hemoglobin, and lipid profile were determined.

RESULTS: In all surgical patients, hypercortisolemia resolved after the surgery. However, only in 14 patients (58%), the clinical improvement was evident (improved control of diabetes and hypertension, body mass loss).

CONCLUSIONS: Although subclinical hypercortisolemia resolved after surgery in all patients with bilateral adrenal tumors, only patients with poorly controlled
diabetes and hypertension and a rapid increase in body mass benefited from the surgery.

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Impact of adrenalectomy and dexamethasone treatment on testicular morphology and sperm parameters in rats: insights into the adrenal control of male reproduction.
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Here we investigated the hypothesis that normal levels of glucocorticoids, a class of adrenal steroid hormones, are required for normal testicular and epididymal functions. We examined the effects of the manipulation of glucocorticoid plasma levels by bilateral adrenalectomy (1, 2, 7 and 15 days) alone or in combination with daily treatment with the synthetic glucocorticoid dexamethasone (DEX; 5 μg/kg, i.p., 6 days) on the morphology of the testis and sperm parameters in rats. We showed that adrenalectomy led to a reduction in testicular sperm count and daily sperm production starting 2 days after surgery and a differential decrease in sperm count in the epididymis, according to the region and time post-adrenalectomy analysed. In parallel, testes from 7-day adrenalectomized (ADX) rats displayed a higher frequency of damaged seminiferous tubules and the presence of elongated spermatids retained in the basal epithelial compartment in stages IX-XVII, which is indicative of defective spermiation. The alkaline comet assay revealed a late effect of adrenalectomy on epididymal sperm DNA fragmentation, which was increased only 15 days after surgery. DEX treatment prevented the changes in testicular and epididymal sperm count observed in 7-day ADX rats, but failed to protect the testis from ADX-induced morphological abnormalities. Thus, our results indicated that glucocorticoids may be involved in events related to the maintenance of spermatogenesis and sperm maturation during adulthood. These findings provide new insights into the importance of adrenal steroids to male fertility.
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A modified adrenal gland-sparing surgery based on retroperitoneal laparoscopic radical nephrectomy.
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BACKGROUND: The objective of this study was to modify the adrenal gland-sparing strategy based on retroperitoneal laparoscopic radical nephrectomy by reviewing the anatomic relationship between the kidney and the adrenal gland.

METHODS: From June 2010 to October 2012, a total of 68 patients (45 males and 23 females) with localized renal cell carcinoma were treated at our hospital. The study included 35 cases that were right side and 33 cases that were left, and average patient age was 54.06 years. The average tumor size was 4.7 cm. Tumors were classified via the TNM staging system. All patients underwent adrenal gland-sparing surgery based on retroperitoneal laparoscopic radical nephrectomy.

RESULTS: For each patient, surgery was successful without conversion to open surgery. The average operative time was 56.65 ± 26.60 min, and the mean blood loss was 70.61 ± 60.96 ml. All patients were discharged from the hospital 3 to 8 days after surgery. During surgery, the adrenal gland was slightly lacerated in three cases and the peritoneum showed perforation in six cases. Only one case recurred during the study follow-up.

CONCLUSIONS: Based on retroperitoneal laparoscopy radical nephrectomy, this effective adrenal gland-sparing surgery showed direct exposure of tissue and little interference of the upper pole of the kidney. Elevation of the adrenal gland could help with the complete dissection of the adrenal gland from the kidney. The separation of the kidney was rapid, simple and accurate. The probability of adrenal gland damage was reduced. This strategy is recommended for widespread use in T1-2 renal neoplasms.

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Adrenal function after adrenalectomy for subclinical hypercortisolism and Cushing's syndrome: a systematic review of the literature.
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CONTEXT: The postoperative course of patients with subclinical hypercortisolism (SH) is yet to be clarified. The aims are to review the prevalence and predictive factors of postoperative adrenal insufficiency and the time to recover a normal adrenocortical function in patients with SH and Cushing's syndrome (CS).

EVIDENCE ACQUISITION: Using the PubMed database, we conducted a systematic review of the literature, selecting studies published from 1980 to 2013.

EVIDENCE SYNTHESIS: Of the 1522 papers screened, 28 were selected (13 retrospective, 14 prospective, and one randomized controlled trial). The prevalence of postoperative adrenal insufficiency was 65.3% in 248 SH subjects and 99.7% in 377 CS patients. Patients with SH were reclassified according to the following diagnostic criteria: subjects defined by pathological dexamethasone
test only (DEX), and those defined by the dexamethasone test with one (DEX+1) or two additional criteria (DEX+2); and they were compared with CS patients. The prevalence of adrenal insufficiency was 51.4, 60.6, 91.3, and 99.7%, respectively, with no significant difference between the two latter groups. The test with the best compromise between sensitivity (64%) and specificity (81%) in predicting adrenal insufficiency was the midnight serum cortisol. The time to achieve eucortisolism was lower in SH patients than in CS patients (6.5 vs 11.2 mo; P < .001).

CONCLUSIONS: Adrenal insufficiency occurs in about half of the patients with SH if defined only by the pathological dexamethasone test. However, prevalence of adrenal insufficiency and time to recovery are tightly related to the degree of hypercortisolism and diagnostic criteria to define SH, which might help to better define SH for future studies.

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Reduction in cortisol inactivation is part of the adrenal stress response to cardiac and noncardiac pediatric surgery: a prospective study using gas chromatography-mass spectrometry analysis.

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We examined the hypothesis that major cardiac surgery triggers a more intense adrenal stress response than less intensive noncardiac surgery, which then alters cortisol inactivation. Urinary excretion rates of glucocorticoid metabolites were determined before and after surgery using gas chromatography-mass spectrometry in 29 children undergoing scheduled major cardiac surgery and 17 control children undergoing conventional noncardiac surgery in a prospective observational study. Excretion rates of glucocorticoid metabolites were summed and corrected for creatinine excretion to calculate cortisol production rates (mg/mmol creatinine/m² body surface area). Precursor/product ratios from individual metabolites were calculated to characterize cortisol inactivation (11β-hydroxysteroid dehydrogenase). Postoperatively, median cortisol production rates increased in both groups (MCS: from 2.7 to 9.3; controls: from 2.7 to 5.8; p<0.001) with no significant difference between groups (p=0.12). Ratios of cortisol to cortisone metabolites, indicating the overall activity of 11β-hydroxysteroid dehydrogenase, increased postoperatively in both groups (p<0.001). In conclusion, surgery resulted in a distinct postoperative increase in cortisol production. In contrast to our hypothesis, children undergoing major
cardiac surgery did not show an increased adrenal stress response compared to children undergoing conventional surgery. Furthermore, the reduction in cortisol inactivation appears to be an essential part of the stress response to pediatric surgery in general.

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Laparoendoscopic single-site adrenalectomy versus conventional laparoscopic adrenalectomy: a comparison of surgical outcomes and an analysis of a single surgeon’s learning curve.
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BACKGROUND: Conventional laparoscopic adrenalectomy (LA) is the gold standard procedure for benign adrenal tumors. Laparoendoscopic single-site adrenalectomy (LESS-A) has been developed as an extension of standard laparoscopic minimally invasive procedures.

METHODS: This retrospective study compared the first experience of one surgeon with 70 LESS-A to 140 LA cases with respect to evaluating the influence of the inexperience on surgical outcomes and to assess this surgeon's learning curve for LESS-A.

RESULTS: Age, gender, BMI, percentage of patients with prior abdominal surgery, tumor laterality, and tumor size were all comparable between the two groups. There were no statistically significant differences in any surgical outcomes, including mean operative time, pneumoperitoneum time, estimated blood loss, transfusion requirements, hemoglobin decrease at postoperative day 1, analgesic requirements, postoperative day of oral intake, conversion rate, or morbidity between the two groups. The one exception was hospital stay. There were no mortalities or reoperations in either group. The morbidity rates in the LESS-A group and LA group were 4.2 and 6.4%, respectively (p = 0.528). LESS-A appears to have a steep learning curve and the operative time of the initial 70 cases decreased markedly and remained stable when the experience level exceeded 12 cases. There was no morbidity or conversion in these first 12 LESS-A cases. Multiple regression analysis revealed that surgeon experience (p = 0.008) and tumor size (p = 0.001) were independent predictors of prolonged operative time.

CONCLUSIONS: Surgical outcomes of LESS-A were equivalent to those of LA without compromising safety. The introduction of LESS-A at our hospital was smooth and safe. While the indication for LESS-A has been controversial, LESS-A was a useful procedure, especially for cases in which cosmesis is of paramount importance.
DOI: 10.1007/s00464-014-3553-3
PMID: 24853845  [PubMed - indexed for MEDLINE]
Computational fluid dynamics endpoints for assessment of adenotonsillectomy outcome in obese children with obstructive sleep apnea syndrome.

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BACKGROUND: Improvements in obstructive sleep apnea syndrome (OSAS) severity may be associated with improved pharyngeal fluid mechanics following adenotonsillectomy (AT). The study objective is to use image-based computational fluid dynamics (CFD) to model changes in pharyngeal pressures after AT, in obese children with OSAS and adenotonsillar hypertrophy.

METHODS: Three-dimensional models of the upper airway from nares to trachea, before and after AT, were derived from magnetic resonance images obtained during wakefulness, in a cohort of 10 obese children with OSAS. Velocity, pressure, and turbulence fields during peak tidal inspiratory flow were computed using commercial software. CFD endpoints were correlated with polysomnography endpoints before and after AT using Spearman’s rank correlation (rs).

RESULTS: Apnea hypopnea index (AHI) decreases after AT was strongly correlated with reduction in maximum pressure drop (dPTAmax) in the region where tonsils and adenoid constrict the pharynx (rs=0.78, P=0.011), and with decrease of the ratio of dPTAmax to flow rate (rs=0.82, P=0.006). Correlations of AHI decrease to anatomy, negative pressure in the overlap region (including nasal flow resistance), or pressure drop through the entire pharynx, were not significant. In a subgroup of subjects with more than 10% improvement in AHI, correlations between flow variables and AHI decrease were stronger than in all subjects.

CONCLUSIONS: The correlation between change in dPTAmax and improved AHI suggests that dPTAmax may be a useful index for internal airway loading due to anatomical narrowing, and may be better correlated with AHI than direct airway anatomic measurements.

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Dexamethasone PONV prophylaxis alters the hypothalamic-pituitary-adrenal axis after transsphenoidal pituitary surgery.

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BACKGROUND: Postoperative nausea and vomiting (PONV) is common after general anesthesia and are reported by approximately 20% to 25% of all patients and up to 39% of patients undergoing neurosurgical procedures. The most common standard prophylaxis is a single application of 4 mg of dexamethasone before initiating anesthesia. Dexamethasone is known to suppress adreno-corticotroph hormone and cortisol levels. The objective was to find out whether this prophylaxis has an effect on the postoperative levels of cortisol in patients undergoing transsphenoidal pituitary surgery, and therefore simulates pituitary deficiency.

PATIENTS AND METHODS: A retrospective analysis of the files of 136 consecutive patients who were operated during a course of 6 months were included. Nineteen patients with a known history of PONV received a standard dose of 4 mg of dexamethasone perioperatively. Blood tests were drawn at the first postoperative day and were compared with blood tests of patients who had no history of PONV and therefore received no prophylaxis.

RESULTS: Patients who were treated with a dexamethasone PONV prophylaxis showed no significant changes in cortisol levels; preoperative median of 93 μg/L (range, 39 to 427) and a postoperative median of 87 μg/L (range, 10 to 733; P=0.798) opposed to patients who did not receive such treatment; preoperative cortisol 114 μg/L (range, 10 to 387) and postoperative levels of 273 μg/L (range, 10 to 1352; P<0.001).

CONCLUSIONS: As early postoperative blood checks of the cortisol levels yield important information about potential pituitary sufficiency after transsphenoidal surgery, the probability that dexamethasone PONV prophylaxis suppresses postoperative cortisol levels should be considered.

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PMID: 24810990 [PubMed - indexed for MEDLINE]


Accuracy of adrenal imaging and adrenal venous sampling in predicting surgical cure of primary aldosteronism.

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CONTEXT: The accurate distinction between unilateral and bilateral adrenal disease in patients with primary aldosteronism (PA) guides surgical management. Adrenal venous sampling (AVS), the criterion standard localization procedure, is not readily available at many centers throughout the world.

OBJECTIVE: The objective of the study was to determine factors most consistent with surgically curable PA.

DESIGN: This was a retrospective observational study.

SETTING: The study was conducted at the Mayo Clinic (Rochester, Minnesota), a tertiary referral center.

PATIENTS: All patients who underwent unilateral adrenalectomy for treatment of PA between January 1993 and December 2011 participated in the study.

INTERVENTION: The intervention in the study was unilateral adrenalectomy.

MAIN OUTCOME MEASURES: Variables associated with the prediction of unilateral disease were measured.

RESULTS: Over 19 years, 263 patients underwent unilateral adrenalectomy for the treatment of PA. Long-term postoperative follow-up was obtained in 143 patients (54.4%). The overall effective cure rate of PA was 95.5% in those patients sent for adrenalectomy for presumptive unilateral disease. In patients with cured PA, defined as the resolution of autonomous aldosterone secretion, hypertension was cured in 53 (41.7%) and improved in 59 (46.5%) patients. PA was not cured with unilateral adrenalectomy in six patients (4.2%). Adrenal imaging and AVS were concordant to the surgically documented side in 58.6% and 97.1% of the patients, respectively. Although there was no statistically significant difference in mean age between the inaccurate vs the accurate adrenal imaging group, we found that the minimum age in the former was 35.1 years.

CONCLUSIONS: Using adrenal imaging and AVS, the effective surgical cure rate for PA was 95.5%. Although the overall accuracy of computed tomography and magnetic resonance imaging in detecting unilateral adrenal disease was poor at 58.6%, adrenal imaging performed well in those patients younger than 35 years of age.

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Factors associated with higher risk of complications after adrenal surgery.
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BACKGROUND: Surgeon experience has been demonstrated to result in better outcomes after a variety of advanced operations. Less information is available regarding adrenal surgery. We compared the outcomes after adrenalectomy for a variety of indications and determined the effect of surgeon's case volume.

METHODS: Cross-sectional analysis was performed using ICD-9 procedure codes
included in the Nationwide Inpatient Sample from 2003 to 2009 to identify all adult patients who underwent unilateral or bilateral adrenalectomy for benign or malignant conditions. Logistic regression was used to test for interaction between surgeon case volume (low = 1, intermediate = 2-5, and high = >5 adrenalectomies per year), diagnosis, type of operation performed, and risk of complications.

RESULTS: A total of 7,829 adrenalectomies were included. Risk of complications after bilateral adrenalectomy was 23.4% compared to 15.0% for unilateral adrenalectomy (odds ratio 2.165, 95% confidence interval 1.335, 3.512). Malignancy was associated with higher risk of complication (23.1%) than benign disease (13.2%) (odds ratio 1.685, 95% confidence interval 1.371, 2.072). Complication rates for low- and intermediate-volume surgeons were 18.8 and 14.6%, respectively, and both were significantly higher than complications by high-volume surgeons (11.6%, p < 0.05). Length of stay and charges were both significantly less for high-volume surgeons compared to lower-volume groups (p < 0.05).

CONCLUSIONS: Low surgeon case volumes and adrenal surgery for malignant or bilateral disease are associated with increased risk of postoperative complications. Length of stay and charges were significantly less when high-volume surgeons perform adrenal surgery.

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Surgical and ablative therapies for the management of adrenal 'oligometastases' - A systematic review.
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BACKGROUND: We systematically reviewed the literature on the use of surgery, stereotactic ablative body radiotherapy (SABR) and percutaneous catheter ablation (PCA) techniques for the treatment of adrenal metastases to develop evidence-based recommendations.

METHODS: A systematic review of the MEDLINE database was performed using
structured search terms following PRISMA guidelines. Eligible publications were those published from 1990 to 2012, written in English, had at least five patients treated for adrenal metastasis and reported on patient clinical outcomes (local control, survival and treatment related complications/toxicity). Where possible, pooled 2-year local control and overall survival outcomes were analysed.

RESULTS: Our search strategy produced a total of 45 papers addressing the three modalities - 30 adrenalectomy, nine SABR and six PCA (818, 178 and 51 patients, respectively). There was marked heterogeneity in outcome reporting, patient selection and follow-up periods between studies. The weighted 2-year local control and overall survival for adrenalectomy were 84% and 46%, respectively, compared with 63% and 19%, respectively for the SABR cohort. Only one study of PCA with five patients analysed clinical outcomes, reporting an actuarial local control of 80% at 1 year. Treatment related complications/toxicities were inconsistently reported.

CONCLUSION: There is insufficient evidence to determine the best local treatment modality for isolated or limited adrenal metastases from any primary tumour. Published data suggests adrenalectomy to be a reasonable treatment approach for isolated adrenal metastasis in suitable patients. SABR is a valid alternative in cases when surgery is not feasible or the operative risk is unacceptable. PCA cannot be recommended until there are more robust studies which include long-term oncological outcomes.

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The adrenal psoas sign: surgical outcomes following a simple technique to maximize removal of extracortical adrenal tissue during bilateral laparoscopic adrenalectomy.
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BACKGROUND: Bilateral laparoscopic adrenalectomy (BLA) is an effective therapy for the management of persistent hypercortisolism in patients after failed transphenoidal pituitary tumor resection for Cushing's disease. Extracortical adrenal tissue has been identified as a source of persistent hypercortisolism and, if not resected along with both adrenal glands, may lead to treatment failure. We report a reliable and reproducible technique called the "psoas sign" for BLA in patients with Cushing's disease which reduces the likelihood of retained extra-adrenal cortical rests and may reduce intraoperative complications.

METHODS: A 16-year retrospective review of all consecutive patients who underwent transabdominal BLA at a single tertiary care center was performed. All patients
underwent BLA utilizing the psoas sign technique and all procedures were performed replicating these predetermined surgical steps: (1) Identification of the inferior pole of the gland. (2) Identification of the inferior aspect of the adreno-caval groove on the right or the adrenal vein/renal vein confluence on the left. (3) Division of the adrenal vein. (4) Dissection and removal of the adrenal gland with clearance of all retroperitoneal fat overlying the psoas muscle.

RESULTS: Between October 1996 and December 2012, 92 patients underwent BLA for refractory Cushing's disease. Patients were predominantly female (90 %) with a median age of 40 years (17-71). There were 3 intraoperative complications (3.2 %), 2 conversions (2.2 %), and 1 death (1.09 %). Four patients were identified as having extracortical rests of adrenal tissue within the retroperitoneal fat (4.3 %). Mean operative time was 272 min (±79.25, n = 68) and median estimated blood loss was 50 mL (10-800 mL).

CONCLUSIONS: The psoas sign technique provides a clear view of the adrenal fossa and facilitates careful dissection of the anatomic planes around the adrenal gland. This technique is feasible, reproducible and in our experience allows for safe removal of both adrenal glands and all surrounding extracortical adrenal tissue.

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BACKGROUND: Laparoscopic adrenalectomy for tumors larger than 6 cm is currently a matter of controversial discussion because of difficult mobilization from surrounding organs and a possible risk of capsule rupture.

MATERIALS AND METHODS: Data of consecutive patients undergoing laparoscopic adrenalectomy between 1/1994 and 7/2012 were collected and analysed retrospectively. Intra- and postoperative morbidity in patients with tumors ≤6 cm (group 1, n = 227) were compared to patients with tumors >6 cm, (group 2, n = 52).

RESULTS: Incidence of adrenocortical carcinoma was significantly higher in group 2 patients (6.3% vs. 0.4%, P = 0.039) whereas the incidence of aldosterone-producing adenoma was lower (2% vs. 25%, P = 0.001). Mean duration of surgery was longer (105 min vs. 88 min, P = 0.03) and the estimated blood loss was higher (470 mL vs. 150 mL) in group 2 patients. Intraoperative bleeding rate (5.7% vs. 0.8%, P = 0.041), and the conversion rate were significantly higher (5.7% vs. 1.3%, P = 0.011) in group 2. Also, postoperative complication rate was significantly higher in group 2 (11.5% vs. 3.0%, P = 0.022). However, only two
major complications occurred, one in each group.
CONCLUSION: Minimally invasive adrenal surgery can be performed by an experienced
surgeon even in patients with large tumors (>6 cm) with an increased but still
acceptable intra- and postoperative morbidity.
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Surgical treatment for late-appearing adrenal metastasis from gastric cancer:
report of two cases.
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Adrenal metastasis following gastrectomy for gastric cancer is often encountered
as part of advanced systemic dissemination, which is usually unresectable. Thus,
there are very few published case reports describing metastasectomy for adrenal
metastasis from gastric cancer. Herein we present our experience in treating two
patients diagnosed and treated for adrenal metastasis 6 years following initial
surgery for advanced gastric cancer (pT2bN1M0 and pT2bN0M0, respectively,
according to the classification system set forth in the sixth edition of The TNM
Classification of Malignant Tumours by the International Union against Cancer).
They underwent successful en bloc R0 resections, followed by systemic
chemotherapy with close postoperative follow-up for another recurrence, and have
remained alive without recurrence for 1 year. These results suggest that active
surgical treatment for resectable metastatic gastric cancer in the adrenal glands
has an important role in prolonging survival in selected patients.
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Outcomes of adrenal-sparing surgery or total adrenalectomy in phaeochromocytoma
associated with multiple endocrine neoplasia type 2: an international
retrospective population-based study.
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MJ(12), Wohlk N(13), Kollyukh O(14), Canu L(15), Loli P(16), Bergmann SR(17),
Biarnes Costa J(18), Makay O(19), Patocs A(20), Pfeifer M(21), Shah NS(22), Cuny
T(23), Brauckhoff M(24), Bausch B(25), von Dobschuetz E(26), Letizia C(27),
Barczynski M(28), Alevizaki MK(29), Czetwertynska M(30), Ugurlu MU(31), Valk
G(32), Plukker JT(33), Sartorato P(34), Siqueira DR(4), Barontini M(5), Szperl
M(6), Jarzab B(7), Verbeek HH(8), Zelinka T(35), Vlcek P(36), Toledo SP(10), Coutinho FL(10), Mannelli M(15), Recasens M(18), Demarquet L(23), Petramala L(27), Yarechmuk S(37), Zabolotnyi D(37), Schiavi F(38), Opocher G(39), Racz K(40), Januszewicz A(6), Weryha G(23), Henry JF(41), Brue T(42), Conte-Devolx B(42), Eng C(43), Neumann HP(44).

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BACKGROUND: The prevention of medullary thyroid cancer in patients with multiple endocrine neoplasia type 2 syndrome has demonstrated the ability of molecular diagnosis and prophylactic surgery to improve patient outcomes. However, the other major neoplasia associated with multiple endocrine neoplasia type 2, phaeochromocytoma, is not as well characterised in terms of occurrence and treatment outcomes. In this study, we aimed to systematically characterise the outcomes of management of phaeochromocytoma associated with multiple endocrine neoplasia type 2.

METHODS: This multinational observational retrospective population-based study compiled data on patients with multiple endocrine neoplasia type 2 from 30 academic medical centres across Europe, the Americas, and Asia. Patients were included if they were carriers of germline pathogenic mutations of the RET gene, or were first-degree relatives with histologically proven medullary thyroid cancer and phaeochromocytoma. We gathered clinical information about patients' RET genotype, type of treatment for phaeochromocytoma (ie, unilateral or bilateral operations as adrenalectomy or adrenal-sparing surgery, and as open or endoscopic operations), and postoperative outcomes (adrenal function, malignancy, and death). The type of surgery was decided by each investigator and the timing of surgery was patient driven. The primary aim of our analysis was to compare disease-free survival after either adrenal-sparing surgery or adrenalectomy.

FINDINGS: 1210 patients with multiple endocrine neoplasia type 2 were included in our database, 563 of whom had phaeochromocytoma. Treatment was adrenalectomy in 438 (79%) of 552 operated patients, and adrenal-sparing surgery in 114 (21%).
Phaeochromocytoma recurrence occurred in four (3%) of 153 of the operated glands after adrenal-sparing surgery after 6-13 years, compared with 11 (2%) of 717 glands operated by adrenalectomy (p=0.57). Postoperative adrenal insufficiency or steroid dependency developed in 292 (86%) of 339 patients with bilateral phaeochromocytoma who underwent surgery. However, 47 (57%) of 82 patients with bilateral phaeochromocytoma who underwent adrenal-sparing surgery did not become steroid dependent.

INTERPRETATION: The treatment of multiple endocrine neoplasia type 2-related phaeochromocytoma continues to rely on adrenalectomies with their associated Addisonian-like complications and consequent lifelong dependency on steroids. Adrenal-sparing surgery, a highly successful treatment option in experienced centres, should be the surgical approach of choice to reduce these complications.

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Laparoscopic transperitoneal anterior adrenalectomy in pheochromocytoma: experience in 62 patients.

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BACKGROUND: Aim was to evaluate the results in 62 patients undergoing laparoscopic adrenalectomy (LA) for the treatment of pheochromocytoma (PHE), with a transperitoneal anterior approach for lesions on the right side, and with a transperitoneal anterior submesocolic approach in case of left-sided lesions.

METHODS: Sixty-two patients underwent LA for the treatment of PHE at two centers in Rome and Ancona (Italy). Two patients had bilateral lesions, for a total of 64 adrenalectomies. Sporadic PHE occurred in 57 patients (91.9 %) and in 5 (8.0 %) it was familiar. Thirty-six patients (58.0 %) underwent right adrenalectomy, 24 (38.7 %) left adrenalectomy, and in 2 cases (3.2 %) LA was bilateral. In 38 cases of right adrenalectomy (59.3 %) and in 5 cases of left adrenalectomy (7.8 %), the approach was a transperitoneal anterior one. A transperitoneal anterior submesocolic approach was used in 21 left adrenalectomy cases (32.8 %).

RESULTS: Mean operative time for right and left transperitoneal anterior LA was 101 min (range 50-240) and 163 min (range 50-190), respectively. Mean operative time for left transperitoneal anterior submesocolic LA was 92 min (range 50-195). For bilateral adrenalectomy, mean operative time was 210 min (range 200-220). Conversion to open surgery occurred in 2 cases (3.22 %) due to extensive adhesions (1) and hemorrhage (1). One major and three minor complications were observed. Mobilization occurred on the first postoperative day. Hospitalization was 4.8 days (range 2-19). The lesions had a mean diameter of 4.5 cm (range...
CONCLUSIONS: Early identification with no gland manipulation prior to closure of the adrenal vein is the main advantages of the transperitoneal anterior approach. PHE may be treated safely and effectively by a laparoscopic transperitoneal anterior approach for right-sided lesions and with a transperitoneal anterior submesocolic approach for left-sided ones.

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Does common channel length affect surgical choice in female congenital adrenal hyperplasia patients?
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OBJECTIVE: Partial/total urogenital sinus mobilization (UGSM) is one of the recommended techniques for treatment of female congenital adrenal hyperplasia (CAH). In this study we compared the length of common channel (CC) and type of operation performed in CAH patients.

PATIENTS AND METHODS: We retrospectively analyzed data of patients receiving surgery for female CAH. Patients were separated into three groups: group 1 had partial UGSM, group 2 had total UGSM, and group 3 had total UGSM plus the vaginal anterior wall was made from CC. Age at surgery, length of CC, surgical time, follow-up time, and complications were compared.

RESULTS: There were a total of 29 patients. For groups 1, 2, and 3, the average age at surgery was 47.2 months, 14.4 months, and 21.3 months, respectively, and the average CC length was 1.25 cm, 3.1 cm, 4.3 cm, respectively. The average time of surgery was 165 min, 193.1 min, 282.5 min, respectively. The average follow-up time was 34.7 months, 36.3 months, 28.3 months, respectively. There were two complications (UGS flap necrosis and opening of sutures) in the third group.

CONCLUSION: We advise the use of partial UGSM for CC of 0.5-2 cm, total UGSM for CC of 2.5-3.5 cm, and total USM with use of CC as the anterior vaginal wall in CC ≥ 4 cm in length. Good cosmetic and functional results are obtained with this approach.

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Topical cocaine vs adrenaline in endoscopic sinus surgery: a blinded randomized controlled study.
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BACKGROUND: Adequate surgical field visualization is among the most important factors in preventing complications in functional endoscopic sinus surgery (FESS). The aim of this study was to assess the effect of topical cocaine vs adrenaline on surgical field visualization and intraoperative bleeding during FESS.

METHODS: A randomized controlled trial was conducted. A total of 37 patients that underwent FESS for chronic rhinosinusitis were randomized to the side of the nose that received adrenaline or cocaine-soaked patties, and the side that was operated first. The surgeon evaluating the bleeding was blinded to the vasoconstrictor allocation. At the commencement of surgery and at regular 15-minute intervals, the operating surgeon evaluated the extent of bleeding in the operative field according to a validated scale. At each assessment, mean arterial pressure (MAP), heart rate, and end tidal CO2 were also recorded. At the end of each side, total blood loss was measured.

RESULTS: There was no difference in the mean surgical field scores between the adrenaline and cocaine sides (2.04 ± 0.75 vs 2.17 ± 0.7, p = 0.24), nor the total blood loss (p = 0.43). On the cocaine side, there was a correlation between surgical field grade and duration of surgery (p < 0.05) as well as blood loss (p < 0.05) and MAP (p < 0.05).

CONCLUSION: There is no difference in the quality of the surgical field achieved through the use of topical cocaine or adrenaline during FESS. Either of these agents can be effectively used for topical decongestion at the onset of surgery.

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Laparoendoscopic single-site (LESS) retroperitoneal partial adrenalectomy using a custom-made single-access platform and standard laparoscopic instruments: technical considerations and surgical outcomes.
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BACKGROUND: We previously reported our initial experience with laparoendoscopic single-site (LESS) retroperitoneal partial adrenalectomy using a custom-made single-port device and conventional straight laparoscopic instruments.

METHODS: Between December 2010 and February 2012, LESS retroperitoneal partial adrenalectomies were performed in 11 patients. Six patients had aldosterone-producing adenomas (APAs) and five patients had nonfunctioning tumors. A single-port access was created with an Alexis wound retractor (Applied Medical, Rancho Santa Margarita, CA, USA) through an incision of 2-3 cm beneath the tip of the 12th rib. All procedures were performed with straight laparoscopic instruments.

RESULTS: All LESS procedures were successfully completed without conversion to traditional laparoscopic conversion. The tumors ranged from 1 cm to 4.7 cm (mean, 2.3 cm). The operative time was 71-257 minutes (mean, 121 minutes). Most patients (n = 8) had minimal blood loss; the other three patients had a blood loss of 150 mL, 100 mL, and 100 mL. The mean hospital stay was 3 days (range, 1-6 days). There were no perioperative or postoperative complications. Pathological examinations revealed negative surgical margins in all specimens. All patients with Conn's syndrome had an improvement in blood pressure and normalization of plasma renin activity and serum aldosterone levels; all patients were free of potassium supplementation.

CONCLUSION: Our results clearly demonstrate that LESS retroperitoneal partial adrenalectomy can be performed safely and effectively using a custom-made single-access platform and standard laparoscopic instruments.

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BACKGROUND: Management of subclinical Cushing's syndrome (SCS) remains controversial; it is not possible to predict which patients would benefit from adrenalectomy. In the present study we aimed to evaluate the role of adrenocortical scintigraphy (ACS) in the management of patients with SCS.

METHODS: The medical records of 33 consecutive patients with adrenal "incidentaloma" and proven or suspected SCS who underwent (131)I-19-iodocholesterol ACS between 2004 and 2010 were reviewed. Sixteen underwent laparoscopic adrenalectomy (surgical group-S-group) and 17 were medically managed (medical group-M-group). Follow-up evaluation was obtained by outpatient consultation.

RESULTS: Overall 25 patients (15 in the S-group and 10 in the M-group) had concordant unilateral uptake at ACS (ACS+). In the S-group, the mean follow-up duration was 30.9 ± 16.1 months and, irrespective of the presence of hormonal diagnosis of SCS, in patients who were ACS+ adrenalectomy resulted in a significant increase in HDL cholesterol and decreases in body mass index, glycemia, and blood pressure (BP). One patient reduced antihypertensive medication and three others were able to discontinue it altogether. Prolonged postoperative hypoadrenalism (PH) occurred in 14 patients in the S-group. The overall accuracy in predicting PH was 93.7 % for ACS and 68.7 % for laboratory findings. In the M-group, the mean follow-up duration was 31.5 ± 26.3 months and no patient developed overt Cushing's syndrome, although ACS+ patients experienced a worsening in glycemia and diastolic BP.

CONCLUSIONS: Adrenal scintigraphy seems the most accurate diagnostic test for SCS. It is able to predict the metabolic outcome and the occurrence of PH, identifying the patients who could benefit from adrenalectomy irrespective of hormonal diagnosis.

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GATA6, SF1, NGFIB and DAX1 in the remodeled subcapsular zones in primary aldosteronism.
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The majority of the cases diagnosed as primary aldosteronism (PA) are caused by aldosterone-producing adenoma (APA) or idiopathic hyperaldosteronism (IHA). Histopathologically, both IHA and adjacent adrenal glands of APA demonstrate remodeled subcapsular zone (RSZ) but these zones in two disorders are markedly different in terms of steroidogenesis. 3β-Hydroxysteroid dehydrogenase/Δ⁵-Δ⁴ isomerase (3β-HSD) expression has been known to be activated synergistically by GATA6 and SF1, and repressed by DAX1 through abolishing the activation. Nerve growth factor-induced clone B (NGFIB) is also known as one of the transcription factors in PA.
factors to bind to and activate 3β-HSD promoter. The results of our immunohistochemical analysis demonstrated the expression levels of 3β-HSD in RSZ of IHA were higher than in RSZ of adjacent adrenals of APA, while those in the zona glomerulosa (ZG) of normal adrenal gland (NA) were in between these two RSZs. The expression levels of GATA6, SF1 and DAX1 did not prominently differ among these three types of adrenals, especially between in RSZs of IHA and APA cases, indicating the marked difference of 3β-HSD expression was unlikely to be explained by the levels of these three factors. However, the levels of NGFIB expression were significantly higher in RSZ of IHA than in RSZ of adjacent adrenals of APA and the ZG of NA (P<0.05), which may partly account for the expression levels of 3β-HSD among the three groups of adrenals. These results may imply NGFIB plays important roles in the marked differences in steroidogenic functions in the two distinct types of RSZ of PA cases.

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Endothelin B-receptors and sympathetic activation: impact on ventricular arrhythmogenesis during acute myocardial infarction.

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AIMS: We investigated the role of endothelin-B receptors on sympathetic activation originating from the adrenal gland or from the myocardium and its impact on arrhythmogenesis during acute myocardial infarction.

MAIN METHODS: We studied two groups of rats (n=120, 284±2 g), namely wild-type and ETB-deficient. Myocardial infarction was induced by permanent ligation of the left coronary artery and ventricular tachyarrhythmias were evaluated from continuous electrocardiographic recordings. Sympathetic activation, measured by indices of heart rate variability, was evaluated after adrenalectomy or catecholamine depletion induced by reserpine. Acute left ventricular failure was assessed by total animal activity.
KEY FINDINGS: Adrenalectomy decreased the total duration of tachyarrhythmias in ETB-deficient rats, but their incidence remained higher, compared to wild-type rats. After reserpine, heart rate variability indices and tachyarrhythmias were similar in the two groups during the initial, ischaemic phase. During evolving infarction, tachyarrhythmia duration was longer in ETB-deficient rats, despite lower sympathetic activation. Heart rate was lower in ETB-deficient rats throughout the 24-hour observation period, whereas activity was comparable in the two groups.

SIGNIFICANCE: Endothelin-B receptors modulate sympathetic activation during acute myocardial infarction not only in the ventricular myocardium, but also in the adrenal gland. Sympathetic activation markedly increases early-phase ventricular tachyarrhythmias, but other mechanisms involving the endothelin system underlie delayed arrhythmogenesis.

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Surgical outcome of laparoscopic surgery, including laparoendoscopic single-site surgery, for retroperitoneal paraganglioma compared with adrenal pheochromocytoma.
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OBJECTIVE: Paraganglioma (PGL) is a rare type of tumor that arises from the extra-adrenal paraganglia. A PGL tumor hypersecretes catecholamines and causes symptoms identical to those in patients with hyper-functioning adrenal pheochromocytoma (PCC). In this study, we compared the surgical outcome of laparoscopic surgery, including laparoendoscopic single-site (LESS) surgery, in patients with PCC and patients with retroperitoneal solitary PGL.

METHODS: The records of 49 patients with PCC and 9 patients with unilateral retroperitoneal PGL at our institution from January 2001 to March 2013 were retrospectively reviewed. Multiple tumors, tumors suspected of being malignant preoperatively, and tumors operated on using a retroperitoneal approach were excluded from the study.

RESULTS: Each group was equivalent with respect to patient background, hemodynamic variables, and preoperative biochemical assessments, including plasma catecholamine levels and catecholamine levels in 24-hour urine samples. The mean operative time was significantly longer in the PGL group (149.4 ± 56.5 minutes v 189.8 ± 44.9 minutes, P=0.019). In univariate and multivariate analyses, tumor size ≥ 50 mm and PGL were statistically significant factors that predicted prolonged operative time. Intraoperative hypotension occurred in 15 patients in the PCC group and in 8 patients in the PGL group, and the difference was statistically significant (P=0.002). One postoperative complication in the PCC group and two postoperative complications (Clavien-Dindo grade II or higher) in
the PGL group were observed, and the difference was statistically significant (P=0.012). Twenty-two patients in this series underwent LESS surgery (PCC: n=19; PGL: n=3), and there was no statistically significant difference in the perioperative outcomes between the two groups. CONCLUSIONS: The present results demonstrate that the operation for solitary extraperitoneal PGL required a longer operative time and had more hypotensive episodes and higher postoperative morbidity than the PCC group. Though the perioperative outcome of LESS surgery for PGL is comparable to that of PCC, we should treat the patients with PGL accordingly.

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Is adrenal venous sampling mandatory before surgical decision in case of primary hyperaldosteronism?
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BACKGROUND: Primary hyperaldosteronism (PHA) is a cause of secondary arterial hypertension potentially curable by laparoscopic unilateral adrenalectomy. We describe the follow-up of these patients according to their medical or surgical treatment.
METHODS: We report a retrospective single-center study of 91 patients with PHA from 1998 to 2012. Treatment was guided by computed tomography (CT) scans. Preoperative adrenal vein sampling (AVS) was performed when the CT scan did not show single solitary unilateral nodules on the adrenal glands. During the follow-up, we considered hypertension to be cured in patients with normal blood pressure without antihypertensive medication (AM), and improvement was defined by a decrease in AM.
RESULTS: A total of 28 patients received only AM. Of the 62 patients who underwent a unilateral adrenalectomy, 46 (74 %) had an adrenal adenoma, 14 (22 %) a hyperplasia, and the adrenal gland was normal in two cases. Hypertension was cured in 24 cases (38 %), and 28 patients (45 %) showed improvement with a reduction in AM. Predictive factors for a cure were gender, age, number of preoperative AMs, preoperative arterial systolic blood pressure, and plasma renin activity. All patients who presented with hypokalemia were cured postoperatively.
We performed 38 AVS and nine of these patients were operated on based on the AVS findings, with an improvement of 100 % of arterial blood pressure after surgery.
CONCLUSION: Laparoscopic unilateral adrenalectomy for PHA cured or improved hypertension in 84 % of patients. Preoperative AVS is mandatory for surgical decision making if the CT scan shows bilateral or no lesions associated with PHA.
DOI: 10.1007/s00268-014-2461-y
PMID: 24481990 [PubMed - indexed for MEDLINE]
Surgical technique: Retroperitoneoscopic approach for adrenal masses in children.

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Laparoscopic adrenalectomy is considered to be the standard of care for the surgical excision of adrenal masses. The transperitoneal laparoscopic and retroperitoneoscopic approaches are described. Both are safe and as effective as open adrenalectomy, with the added benefit of the minimally invasive approach. It can be utilized for patients requiring surgery for a phaeochromocytoma, adrenal adenoma, adrenal adenocarcinoma, Cushing's syndrome, neuroblastoma, and an incidentaloma. Relative contraindications include previous surgery of the liver or kidney, large tumours (>8-10 cm in diameter) or coagulation disorders. Although the transperitoneal route is used more widely, the retroperitoneal approach provides direct access to the adrenal gland and easy visualization of the adrenal vein. It avoids also colonic mobilization, minimizes the risk of injury to hollow viscera, and the potential risk of adhesion formation. However, the reversed orientation of the kidney and hilum, combined with a significantly smaller working space, may make this approach difficult to master.

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Congenital adrenal hyperplasia (CAH) most commonly due to 21-hydroxylase deficiency is the most common type of disorder of sex development. This review will focus on CAH addressing historical and current surgical techniques with their anatomical foundations, with special attention to long-term results and outcomes on sexual function, patient satisfaction, patient attitude toward surgery, and ongoing controversies in management of these patients.

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Response to comments made on article: minimally invasive surgery for malignant adrenal tumors.
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Comment on
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PMID: 24360969 [PubMed - indexed for MEDLINE]

The vascular surgeon's experience with adrenal venous sampling for the diagnosis of primary hyperaldosteronism.
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BACKGROUND: Adrenal venous sampling (AVS) is used to distinguish between bilateral idiopathic hyperplasia and a functional adrenal tumor in patients with hyperaldosteronism. Successful sampling from both adrenal veins is necessary for lateralization and may require more than 1 procedure. AVS has traditionally been performed by interventional radiologists; however, our goal was to examine the outcomes when performed by a vascular surgeon.

METHODS: All patients with a diagnosis of hyperaldosteronism were referred for AVS regardless of imaging findings. Cortisol and aldosterone levels were measured in blood samples from both adrenal veins. Postoperative analysis of intraoperative laboratory values before and after cosyntropin administration determined successful cannulation and sampling of each vein.

RESULTS: Between 2007 and 2012, 53 patients underwent AVS by one vascular surgeon. The average age was 54 and 63% were men. Our success rate increased with experience, because during the earlier years (2007-2010) primary and secondary success rates were 58% and 68%, respectively compared with later years (2011-2012) when primary and secondary success rates were 82% and 95%, respectively (P<0.05). Results of AVS altered localization of disease compared with what had been anticipated based on preoperative imaging and thus influenced surgical decision making in 47% of cases.

CONCLUSIONS: AVS is an important procedure in the work up of hyperaldosteronism to help identify and localize metabolically active tumors. It is an additional
area in medicine where a vascular surgeon can lend expertise. Success with the procedure improves with experience and should be performed by high volume surgeons.

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In the presence of a history of cancer, adrenal masses are commonly, but not exclusively, metastases. Depending upon the status of the patient's ongoing cancer therapy, overall tumor burden, and performance score, adrenalectomy is a viable treatment option. Herein we review the prevalence, diagnostic evaluation, and selection for surgical treatment of adrenal metastases. Additional attention is paid to recent data supporting the safety and oncologic efficacy of laparoscopic adrenalectomy.
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Comment in
Comment on
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A marked proportional rise in IVC aldosterone following cosyntropin administration during AVS is a signal to the presence of adrenal hyperplasia in
primary aldosteronism.
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We hypothesized aldosteronoma responsiveness to cosyntropin may be a characterizing feature that could be determined in addition to standard adrenal vein sampling (AVS) data. We reviewed an AVS database from June 2005 to October 2011 including 65 patients with confirmed primary aldosteronism (PA) who underwent AVS and, if applicable, unilateral adrenalectomy. Patients were divided into confirmed lateralized and non-lateralized groups and subgrouped by histology. Plasma aldosterone in inferior vena cava (IVC) pre- and post-cosyntropin infusion during AVS was measured. Peak aldosterone and proportional change was compared between groups. Baseline and peak IVC aldosterone was higher in lateralized patients but incremental aldosterone rise was much greater in subjects with bilateral hyperplasia. From receiver operator characteristics (ROC) analysis, the optimized diagnostic cut point of peak IVC aldosterone of >649 pmol l⁻¹ would have a sensitivity of 94% for surgical disease although specificity of just 59%. A 250% increase in IVC aldosterone following cosyntropin would be specific enough to exclude 87% of surgical/lateralized disease. These diagnostic capabilities are similar to other results with non-AVS tests performed for diagnosis of lateralization. Although not specific enough to replace standard AVS interpretation, a marked IVC aldosterone increase after cosyntropin during AVS is a useful additional test to diagnose non-lateralizing forms of PA. Such a calculation requires no additional expense or tests.

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Suppression of adrenal gland-derived epinephrine enhances the corticosterone-induced antinociceptive effect in the mouse formalin test.
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BACKGROUND: There is both clinical and experimental evidence to support the application of corticosterone in the management of inflammation and pain. Corticosterone has been used to treat painful inflammatory diseases and can produce antinociceptive effects. Epinephrine is synthesized from norepinephrine
by the enzyme phenylethanolamine N-methyltransferase (PNMT) and works as an
dogenous adrenoreceptor ligand secreted peripherally by the adrenal medulla. It
is currently unclear whether corticosterone's antinociceptive effect is
associated with the modulation of peripheral epinephrine.
METHODS: We first determined whether exogenous corticosterone treatment actually
produced an antinociceptive effect in a formalin-induced pain model, and then
examined whether this corticosterone-induced antinociceptive effect was altered
by suppression of adrenal-derived epinephrine, using the following three
suppression methods: (1) inhibition of the PNMT enzyme; (2) blocking peripheral
epinephrine receptors; and (3) adrenalectomy.
RESULTS: Exogenous treatment with corticosterone at a high dose (50 mg/kg), but
not at lower doses (5, 25 mg/kg), significantly reduced pain responses in the
late phase. Moreover, injection of 2,3-dichloro-a-methylbenzylamine, a PNMT
enzyme inhibitor, (10 mg/kg) before corticosterone treatment caused a leftward
shift in the dose-response curve for corticosterone and injection of propranolol
(5 mg/kg), but not phentolamine, also shifted the dose-response curve to the left
during the late phase. Chemical sympathectomy with 6-hydroxydopamine had no
effect on corticosterone-induced antinociceptive effect, but injection of a low
dose of corticosterone produced an antinociceptive effect in adrenalectomized
animals.
CONCLUSIONS: These results demonstrate that suppression of epinephrine, derived
from adrenal gland, enhances the antinociceptive effect of exogenous
corticosterone treatment in an inflammatory pain model.
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Adrenal venous sampling for stratifying patients for surgery of adrenal nodules
detected using dynamic contrast enhanced CT.
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PURPOSE: We aimed to assess the value of adrenal venous sampling (AVS) for
diagnosing primary aldosteronism (PA) subtypes in patients with a unilateral
nodule detected on adrenal computed tomography (CT) and scheduled for
adrenalectomy.
MATERIALS AND METHODS: This retrospective study included 80 consecutive patients
with PA undergoing CT and AVS. Different lateralization indices were assessed,
and a cutoff established using receiver operating characteristic curve analysis.
The value of CT alone versus CT with AVS for differentiating PA subtypes was
compared. The adrenalectomy outcome was assessed, and predictors of cure were
determined using univariate analysis.
RESULTS: AVS was successful in 68 patients. A cortisol-corrected aldosterone
affected-to-unaffected ratio cutoff of 2.0 and affected-to-inferior vena cava
ratio cutoff of 1.4 were the best lateralization indices, with accuracies of
82.5% and 80.4%, respectively. CT and AVS diagnosed 38 patients with
aldosterone-producing adenomas, five patients with unilateral adrenal
hyperplasia, and 25 patients with bilateral adrenal hyperplasia. Of the 52
patients with a nodule detected on CT, subsequent AVS diagnosed bilateral adrenal
hyperplasia in 14 patients (27%). Compared to the results of combining CT with
AVS, the accuracy of CT alone for diagnosing aldosterone-producing adenomas was
71.1% (P < 0.001). The cure rate for hypertension after adrenalectomy was 39.2%,
with improvement in 53.5% of patients. On univariate analysis, predictors of
persistent hypertension were male gender and preoperative systolic blood
pressure.
CONCLUSION: To avoid inappropriate surgery, AVS is necessary for diagnosing
unilateral nodules with aldosterone hypersecretion detected by CT.
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PMCID: PMC4463251
PMID: 24047720  [PubMed - indexed for MEDLINE]

A 10-year single-center experience with surgical management of adrenal
yelolipoma.
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University, Shanghai, China.
OBJECTIVE: The purpose is to report our 10-year experience with surgical
management of large or symptomatic adrenal myelolipoma.
PATIENTS AND METHODS: Patients receiving surgical treatment for adrenal
myelolipoma between December 2001 and September 2011 in our institution were
retrospectively reviewed. Patients were divided into two groups: open surgery and
laparoscopic surgery. Patient demographic data, lesion size evaluated by computed
tomography scan or magnetic resonance imaging, operation time, blood loss, time
of returning to diets, perioperative complications, and length of hospital stay
were collected and analyzed.
RESULTS: Forty patients (14 received open surgery and 26 received laparoscopic
surgery) were enrolled in our study. Both procedures were successful and no
patient in the retroperitoneal laparoscopic group required conversion to open
surgery. The mean age of the patients was 52.7 years. The median size of the
tumor was 5.0 cm. Forty-three percent of patients suffered from lumbago. There
was no statistical difference in perioperative complications between the two
groups (p>0.05). Retroperitoneal laparoscopic adrenalectomy patients had a
shorter operation time (90.66±37.97 min vs 141.82±62.78 min, p=0.017), less blood
loss (150, 100-200 mL vs 450, 300-525 mL, p=0.000), earlier time of returning to
diets (2, 2-3 days vs 3, 2-4.5 days, p=0.036), and a shorter hospital stay (6, 5-7 days vs 10, 8-11.25 days, p=0.000) when compared with open surgery patients.
CONCLUSION: Both open and laparoscopic surgeries are efficient and safe treatments for large or symptomatic adrenal myelolipoma, and retroperitoneal laparoscopic surgery has the advantages of minimal invasion and rapid postoperative recovery.
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OBJECTIVE: To evaluate the feasibility and safety of retroperitoneal laparoendoscopic single-site adrenalectomy for pheochromocytoma (LESS-PHEO) and summarize our initial experience.
PATIENTS AND METHODS: Between June 2009 and June 2013, 21 patients with adrenal pheochromocytoma underwent adrenalectomy by means of LESS-PHEO in our department. Fifty-three patients with pheochromocytoma underwent conventional retrolaparoscopic adrenalectomy (RLAP-PHEO) between March 2001 and June 2013, of whom 42 were selected as a control group for a retrospective serial case-control analysis (1:2 matched-pair cohort). In the operation, the retroperitoneal space was created and dilated by blunt finger dissection and the pneumoperitoneal pressure was maintained below 10 mm Hg. As the first step, ligation of the adrenal central vein was performed. Intraoperative hemodynamic parameters, operating time, estimated blood loss, transfusion requirement, incidence of perioperative complications, visual analog pain scale (VAPS) score, time to resumption of oral intake and ambulation, and postoperative hospitalization were compared between the groups.
RESULTS: All the operations were technically successful, without reoperations or conversion to open procedures. The 24-hour postoperative VAPS score was lower in the LESS-PHEO group than in the control group (5 vs 7; p<0.001). Despite a longer median operative time (167.4 minutes vs 125.5 minutes; p<0.001), the patients in the LESS-PHEO group resumed oral intake sooner (1 day vs 2 days; p<0.001), ambulated sooner (1 day vs 2 days; p<0.001), and were discharged earlier (4 days vs 7 days; p<0.001). No perioperative complications occurred in both the groups. No statistically significant differences in hemodynamic parameters or estimated blood loss were found between the groups.
CONCLUSION: Although more training and practice are needed to shorten its operative time, LESS-PHEO, as performed by an experienced laparoscopic urologist, is a feasible and safe procedure associated with less postoperative pain and faster recovery.
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Perioperative, functional, and oncologic outcomes of partial adrenalectomy for multiple ipsilateral pheochromocytomas.

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OBJECTIVE: Managing patients with multiple adrenal masses is technically challenging. We present our experience with minimally invasive partial adrenalectomy (PA) performed for synchronous multiple ipsilateral pheochromocytomas in a single setting.

MATERIALS AND METHODS: We reviewed records of patients undergoing PA for pheochromocytoma at the National Cancer Institute between 1994 and 2010. Patients were included if multiple tumors were excised from the ipsilateral adrenal gland in the same operative setting. Perioperative, functional, and oncologic outcomes of PA for multiple pheochromocytomas are shown.

RESULTS: Of 121 partial adrenalectomies performed, 10 procedures performed in eight patients for synchronous multiple ipsilateral pheochromocytomas were identified. All eight patients were symptomatic at presentation. The mean patient age was 30.6 years, median follow up was 12 months. The average surgical time was 228 minutes, average blood loss of 125 mL, and average number of tumors removed was 2.6 per adrenal. In total, 26 tumors were removed, 24 were pathologically confirmed pheochromocytomas, while two were adrenal cortical hyperplasia. After surgery, all patients had resolution of their symptoms, one patient required steroid replacement postoperatively. On postoperative imaging, one patient had evidence of ipsilateral adrenal nodule at the prior resection site 2 months postoperatively, which was consistent with incomplete resection.

CONCLUSIONS: Minimally invasive surgical resection of synchronous multiple pheochromocytomas is feasible with acceptable perioperative, functional, and short-term oncologic outcomes.

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retroperitoneoscopic adrenalectomy for 16 patients with pheochromocytoma. In all patients, the diameter of the pheochromocytoma was less than 4.0 cm. During the operation, a single-port access was inserted through a 2.5-3.0 cm transverse incision below the tip of the 12th rib. Internally, the operative procedure duplicates the conventional retroperitoneoscopic adrenalectomy for pheochromocytoma.

RESULTS: No conversions to open surgery or standard laparoscopy with additional trocars were necessary. The mean operative duration was 68.1 minutes (range 41-125 min). The mean blood loss was negligible (<50 mL), and no patient needed blood transfusion. Intraoperative hypertension (SBP>180 mmHg) occurred in 12.5% (2/16) of the patients. No patient had sustained hypertension, and none experienced intraoperative hypotension (systolic blood pressure <80 mm Hg). The only postoperative complication was one case of pneumonia successfully treated with antibiotics. The average postoperative hospital stay was 3.1 days (range 2-5 days). All patients left the hospital with a good cosmetic appearance.

CONCLUSIONS: In properly selected patients, LESS retroperitoneoscopic adrenalectomy is a feasible and safe procedure for pheochromocytoma.

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