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1. DCD LIVERS – CAVEAT EMPTOR

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Background: More than 2,000 patients with end-stage liver disease die each year while awaiting an available organ. Liver allografts procured from donation after brain death (DBD) do not meet the current need for organs. Liver transplantation from donation after cardiac death (DCD) donors is increasingly being used to address critical organ shortages. Early reports touting the successful use of DCD livers using standard survival rates may have overestimated the effectiveness of DCD livers as a therapeutic alternative.

Methods: We retrospectively reviewed the outcomes of 32 DCD liver recipients and compared these to 242 DBD recipients performed at Northwestern Memorial Hospital between December 2003 and May 2008. Adult (age \geq 18 years) recipients were included in the analysis; whereas pediatric, live donor, split, multi-organ and re-transplants were excluded. In addition, we compared our outcomes to United Network for Organ Sharing (UNOS) data from a cohort of DCD and DBD liver recipients categorized by Organ Procurement Organization (OPO) and national data over a similar time period.

Results: Donor and recipient variables including donor and recipient age, recipient etiology of liver disease, MELD, and cold ischemia time were similar among the DCD and DBD groups. The incidence of primary non-function, hepatic artery thrombosis and anastomotic bile duct complications were also comparable. Similar to other reports, the overall patient survival was not statistically different for recipients of DCD and DBD donors (81.3% vs. 91.3%, $p=ns$). More strikingly, our data demonstrate higher re-list (34.4% vs. 5.8%, $p<0.0001$) and re-transplant (15.6% vs. 5.0%, $p=0.035$) rates among DCD livers. Furthermore, patients transplanted with DCD livers had a 9.05 higher risk of re-listing, and a 4.35 higher risk of re-transplantation as compared to DBD livers. Ischemic cholangiopathy was the most common indication for re-listing for DCD recipients (61.5%). The incidence of ischemic cholangiopathy was 28% in the DCD group. Patients developing ischemic cholangiopathy require multiple percutaneous and endoscopic interventions as well as chronic suppressive antimicrobial therapy. Data from the national experience showed very similar patient survival (84%) as well as re-transplant rates (12%). Neither center experience nor OPO volume (>50 cases or <50 cases) had an impact on patient survival (81.2% vs. 80.4%, $p=ns$) and rates of re-listing (20.3% and 19.7%, $p=ns$) or re-transplantation (13.0% vs. 12.7%, $p=ns$).

Conclusion: Survival metrics for recipients of DCD liver transplants misrepresent the status and outcomes of DCD grafts. Our data reveals

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substantial re-list and re-transplant rates indicative of the natural history of ischemic cholangiopathy among DCD livers. Further studies focused on quality of life and the economic impact of DCD liver transplantation are needed in order to more accurately inform the decision to promote and utilize DCD livers.

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2. RISK FACTORS FOR THYROID HORMONE REPLACEMENT AFTER THYROID LOBECTOMY

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Purpose: The purpose of this study was to determine the incidence of and identify risk factors for post-operative thyroid hormone replacement in patients undergoing thyroid lobectomy.

Methods: We retrospectively reviewed all patients who underwent a thyroid lobectomy from May 2004 to December 2007. Patients with a malignancy or on pre-operative thyroid hormone replacement were excluded from the analysis.

Results: We identified 547 patients who underwent thyroid lobectomy for benign disease with a mean (SD) age of 50 (16) years, and 79% were female. Following thyroid lobectomy, the incidence of post-operative thyroid hormone replacement in our cohort was 14.3% (78 of 547). Patients with Hashimoto's thyroiditis were significantly more likely to require thyroid hormone therapy compared to patients without this diagnosis (32.1% vs. 11.1%, $p < 0.001$). In addition, patients who required post-operative thyroid hormone replacement had higher mean pre-operative TSH and lower mean free T4 serum levels compared to patients not requiring treatment (TSH: 2.12 vs. 1.35 IU/mL, $p = 0.006$; free T4: 1.03 vs. 1.34 IU/mL, $p = 0.01$, respectively). When the patients were stratified based on their pre-operative TSH levels into three groups, 0 - 1.5, 1.51 - 2.5, and ≥ 2.51 IU/mL, the percentage of patients who needed thyroid hormone replacement was 13.5, 20.5, and 41.3, respectively (≥ 2.51 vs. 0 - 1.5, $p = 0.0001$; ≥ 2.51 vs. 1.51 - 2.50, $p = 0.02$). Patients who were female or who experienced transient hypocalcemia after surgery also trended towards an increased need for thyroid hormone therapy, but these factors did not reach statistical significance ($p = 0.06$ for both).

Conclusion: Following thyroid lobectomy, 14.3% of patients will experience hypothyroidism requiring thyroid hormone treatment. Risk factors for thyroid hormone replacement after thyroid lobectomy include a diagnosis of Hashimoto's thyroiditis, serum TSH ≥ 2.5 IU/mL, and lower free T4 levels pre-operatively. Female gender and post-operative hypocalcemia may also increase this risk.

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3. DOES DCIS ACCOMPANYING INVASIVE CARCINOMA AFFECT PROGNOSIS?

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Introduction: Ductal carcinoma in situ (DCIS) often accompanies the presence of invasive breast cancer. The implication of this finding in terms of prognosis remains unclear. The purpose of this study was to determine the impact of the presence of DCIS on prognosis in patients with invasive breast cancer.

Methods: The North American Breast International Group Tamoxifen Adjuvant Trial is an investigator-initiated multicenter trial which randomized patients with hormone-receptor positive invasive breast cancer to receive either tamoxifen or toremifene. 1709 patients, all of whom were treated with hormonal therapy, formed the cohort of interest for this study. Clinicopathologic data, along with information regarding survival and recurrence, was collected in a prospective fashion. Median follow-up was 59 months. Statistical analyses were performed using SPSS (Version 16.0, Chicago, IL).

Results: Of the 1709 patients in this study, 434 (25.4%) had DCIS accompanying their invasive disease. On univariate analysis, the presence of DCIS was associated with a trend towards improved 5-year disease free (93.6% vs. 90.5%, $p=0.089$) and overall survival (95.3% vs. 92.6%, $p=0.058$). DCIS was associated with younger patient age (median 65 vs. 69 years, $p<0.0001$), smaller tumor size (median 1.2 vs. 1.3 cm, $p=0.060$), low grade tumors (29.3% vs. 35.0%, $p=0.045$), and invasive ductal histology (87.3% vs. 76.5%, $p<0.0001$). Controlling for these factors, DCIS was no longer associated with a difference in disease-free (OR: 0.763, 95% CI: 0.485-1.200, $p=0.242$) and overall survival (OR: 0.695, 95% CI: 0.402-1.200, $p=0.192$).

Conclusion: While the presence of DCIS is often associated with favorable tumor features including smaller tumors and low grade, its presence is not an independent predictor of survival in patients with concomitant invasive breast cancer.

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4. SURGEON-PERFORMED ULTRASOUND: A SINGLE INSTITUTION EXPERIENCE IN PARATHYROID LOCALIZATION.

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Introduction: Different imaging modalities have been used to localize hyperfunctioning parathyroid glands in patients with primary hyperparathyroidism (HPT). Excellent long-term results have been reported when abnormal glands were localized by surgeon preformed ultrasound (SUS) prior to directed parathyroidectomy. The purpose of this study is to evaluate preoperative SUS for parathyroid gland localization in patients with HPT.

Methods: A total of 442 patients with HPT underwent SUS at a single institution between 2002 and 2008. Patients were divided in 2 groups: group 1 (n=338, true positives) had correct localization of parathyroid gland(s) at the time of surgery; and group 2 (n=104), in which preoperative SUS failed to correlate with intraoperative findings. SUS true positivity rate, demographics, operative findings and outcomes were compared. True positivity (TP) was defined as the ability of SUS to localize all hypersecreting parathyroid glands prior to surgery resulting in operative success. Operative success was defined as normal serum calcium and PTH levels 6 months after surgery. False positivity (FP) was when the SUS identified a lesion (e.g. thyroid nodule or lymph node) that was not a parathyroid at the time of surgery. Data was collected prospectively and reviewed retrospectively. P value < 0.05 was considered statistically significant.

Results: Of the group of 442 patients, 338 (76%) had true positive SUS results. Group 1 patients tended to be younger compared to group 2 patients (mean age 57 vs. 63 years, $p < 0.001$). In group 2, 45/104 (43%) patients had false positive SUS ($p < 0.001$), and 59/104 (57%) patients had a negative localization study or missed multigland disease. Group 1 patients had a shorter operative time compared to group 2 patients (60 vs. 79 minutes, $p = 0.002$). The rates of bilateral neck exploration and multigland disease in groups 1 and 2 patients were: 8% vs. 39% ($p < 0.001$), and 2% vs. 19% ($p < 0.001$), respectively. Although not statistically significant, group 1 patients had larger gland size compared to group 2 patients (1.51 vs. 1.34 cm³, $p = \text{NS}$). Mean follow up was 20 months. The operative failure rate in group 1 patients was 0.3% compared to 10% in group 2 patients ($p < 0.001$). Preoperative and postoperative serum calcium, PTH, creatinine and Vit D-25-OH levels did not differ between the groups.

Conclusions: Surgeon performed ultrasound correctly localizes parathyroid glands in a majority of patients with HPT. A higher rate of correct localization is seen in younger patients. When SUS

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findings correlate with intraoperative findings, the rate of bilateral neck exploration and multigland disease is significantly lower. In addition, the operative time is significantly shorter.

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5. TRAUMATIC DIAPHRAGMATIC INJURY: EXPERIENCE FROM A LEVEL I TRAUMA CENTER

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Objective: Diaphragmatic injuries are uncommon and may be associated with significant morbidity and mortality. We sought to analyze patients with diaphragmatic injuries in a large level one Trauma Center as well as an associated county coroner in order to identify characteristics predictive of increased mortality.

Methods: Databases from a level I university trauma center and an associated county coroner contain information for over 20,000 patients. We queried these from January 1992 thru May 2005 to identify patients whose ICD-9 diagnoses included those pertaining to diaphragmatic injuries. Once this cohort was identified, hospital records, operative reports, and autopsy reports were reviewed to determine injury characteristics, treatment provided, and outcome. Statistical analyses were performed using Student's t-test, chi-square analyses, ANOVA, and multiple logistic regression.

Results: Diaphragmatic injuries were identified in 254 individuals. 200 (78.7%) patients survived to undergo operative repair of injuries. 161 (63.4%) patients were treated via laparotomy, 21 (8.3%) via combined laparotomy and thoracic approach, 8 (3.1%) via thoracotomy, 4 (1.6%) via laparoscopy, and 6 (2.4%) via an indeterminate procedure. One injury was not repaired during the initial admission. There were significant differences in injury characteristics based on sex (32% of males sustained blunt injuries vs. 66.7% of females, $p < 0.0001$), age (mean 43 years for blunt trauma vs. 29.8 years for penetrating, $p < 0.0001$), side of injury (55.6% of those with bilateral injuries had sustained blunt trauma vs. 45% with left-sided injuries vs. 21.8% with right-sided injuries, $p = 0.0022$), and injury severity score (ISS) (mean 45.8 for those with blunt trauma vs. 30.4 for penetrating, $p < 0.0001$). There were significant differences in outcome based on trauma mechanism (46.5% of those who sustained blunt trauma died vs. 22.6% with penetrating, $p < 0.0001$).

Eighty-eight patients (34.6%) with diaphragmatic injuries died. Of these deaths, 33 (37.5%) occurred prior to arrival at our center. The mortality following hospital admission was 24.9%. In addition to differences due to trauma mechanisms, there were significant differences between survivors and non-survivors in terms of age (mean 41.1 years for non-survivors vs. 32 for survivors, $p = 0.0002$), ISS (mean 60.6 for non-survivors vs. 25 for survivors, $p < 0.0001$), sex (27% of males died vs. 51% of females, $p = 0.0019$), and side of injury (55.6% of those with bilateral injuries died vs. 29.5% with right-sided injuries

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vs. 17.1% with left-sided injuries, $p < 0.0001$). By multiple logistic regression analyses, increased age and ISS were significant predictors of the probability of death (see table).

Conclusions: Traumatic diaphragmatic injuries are indicators of significant trauma burden and morbidity and mortality. Patients with diaphragmatic injuries associated with blunt trauma, higher ISS, and advanced age are at the greatest risk of death.

FACTORS ASSOCIATED WITH THE RISK FOR DEATH IN PATIENTS WITH DIAPHRAGMATIC INJURIES			
	Factor	Odds Ratio [95% Confidence Interval]	p-value
All patients	Age	1.044 (1.015-1.074)	$p = 0.0029$
	ISS	1.145 (1.103-1.188)	$p < 0.0001$
Patients sustaining blunt trauma	Age	1.036 (1.006-1.067)	$p = 0.0199$
	ISS	1.109 (1.067-1.153)	$p < 0.0001$
Patients sustaining penetrating trauma	Age	1.045 (0.967-1.129)	$p = 0.2665$
	ISS	1.258 (1.130-1.400)	$p < 0.0001$

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6. NEUROLOGIC OUTCOMES WITH CEREBRAL OXYGEN MONITORING IN TRAUMATIC BRAIN INJURY

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Introduction: Improving neurologic outcomes in patients with traumatic brain injury is of critical importance to all trauma surgeons. Monitoring and optimizing cerebral oxygenation has been advocated to improve outcome in head-injured patients. In our initial study, mortality, hospital (HLOS) and ICU length of stay (ICULOS) were equivalent for those patients with cerebral oxygen monitoring and those with standard intracranial pressure monitoring. This study confirmed those findings in a larger population and compared subsequent neurologic outcomes.

Methods: Patients with severe TBI (GCS < 8) were identified on admission to a Level 1 trauma center. A polarographic cerebral oxygen monitor (Licox) or fiberoptic intracranial pressure monitor (Camino) was inserted based on attending surgeon preference. An evidence-based algorithm for treatment was implemented to provide uniform care, including maintenance of cerebral oxygen levels > 20 mm Hg in those patients in the L group. Data collected included elements from the prehospital record, the ED record and the first ten days of the ICU hospitalization. After discharge, patients were contacted for evaluation of progress, and a Glasgow Outcome Score determined.

Results: One hundred forty-one patients were entered into the study over a four-year period. There were 81 patients in the Licox group (L) and 64 patients in the Camino group (C). There were no significant differences between the study groups in patient age, gender, Abbreviated Injury Score-Head, Injury Severity Score, hypotension or hypoxia. L patients had a mean of 21.5 + 29.8 hours with an ICP > 25, and C patients had a mean of 27.4 + 36.7 hours (p = 0.3). Mortality, HLOS and ICULOS were not different between the two groups. However, three month Glasgow Outcome Scores in the Licox group (vegetative, severe 15%, moderate, recovered 85%) were better than those in the Camino group (vegetative, severe 39%, moderate, recovered 61%) (p=0.02).

Conclusion: Mortality and LOS with cerebral oxygen monitoring and treatment are equivalent to those with standard intracranial pressure monitors. However, neurologic outcomes at three months are superior after Licox monitoring. Optimizing cerebral oxygen levels improves long term neurologic outcome in patients with traumatic brain injury.

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7. RADIOGUIDED PARATHYROIDECTOMY FOR HYPERPARATHYROIDISM IN THE REOPERATIVE NECK

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Background: Parathyroidectomy for primary hyperparathyroidism (HPT) is associated with high cure rates and minimal morbidity. However, in patients who have undergone previous neck operations, resection of diseased parathyroids can be difficult due to dense scar tissue as well as anatomic distortion, and has been reported to have a higher rate of complications. Radioguided surgery with a gamma probe has been shown to facilitate intraoperative localization of hyperplastic parathyroid glands. The purpose of this study was to determine the utility of the radioguided technique during parathyroidectomy for HPT in the reoperative neck.

Methods: We reviewed all patients with HPT and a history of prior neck surgery who underwent radioguided parathyroidectomy (RGP) from March 2001 to May 2008. An evaluation of patient demographics, anesthetic method, duration of surgery, length of stay, radioguided probe use, and outcomes was performed. Data are reported as mean \pm SEM.

Results: We identified 105 patients with primary (n=90), secondary (n=6), or tertiary (n=9) HPT who underwent a total of 133 previous neck operations. Sixteen patients (15%) had a history of two prior neck surgeries, and 6 patients (6%) underwent 3 or more prior neck procedures. The mean age of the patients was 59 ± 1 years, and 77% (n=79) were female. The types of previous neck operations included open or minimally invasive parathyroidectomy (n=69), partial or total thyroidectomy (n=32), carotid endarterectomy (n=10), cervical spine surgery with an anterior approach (n=6), neck dissection (n=4), tracheostomy (n=4), and other procedures (n=8). Thirty-nine percent of these patients had ectopic parathyroids, and 10% of the RGPs were performed under local anesthesia. The average lengths of surgery and hospital stay were 121 ± 4 minutes and 0.6 ± 0.1 days, respectively, while the mean gland weight was 676 ± 57 mg. The mean in vivo and ex vivo counts obtained with the radioguided probe were 313 ± 27 and 138 ± 14 , respectively. In addition, the ex vivo percentage of background was $68 \pm 7\%$, and virtually all resected parathyroids had ex vivo counts greater than or equal to 20%. Following RGP, 95% of patients were cured with less than 5% of patients experiencing complications.

Conclusion: These results illustrate that RGP is a valuable adjunct in the reoperative neck. In addition, RGP allows similar operative times, lengths of stay, efficacy, and complication rates as those reported for patients undergoing initial parathyroidectomy.

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8. ACUTE LOWER GASTROINTESTINAL BLEEDING IN 1112 PATIENTS ADMITTED TO AN URBAN EMERGENCY MEDICAL CENTER

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Background: This study was performed to elucidate the etiology, effectiveness of diagnostic and therapeutic modalities and outcomes in patients with acute lower gastrointestinal bleeding (LGIB).

Methods: A retrospective review of the medical records of 1112 consecutive patients (pts) admitted to the surgical service of an urban emergency hospital with LGIB from 1988 to 2006. Two periods were compared: 1988-1997 (504 pts) and 1998-2006 (608 pts).

Results: Symptoms included hematochezia (56%), maroon stool (17%), and melena (11%). Diagnostic studies included colonoscopy (100%) within 24 hours (32%), upper endoscopy (62%), barium enema (6%), nuclide scans (3%), and arteriography (2%). Eleven of 27 nuclide scans were positive, whereas, two of 22 angiograms were therapeutic. The symptoms and diagnostic studies were similar for the two periods. The common sources of bleeding for the two periods was diverticulosis (29%; 37%), hemorrhoids (24%, 21%), cancer (14%; 12%), and small bowel (1%; 1%). Bleeding stopped spontaneously in 863 pts (76%; 79%). Endoscopic hemostasis was achieved in 33 pts (1%; 5%; $p < 0.05$) leading to a decrease in emergency operative hemostasis (3.4%; 4.8%) and a decrease in elective operations (23%; 17%; $p < 0.05$). The readmission rate (5%) for bleeding was similar for both periods and due primarily to diverticulosis.

Conclusion: Diverticulosis, hemorrhoids, and carcinoma are the most common causes of severe acute LGIB with diverticulosis causing the highest recurrence. Early colonoscopy is the best diagnostic tool and is now being used more effectively for hemostasis. This reduces the need for operative intervention.

Key Words: lower gastrointestinal bleeding, cause, treatment, colonoscopy.

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9. USE OF MONTE CARLO SIMULATION IN DECISION-MAKING TO OPTIMIZE THE NUMBER OF ICU BEDS FOR SURGICAL PATIENTS

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Background: In recent years the surgical mission of our institution has evolved away from its original focus on primary, secondary and tertiary care to one increasingly concentrated on tertiary and quaternary care. This switch in clinical direction has created an unmet need with respect to the allocation of critical care resources to surgical services resulting in delayed or cancelled operations. This situation prompted us to consider the number of ICU beds required to significantly reduce or eliminate such unscheduled disruptions and how best to determine this number.

MEAN OF EACH PERFORMANCE MEASURE AS A FUNCTION OF ICU BED COUNT					
BEDS	CANCELLED	DAYS	PARKED	NUMBERS	UTILIZATION
6	560.8	424.2	31.1%	657.5	55.7%
7	485	363.3	25.4%	761.6	59.8%
8	408.1	274.6	20.7%	857.9	62.6%
9	329	186.9	16.3%	926.9	64.7%
10	252.9	116.7	12.1%	982.2	66.4%
11	181.8	66.4	8.5%	1025.5	67.1%
12	122.7	34	5.6%	1055.1	66.3%
13	70.3	15.2	3.2%	1066.4	64.0%
14	36.8	6	1.6%	1059.7	60.6%
15	18.3	2.5	0.8%	1052.5	56.9%
16	8.7	1.1	0.4%	1048.8	53.6%
17	4.1	0.4	0.2%	1046.0	50.4%

Method: A discrete event-based Monte Carlo simulation study of the events affecting requests for ICU admission of surgical patients was performed. A simulation model was built to include requests for ICU beds from the OR, PACU, ER and surgical wards. The study obtained data from April 2007 through March 2008. That data was used to determine for each type of intervention: the number of interventions; the fraction of surgical procedures that were classified urgent or emergent; the 1st, 2nd, . . . 100th percentile of the length of operative

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interventions, the time from operative intervention to an ICU admission request, and the ICU length of stay.

The following performance measures were specified: the number of blocks in which at least one procedure was cancelled (CANCELLED), the relative increase in the mean wait time for surgery in days (DAYS), the percentage of time in which patients that should be in the ICU were parked elsewhere (PARKED), the number of operative procedures involving requests for ICU admission that were performed (NUMBERS), and bed utilization (UTILIZATION). The model was validated quantitatively, and by the Delphi Method using an expert focus group.

Results: A simulation trial was run for each ICU bed count with each trial consisting of 64 runs of 39 months, including a 15 month warm up period to bring the model to a steady state prior to collecting the performance measures generated by the simulation. Using the Results of these trials, the relationship between the number of ICU beds and the metrics specified above was determined.

Conclusions: In this study we determined that 16 was the minimum number of SICU beds (twice the number currently available) required to significantly reduce OR delays and cancellations to an acceptably low level. We also determined that decision-making involving complex problems, including those related to surgical management issues, can benefit from Monte Carlo simulation. In particular, simulation makes it possible to test alternative hypotheses and solutions and to identify unanticipated shortcomings or opportunities associated with each. This work is now being extended so as to achieve the improved performance at higher levels of bed utilization.

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10. COMPARISON OF LAPAROSCOPIC TRANSABDOMINAL LATERAL VERSUS POSTERIOR RETROPERITONEAL ADRENALECTOMY

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Purpose: For the past 14 years, we have been performing laparoscopic adrenalectomy via the lateral transabdominal, as well as the posterior retroperitoneal approach. The aim of this study is to describe patient selection criteria for each approach with comparison of perioperative outcomes.

Methods: In patients with smaller tumors, low body mass index (BMI), history of previous abdominal operations, appropriate body habitus and bilateral pathology, we have preferentially performed the posterior approach. Data regarding clinical pathology, tumor size, BMI, estimated blood loss (EBL), operating time (OT), morbidity, mortality and length of stay (LOS) were analyzed retrospectively. Data are expressed as mean +/- SEM.

Results: One hundred seventy-two laparoscopic adrenalectomy procedures were performed in 159 patients between 1994 and 2008. Lateral approach was used in 69 patients (right side: 39%, left side: 55%, bilateral: 6%) and posterior approach in 90 patients (right side: 42%, left side: 48%, bilateral: 10%). The incidence of prior abdominal surgery was higher in the posterior group (26% vs. 19%, NS). Lateral approach was used in 9% (3/34) of aldosteronoma, 38% (9/24) of Cushing's disease/syndrome, 47% (18/38) of non-secreting cortical adenoma, 66% (23/35) of pheochromocytoma, 41% (7/17) of malignant lesions and 73% (8/11) of others. Thirty percent of the bilateral adrenalectomies were performed via lateral and 70% via posterior approach. Two patients in posterior approach were converted to laparoscopic lateral approach and 2 patients in lateral approach converted to open. Overall, patient age and gender were similar between groups. BMI was higher in patients undergoing adrenalectomy via lateral vs. posterior approach (32.4 vs. 28.4, $p=0.005$). Tumor size was larger than 6 cm in 11 (16%) and 1 (1%) of the patients in the lateral and posterior groups, respectively. On univariate analysis, mean OT for lateral and posterior approaches was similar for unilateral cases (157 ± 7 vs. 138 ± 6 minutes, respectively, $p=NS$). This was also true on multivariate analysis when corrected for patient selection factors. EBL was 35 ± 7 ml for lateral vs. 25 ± 6 ml for posterior approach, $p=0.05$. LOS in lateral and posterior approaches was 1 day in 56% vs. 82%, 2 days in 29% vs. 13% and more than 2 days in 15% vs. 5% of the patients, respectively. Two patients in the lateral group died postoperatively due to cardiac and pulmonary

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causes and 2 patients in the posterior group developed temporary neuralgia.

Conclusions: To our knowledge, this is the largest series comparing two different approaches for laparoscopic adrenalectomy. Our study shows that the lateral and posterior techniques have a similar perioperative outcome when patients are selected for each option based on certain criteria.

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11. DOES THE NEED FOR NON-CARDIAC SURGERY DURING VENTRICULAR ASSIST DEVICE (VAD) THERAPY IMPACT CLINICAL OUTCOME?

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Introduction: The role of the ventricular assist device (VAD) in the management of acute heart failure continues to expand. While initially meant to act as a bridge to cardiac transplant, this technology is proving to be of great value in a rapidly growing number of clinical situations. Despite the success of this therapeutic approach, the clinical course for patients requiring non-cardiac surgery (NCS) during VAD therapy is not well described. The study purpose was to identify VAD patients requiring NCS at a busy cardiac center and compare their clinical outcomes to those not requiring NCS.

Methods: Records for all patients undergoing VAD therapy at a single institution from 2000-2007 were reviewed. All patients within this group requiring NCS were identified. Data collected from all subjects included demographics, time on VAD support, survival time from VAD implant to death or end of study, cause of death, and subsequent outcome of VAD therapy (heart transplant or VAD explant). Data collected from NCS subjects included procedure type, complications, and survival. Outcomes were compared between VAD patients who required NCS and those that did not. VAD subjects who had abdominal surgery were compared to those having non-abdominal procedures. Data are reported as mean \pm SD. A p-value of ≤ 0.05 was considered significant.

Results: 142 subjects met inclusion criteria. Age, sex, and type of VAD did not differ between VAD subjects with or without NCS. 25 subjects (17.6%) underwent 27 NCS procedures 199.1 \pm 181 days post VAD implant (Table). There were no perioperative deaths and survival to discharge was 55.6%. The 28-day mortality was 36%. Non-survivors died 73.9 \pm 158 days from NCS. Only one intraoperative complication was noted (inadvertent opening of VAD pocket). Infectious complications occurred in 33%, with sepsis and urinary tract infection being most common. Bleeding requiring transfusion occurred in 48.1%, with 2.5 \pm 1.5 units transfused. Estimated blood loss during NCS was 355 \pm 742mL. The INR at time of NCS was 1.9 \pm 0.8. Subjects with NCS were on VAD support longer than subjects without NCS (244.7 days vs. 86.7 days, $p < 0.01$). Subjects with NCS had no difference from those without NCS in survival to the end of the study (44% vs. 46.2%) or survival time from VAD implant (516.9 days vs. 523.2 days). For those not surviving, cause of death was not different between groups. Patients who required NCS were less likely

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to progress to heart transplant. (34.5% vs. 12%; OR 3.9, CI 1.1-13.7). The indication for abdominal surgery was more likely to be unrelated to VAD support than cases where non-abdominal surgery was required (71.4% vs. 38.5%).

Conclusions: NCS is not uncommon during VAD therapy. Bleeding was the most common complication seen after NCS. Patients requiring NCS are on VAD support longer and are less likely to undergo eventual cardiac transplant. Despite this, NCS appears safe and does not appear to increase mortality in the VAD population.

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12. LAPAROSCOPIC DISTAL PANCREATECTOMY OFFERS STATISTICALLY SIMILAR OPERATIVE TIMES AND POST OPERATIVE MORBIDITY RATES BUT PROVIDES A SHORTER LENGTH STAY

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Background: Laparoscopic distal pancreatectomy (LP) is an emerging modality for managing premalignant pancreatic tail neoplasms. The efficacy of LP has been examined in single and multi-institutional retrospective reviews but not compared prospectively to open distal pancreatectomy (SDP). We present a prospectively collected single institution series comparing LP to SDP.

Methods: We maintain a prospectively accruing database tracking perioperative characteristics for all patients presenting to our tertiary care facility for treatment of pancreatic disease. We queried this database for patients undergoing LP or SDP between January 2003 and May 2008. Preoperative (age, sex, symptoms, tumor size, presence of comorbid diabetes, heart disease and COPD), operative (length of operation, blood loss, pathology, lymph nodes resected) and postoperative (length of stay, perioperative mortality, morbidity including ileus, wound infection, deep venous thrombosis, abdominal abscess, pancreatic fistula) characteristics were compared using standard statistical methods.

	LP	SDP
Tumor Size (CM)	3.78±0.4	4.04±0.04
OR Time (Minutes)	236.00±15.8	255.82±31.7
EBL (mL)	219.4±30.56	723.1±136.5**
% AdenoCA	4%	21%**
Lymph Node No.	5.22±0.05	9.57±1.26**
Morbidity	41%	35%
30 Day Mortality	0.0%	2.0%
Pancreatic Fistula	22.0%	13.0%
LOS	4.0±0.3	8.66±0.7**

**p<0.05

Results: One hundred twelve patients underwent distal pancreatectomy during the study period. Eighty five were SDP. Twenty eight LP were attempted and 27 completed laparoscopically. One LP was converted to an open procedure because of intraoperative

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bleeding and was excluded from study. In comparison to SDP, patients undergoing LP had statistically similar preoperative demographics, disease comorbidities, tumor sizes, lengths of operation, rates of perioperative mortality, postoperative morbidity and pancreatic fistula. Patients undergoing LP were less likely to have ductal adenocarcinoma and had fewer lymph nodes harvested in their resection but had a significantly shorter postoperative length of stay (LOS) and significantly lower estimated blood loss than those undergoing SDP.

Conclusions: LP is a safe, effective modality for managing premalignant pancreatic neoplasms providing a post operative morbidity rate comparable to that for SDP and a substantially shorter postoperative length of stay. LP fails to provide a lymphadenectomy comparable to that of SDP. This may limit the applicability of LP to the treatment of pancreatic adenocarcinoma.

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13. EQUIVALENT OUTCOMES WITH PRIMARY (PTX) AND RETRANSPLANTATION (RETX) IN AFRICAN-AMERICAN (AA) DECEASED-DONOR (DD) RENAL ALLOGRAFT RECIPIENTS (RARS)

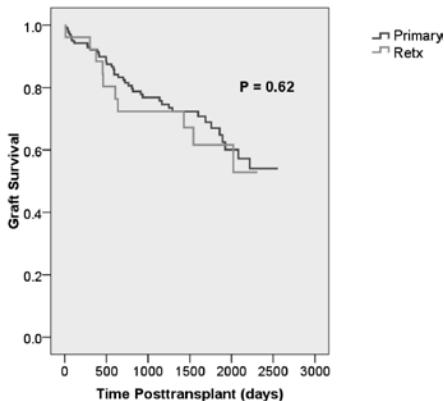
SA Gruber, KL Brown, J M El-Amm, A Singh, K Mehta, E Cincotta, D Sternbauer, JE Losanoff, MS West, MD Doshi

Wayne State University School of Medicine, Detroit, MI

Graft survival following renal Retx has been inferior to that following Ptx transplantation, particularly in the presence of additional risk factors for increased acute rejection (AR) and/or poorer outcome, such as DD source, AA ethnicity, high panel reactive antibody (PRA), hepatitis C virus positivity (HCV+), and delayed graft function (DGF). We hypothesized that this difference in outcomes could be eliminated in AAs with selective intensification of contemporary induction and maintenance immunosuppression in Retx patients (pts). Among 166 AA DD RARS transplanted from 7/01 through 7/07, we compared the outcomes of 26 (16%) receiving a second graft with those of 140 Ptx cases, with minimum follow-up 12 months (mo). All pts received either Thymoglobulin (ATG; 4-11 doses) or 2 doses of an IL-2 receptor antagonist for induction, and were maintained on either tacrolimus (TCL) or sirolimus (initial target trough levels 10-12 ng/ml) + mycophenolate mofetil (1 g BID) \pm prednisone (pred). Comparison of variables between groups was performed using χ^2 or Student's t-test, as appropriate, and Kaplan-Meier analysis for pt and graft survival. The Retx and Ptx groups did not significantly differ with respect to donor race, % extended criteria + cardiac death donors, cold ischemic time, recipient BMI, sex, % HCV+ (19 vs 29), HLA mismatch (4.1 vs 4.0), % on TCL (89 vs 81), DGF (42% vs 48%), or mean follow-up (43.9 ± 24.0 vs 39.4 ± 23.4 mo). However, Retx pts received kidneys from older donors (age 37 vs 31, $p=0.03$), were younger (age 42 vs 50, $p<0.005$), more sensitized (current PRA>10% in 69% vs 7%, $p<0.001$; peak PRA>10% in 96% vs 36%, $p<0.001$), more likely to receive ATG (100% vs 70%, $p=0.001$) and be maintained on pred (85% vs 51%, $p<0.001$), received more doses of ATG (mean 6.4 ± 1.9 [85% >4 doses] vs 5.0 ± 1.7 [38% >4 doses], $p<0.001$), and were less likely diabetic (0% vs 31%, $p<0.001$). There was no difference in overall pt (92% vs 89%, $p=0.57$) or graft (figure; 62% vs 71%, $p=0.62$) survival between Retx and Ptx groups, respectively. 1-year actual pt and graft survival were 100% vs 96% and 92% vs 92%, respectively. 25% of death-censored graft losses were due to noncompliance in both groups, but no deaths or graft losses were due to progression of liver disease in HCV+ pts. There were no significant differences between the Retx and Ptx groups with regard to AR (12% vs 21% at 1 year, 35% vs 30% overall; $p=0.28, 0.64$),

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CMV infection (8% vs 4%; $p=0.47$), BK nephropathy (4% vs 1%; $p=0.18$), new-onset diabetes mellitus (31% vs 27% of those at risk; $p=0.69$), and serum creatinine at 12 mo (1.7 ± 0.9 vs 1.7 ± 0.8 mg/dl; $p=0.92$), respectively. We have demonstrated for the first time that AA RARs can undergo a second, DD transplant with intermediate-term outcomes comparable to that of a Ptx graft, despite the presence of multiple immunologic and nonimmunologic high-risk factors, by extending the course of ATG induction and continuing pred therapy in the vast majority of cases.



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14. MORTALITY FOR INTRA-ABDOMINAL INFECTION IS ASSOCIATED WITH DISEASE RISK RATHER THAN THE SOURCE OF INFECTION

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Background: Intra-abdominal infections (IAIs) are an important cause of mortality and morbidity. Nosocomial IAIs (NIAIs) have been associated with higher mortality than community-acquired IAIs (CIAIs). We hypothesized that intrinsic risk factors were a better predictor of mortality than the type of infection.

Methods: Patients with IAI treated at a single urban academic hospital from June 1999- June 2007 were reviewed. Data collected included co-morbidities, preoperative and post-operative day 7 (POD-7) physiological variables, type of intervention performed (operation vs. percutaneous drainage), culture results, antibiotic treatment, and post-operative complications. Charlson scores and multiple organ dysfunction (MOD) scores were calculated at admission and POD-7.

Results: There were 452 patients identified; 236 (52.2%) had CIAI and 216 (47.8%) had NIAI. The mean age was 51.3 ± 17.9 and 52 % were males. The MOD score was 1.78 ± 0.12 and Charlson index was 1.42 ± 0.09 . The most common sources of infection were appendix (129, 29%), followed by colon (111, 24.6%), post operative (103, 23 %), and small bowel (62, 14 %). Patients with NIAI had longer ICU and hospital stays compared to CIAI ($p < 0.002$). Mortality was higher in patients with NIAI ($p = 0.03$). Univariate analysis identified age > 65 ($p = 0.001$), history of peripheral vascular disease ($p = 0.002$), history of solid tumor with metastasis ($p = 0.002$), Charlson index score > 2 ($p = 0.011$), MODS score > 2 ($p = 0.014$), creatinine > 1.5 ($p = 0.001$), bicarbonate < 20 ($p = 0.02$) and PaO₂ < 80 mm Hg ($p = 0.028$) as associated with increased mortality. Logistic regression analysis demonstrated preoperative creatinine > 1.5 mg/dL ($p = 0.013$, Odds ratio 11.0, 95%CI- 1.64-74.6), PaO₂ < 80 mmHg ($p = 0.03$, Odds ratio 8.6, 95%CI-1.23-59.14), Charlson index score > 2 ($p = 0.05$, Odds ratio 0.1, 95%CI 0.02-1.00) were independent risk factors for mortality. Neither univariate nor regression analysis demonstrated an association between NIAI and the risk of death.

Conclusion: These results suggest that although NIAI is associated with a higher risk of mortality than CIAI, co-morbid diseases (Charlson score > 2 , acute renal failure and metastatic disease) are better predictors of mortality risk and aggressive intervention should be targeted towards improving these risk factors when possible.

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15. PRIMARY REPAIR OF CIVILIAN COLON INJURIES IS SAFE IN THE DAMAGE CONTROL SETTING

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Background: Although the safety of primary repair/anastomosis for civilian colon injuries after standard laparotomy (SL) has been established, recent civilian and military reports have questioned the advisability of this technique in the patient requiring damage control laparotomy (DL). We hypothesized that even in the high risk DL group, primary repair could be safely utilized after patient stabilization, and that the open abdomen would allow for close inspection of potential leaks while timely diversion could still be applied.

Methods: All patients admitted to our level 1 trauma center with a colon injury over a 7 year period were retrospectively reviewed from a prospectively collected database. Patients were categorized as having undergone either SL or DL at initial operation. Primary variables of interest were: injury patterns, method of primary repair (suture repair, resection and primary anastomosis, resection and delayed anastomosis), diversion techniques (planned diversion or diversion for anastomotic dehiscence), and colon related morbidity and mortality. High risk status in the DL group was identified by physiologic variables: mean ISS, red blood cell transfusions (RBC), intensive care unit (ICU) length of stay and ventilator days.

Results: During the study period, 308 patients had colonic wounds identified at laparotomy. 280(91%) patients underwent SL, of which 277 (98.9%) had primary colonic repair/anastomosis. One patient in the SL group required diversion for subsequent leak (0.03%) and two patients had planned diversion (0.06%) In contrast, 28 hemodynamically unstable patients required DL. Mean \pm SD indices of injury severity in this group included: ISS=36.2 \pm 15.8, RBC=28.7 \pm 25.4 units, ventilator days= 20.1 \pm 16.3, ICU length of stay=29.5 \pm 21.6 days. In the DL group, 25(89.2%) patients had attempted primary repair/anastomosis and 21 (84%) had bowel continuity successfully re-established in 2.6 \pm 2 days. 4 patients (14.2%) in this group developed colon related complications which were successfully treated with subsequent diversion prior to definitive abdominal closure. 3 patients (10.7%) had planned diversion for injuries which were considered at high risk for leak at initial or subsequent re-exploration. There were no colon related deaths in either group.

Conclusion: Primary repair of colon injuries appears safe in the damage control setting after resuscitation with restoration of physiologic indices. Although it is associated with a higher leak

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rate than standard laparotomy, the open abdomen affords careful inspection of abdominal contents at re-exploration to identify patients who require subsequent diversion.

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16. A SINGLE INSTITUTIONAL EXPERIENCE OF FACTORS AFFECTING SUCCESSFUL IDENTIFICATION OF SENTINEL LYMPH NODE IN BREAST CANCER PATIENTS

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Background: Sentinel lymph node biopsy (SLNB) using radiocolloid and/or blue dye has replaced routine axillary lymph node dissection for initial axillary staging in clinically node-negative breast cancer patients. We hypothesize that certain clinical parameters may be associated with failure to identify a SLN including body mass index (BMI), identification of nodes by lymphoscintigraphy, experience of the team and the presence of axillary metastasis.

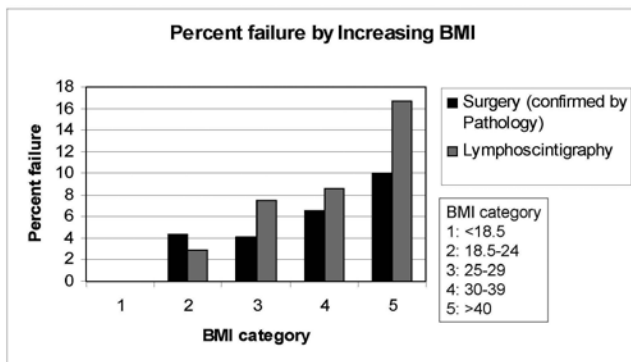
Methods: We have performed an IRB-approved, retrospective analysis of 402 consecutive breast cancer patients who underwent SLNB from 2000 to 2007 at the University of Iowa. Particular expertise has been developed for patients with obesity (BMI > 30) or morbid obesity (BMI > 40). Clinical parameters collected include, patient age, BMI, year of surgery, results of lymphoscintigraphy, the use of blue dye and pathological findings.

Results: Of 402 patients, 399 had lymphoscintigraphy performed at the time of injection of radiocolloid. No significant differences in the ability to identify a SLN were found with respect to patient age, histologic type of breast cancer or whether the SLN was involved with metastasis. The overall failure rate for identification of a SLN on lymphoscintigraphy was 6.7% and for identification at surgery was 5%; however, there was a significant decrease in the failure rate when comparing the first 100 patients with the last 100 patients for both lymphoscintigraphy (13/100 vs. 1/102, $p < 0.001$) and surgery (18/100 vs. 0/102, $p < 0.001$). Of the 399 patients who had lymphoscintigraphy, 372 patients had at least one SLN identified by lymphoscintigraphy and of these, 8 patients did not have a SLN identified at surgery (8/372, 2.2%). Of the 27 patients with negative lymphoscintigraphy results, 11 patients (11/27, 41%) had no SLN identified at surgery. Successful imaging was predictive of successful SLNB, $p < 0.0001$. Patients with a BMI > 40 had a significantly higher failure to identify a SLN by lymphoscintigraphy (5 of 29 patients) compared with patients with a normal BMI of 18.5-25 (4 of 140 patients), $p = 0.008$. There was a trend in failure to identify a SLN during surgery with obesity.

Conclusions: The successful identification of a SLN in breast cancer is influenced by the patient's BMI, institutional experience and successful imaging by lymphoscintigraphy. After gaining appropriate experience (100 cases), the probability of successfully identifying a

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SLN at the time of surgery in a patient with BMI < 40 who images on lymphoscintigraphy is 99.7%.



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17. THE PULMONARY EMBOLISM RISK SCORE (PERS) SYSTEM REDUCES THE INCIDENCE AND MORTALITY OF PULMONARY EMBOLISM AFTER GASTRIC BYPASS

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Pulmonary embolism (PE) is a leading cause of death after gastric bypass and current recommendations for prophylaxis may be inadequate.

Methods: We performed a retrospective review of our first 1341 patients (controls) who underwent gastric bypass from June, 2000 through December, 2004. The factors which may have contributed to PE were identified and weighted to create the PERS system (Table). We postulated that more aggressive prophylaxis in higher risk groups might have prevented the development of PE. Therefore, we prospectively calculated the PERS in each of 1652 subsequent gastric bypass patients of our group from January 2005 through July 2008 (study group), and determined 3 levels of risk based on total points. Standard risk patients (PERS < 4) were ambulated 2 hours after surgery, had application of intermittent compression devices, and received subcutaneous heparin perioperative. Intermediate risk patients (PERS = 4) received standard prophylaxis and 3 weeks of post hospital discharge heparin. High risk patients (PERS > 4) had post discharge heparin and a pre operative vena cava filter (VCF).

Condition	Points
Immobility	1
ICU stay	1 point for each day
Stasis changes of lower extremities	1
Body Mass Index	>40, 1 >50, 2 >60, 3
Male gender	2
Obstructive sleep apnea	2
Smoking	1
History of PE	4
History of DVT, phlebitis, or + Doppler	3
Fatty liver	1
Weight greater than diagnostic equipment needed to diagnose PE	2
Clotting factor abnormality (Factor V mutation, etc)	Vena cava filter plus lifelong (?) warfarin

Results: The 0.36% incidence of PE (6 patients) in the study group was significantly less ($p < 0.05$) than the 1.0% incidence (13 patients) in the controls. Two PE in the study group occurred in patients who did not complete the post discharge heparin protocol. Furthermore,

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3 of 189 males in the control group died of PE, while there were no deaths from PE in 271 males in the study group, $p < 0.05$. There were no bleeding or thrombotic complications from placement of the VCF. Two patients (0.1 %) developed heparin induced thrombocytopenia.

Conclusions: The PERS is an effective scoring system for determining pre operatively the level of risk for post operative PE in gastric bypass patients. Basing perioperative PE prophylaxis on the level of risk reduces the incidence and mortality of PE and consumes resources judiciously. The PERS system may be appropriate for general surgery patients as well.

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18. INITIAL EXPERIENCE TRANSPLANTING KIDNEYS FROM DECEASED DONORS WITH TERMINAL ACUTE RENAL FAILURE

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Introduction: The disparity between organ supply and demand continues to widen in spite of increased utilization of “marginal” donors. However, transplantation of kidneys from deceased donors with terminal acute renal failure (ARF) remains relatively uncommon.

Methods: ARF donor kidneys may be defined as either a doubling in donor admission serum creatinine (SCr) or a terminal SCr level >2.0 mg/dl. We retrospectively reviewed outcomes in patients transplanted with an ARF donor kidney at our institution.

Results: Between January 2007 and August 2008, we transplanted 22 kidneys from 16 ARF donors (14 male, 2 female), including both kidneys from 6 donors. The deceased donor group included 18 kidneys from standard criteria donors, 2 from expanded criteria donors, and 2 from a single donation after cardiac death donor. All but 4 of the kidneys were imported from other donor service areas, and virtually all of the kidneys were turned down by multiple transplant centers because of impaired renal function. Mean donor age was 34 years (range 20-65), mean donor weight was 92.8 kg, and causes of brain injury included trauma (7 donors), anoxia (5 donors) and stroke (4 donors). Mean admission and terminal donor SCr levels were 1.4 mg/dL and 3.3 mg/dL, respectively. Mean estimated donor creatinine clearance was 41 mL/min. All but 2 kidneys were placed on pump preservation and the mean cold ischemia time (CIT) was 27.6 hours (range 11-41). The recipient group included 15 men and 7 women with a mean age of 50.4 years (range 27-70), a mean weight of 83 kg, and a mean waiting time of 22.6 months (range 1-54). Five patients (23%) were highly sensitized (peak panel reactive antibody level >50%). All patients received antibody induction (17 alemtuzumab, 3 Thymoglobulin®, 2 basiliximab) in combination with tacrolimus, MMF, and tapered steroids (50% had early steroid withdrawal). Patient and graft survival rates are both 100% with a mean follow-up of 10 months. Delayed graft function (DGF), defined as the need for dialysis in the first week, occurred in 8 patients (36%). Mean initial length of stay was 6.1 days (range 4-11), and 7 patients (32%) had one or more readmissions with a cohort average of 0.55 readmissions/patient. Three patients (14%) had acute rejection episodes (all treated successfully with Thymoglobulin®). Only one patient required re-operation (4.5%, for a ureteral stricture). A total of 8 patients (36%) developed infections, including 4 urinary tract infections, 2 CMV infections, 1 pneumonia, and 1 infected lymphocele. Mean 1, 6, and 12

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month recipient SCr levels and glomerular filtration rates (GFR) were 1.9 mg/dL (43.7 mL/min), 1.6 mg/dL (50.5 mL/min) and 1.5 mg/dL (51.9 mL/min), respectively.

Conclusion: Kidneys from deceased donors with terminal ARF transplanted into appropriately selected recipients have excellent short-term outcomes and represent another potential method to safely expand the donor pool.

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19. ROUTINE BILATERAL CENTRAL LYMPH NODE CLEARANCE FOR PAPILLARY THYROID CANCER

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Summary: There is currently disagreement regarding the management of central lymph nodes in patients with papillary thyroid cancer, with recommendations ranging among selective dissection, unilateral dissection, and routine bilateral dissection. We hypothesize that bilateral central lymph node dissection for papillary thyroid cancer is safe and oncologically justified.

Methods: Retrospective, Institutional Review Board approved, database review of all patients treated for papillary cancer at a 636 bed tertiary referral center and university affiliated hospital between January 2000 and May 2008. Three hundred three patients were identified in our hospital tumor registry as having papillary thyroid cancer with operative procedures during this time period. Records were analyzed for tumor characteristics (size, lymph node harvest), injury to the recurrent laryngeal nerve, tumor recurrence, and need for further operative procedures.

Results: Of the 303 patients, 264 received total thyroidectomy, and 39 received a lesser operation. Bilateral central lymph node dissection was performed in 163, unilateral central lymph node dissection in 16, and no central lymph node dissection in 124. The central lymph nodes were positive in 84 patients (46.9%); and 43 patients (26.4%) that had bilateral dissection had lymph nodes positive in the contralateral compartment. Of the 598 recurrent laryngeal nerves at risk, 5 were sacrificed oncologically, 14 temporary injuries occurred, and 6 permanent injuries resulted (1 %). Of the 10 documented cancer recurrences, 4 were in the central neck, and all occurred in patients who did not have central lymph node dissections. The risk of recurrent laryngeal nerve injury was not significantly greater with bilateral lymph node dissection when compared to unilateral or no lymph node dissection ($p=0.27$), and those with bilateral lymph node dissection had statistically larger tumors ($p<0.001$), 1.5 cm vs 0.85 cm.

Conclusions: Lymph node metastases are present in both the ipsilateral and contralateral central lymph node basins in a significant percentage of patients with papillary thyroid cancer. Routine bilateral central lymph node dissection in patients with papillary thyroid cancer has the potential to clear metastatic disease without increasing the risk of recurrent laryngeal nerve injury.

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20. LYMPH NODE EVALUATION IS ASSOCIATED WITH IMPROVED SURVIVAL FOLLOWING SURGERY FOR GALLBLADDER CANCER

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Introduction: Current National Comprehensive Cancer Network guidelines recommend radical cholecystectomy including hepatic resection and portal lymph node (LN) dissection for patients with early-stage gallbladder (GB) cancer. We sought to determine the survival benefit conferred by adequate LN evaluation.

Methods: We used the Surveillance, Epidemiology and End Results (SEER) tumor registry to identify patients who had surgery for GB cancer between 1988 and 2004. Patients were classified by stage of disease, surgical procedure performed (cholecystectomy alone or radical resection), number of LN evaluated (0,1,>1) and receipt of radiation (RT). We included patients with T1B, T2 and T3 tumors who were LN positive or negative. Patients with T4 tumors and those with metastatic disease were excluded. Multivariate analysis included adjustment for age, race, gender, tumor grade, stage, surgery performed, receipt of RT and tumor registry.

Results: We identified 4631 patients who underwent surgery for stage 1-2B GB (including T1B-T3, LN positive or negative) cancer between 1988 and 2004. Of 4631 patients, 9.6% (443) had radical resection while 90.4% (4188) had cholecystectomy alone. Among patients undergoing radical resection, 56% had LNs evaluated as compared with 28% of patients following cholecystectomy alone. For patients with T1B and T2 tumors who underwent radical surgery, pathologic evaluation of at least one LN was associated with a significant improvement in median overall survival (OS) as compared with those who had no LN evaluated (123 months v. 22 months, $p < 0.0001$). Radical surgery with no LN evaluation provided similar OS as compared with cholecystectomy alone (22 months v. 23 months, $p = NS$). For patients with T3 tumors, radical resection including pathologic evaluation of at least one LN was also associated with significantly improved OS compared to radical surgery with no LN evaluation (12 months v. 7 months, $p = 0.0014$). Again, individuals who had radical surgery without LN evaluation had similar OS to those who had cholecystectomy alone (7 months v. 6 months, $p = NS$). Individuals who had radical surgery with LN evaluation were more likely to receive RT than those who had radical surgery without LN evaluation (33.1% v. 19.1%, $p = 0.002$). However, in multivariate analysis (including adjustment for RT), LN evaluation was still associated with a significant reduction in mortality as compared

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with no LN evaluated (HR=0.611, 95%CI = 0.484, 0.770). The pathologic evaluation of additional LN (>1) did not provide any additional benefit compared to evaluation of a single node (HR=0.795, 95%CI=0.571,1.107). Radical resection alone (without LN evaluation) did not provide any benefit over cholecystectomy alone (HR=1.098, 95%CI=0.971,1.241).

Conclusion: LN evaluation is a critical component of radical surgery for GB cancer. In the absence of LN evaluation, radical resection provides no benefit over cholecystectomy alone.

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21. THE MOLECULAR PATHOGENESIS OF BARRETT'S ESOPHAGUS: BILE ACID INHIBITS NOTCH SIGNALING IN HUMAN ESOPHAGEAL ADENOCARCINOMA CELLS.

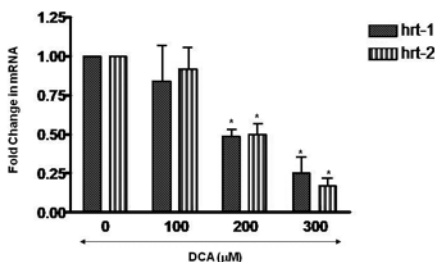
D Morrow , NE Avissar , EM Redmond , L Toia BS, TJ Watson , C Jones , DP Raymond , JH Peters

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Introduction: The molecular events in the pathogenesis of Barrett's esophagus are largely unknown, although they likely involve altered stimulation of epithelial stem cell differentiation by luminal content. Two key facts are known, first, that luminal bile salts play a role in the development of Barrett's and second, that Notch signaling is fundamental to the development and maintenance of intestinal epithelium. As such, we tested the hypothesis that bile acid exposure alters the Notch signaling pathway using an in vitro human esophageal adenocarcinoma cell model.

Methods: Human esophageal adenocarcinoma cells (OE33) were exposed (0-8 h) to increasing concentrations of deoxycholic acid (DCA) (100-300 μ M). Levels of mRNA for Notch receptors 1, 3 and 4 and Notch target genes *hrt-1* and *-2* and *hes-1* and *hes-5* were measured by quantitative real-time PCR. Notch 1 and 3 intercellular domain (NCID 1 and 3) protein expression was measured by Western blot analysis. Experiments were conducted in triplicates. Values are expressed as mean \pm SEM.

Bile Acid (8h) Inhibits Notch Target Gene mRNA Expression in OE33 Cells



N=3 $p < 0.05$

Results: DCA decreased Notch receptor mRNA and protein expression in a dose and time-dependent manner. mRNA expression for Notch 1, 2 and 4, decreased markedly (50.0 \pm 13.0%, 84.0 \pm 6.0%

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and 74.0+/-14.0% respectively), after 8h in the presence of 300um DCA. Levels of NCID 1 and 3 were also reduced by 50.0+/-11.0%, and 70.0+/-10.0% respectively with 300uM DCA after 8h. Similar decreases were observed for Notch target gene mRNA expression following treatment with DCA, with a maximum decrease of 75.0+/-11.0% and 83.0+/-5.0% in hrt-1 and -2 and a decrease of 73.0+/-12% and 75.0+/-16.4% in hes1 and 5 mRNA expression observed after 8h with 300um. All changes were significant to $p < 0.05$.

Conclusion: This is the first evidence linking bile acids and Notch signaling to the pathogenesis of Barrett's esophagus. As it has been shown that Notch inhibition in intestinal precursor cells causes development of goblet cells, these results suggest that Notch signaling may be one of the key processes contributing to the pathology of the goblet rich intestinal metaplasia characterizing BE.

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22. COMPARISON OF OUTCOMES AFTER HAND-SEWN VERSUS STAPLED ILEAL POUCH-ANAL ANASTOMOSIS IN 3109 PATIENTS

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The aim of this study is to compare short and long-term outcomes after primary hand-sewn ileal pouch-anal anastomosis (IPAA) with those after stapled IPAA.

Between 1983 and 2007, patients who underwent a primary ileal pouch-anal anastomosis at the Cleveland Clinic and had complete data in our Institutional Review Board approved pelvic pouch database were included in this study. Differences between Group A (patients with hand-sewn IPAA) and Group B (those with stapled IPAA) for pre and perioperative factors, post operative complications, long-term functional outcomes and quality of life (QOL) over 20 years were investigated.

Of 3382 patients undergoing a primary IPAA, 3109 with complete data comprised the study group with a median follow up of 7.1 years (range, 0.1-24). Mean age at the time of surgery was 37.9 ± 13.2 years, while 1741 patients (56 %) were male. Group A (n=474) and Group B (n=2635) had similar age (37.1 ± 12.3 vs. 38.1 ± 13.3 , $p = 0.28$), gender (56.5 % vs. 55.9% male, $p = 0.8$), albumin level (4.1 ± 0.5 vs. 4.1 ± 0.5 gm/dl, $p = 0.74$), rate of prior colectomy (n=131, 27.6% vs. n=727, 27.6 %, $P = 0.98$), and use of steroids (n=196, 45.4% vs. n=1240, 49.7 %, $p = 0.1$). Group A had higher number of patients with ileostomy (n=468, 98.7 % vs. n=2270, 86.1 %, $p = 0.001$), and longer length of hospital stay (9.9 ± 5.13 vs. 7.4 ± 3.9 , $p = <0.001$) while patients in Group B had greater body mass index (24.4 ± 4.6 vs. 25.6 ± 5.2 , $p = <0.001$), and more J-pouch (65.7 % vs. 91.9 %, $p = <0.001$). Development of anastomotic separation (n=35, 7.4 % vs. n=144, 5.5 %, $p = 0.1$), pelvic sepsis (n=47, 9.9% vs. 218, 8.3%, $p = 0.24$), and pouchitis (n=196, 41.4 % vs. n=1055, 40 %, $p = 0.59$) were similar between groups whereas postoperative hemorrhage (n=33, 7 % vs. n=105, 4 %, $p = 0.004$), anastomotic stricture (n=103, 21.7 %, n=422, 16 %, $p = 0.002$), pouch-related fistula (n=57, 12 %, n=235, 8.9 %, $p = 0.033$), and pouch failure (n=54, 11.4 %, n=106, 4 %, $p = <0.001$) were significantly higher in Group A. As for comparison of most recent functional outcomes and QOL data adjusted for follow-up time, bowel frequency (7.58 ± 3.5 vs. $7.62 \pm$, $p = 0.74$), rate of urgency were similar between groups (8.2 % vs. 9.4 %, $p = 0.71$), while a significantly higher proportion of patients in Group A described incontinence (5.8% vs. 2.2 %, $p = <0.001$), seepage ($P = <0.001$), pad usage ($P = <0.001$), dietary, social, and work restrictions ($P = <0.001$, $p = <0.001$, $p = 0.025$ respectively). Quality of life ($P = <0.001$), health ($P = 0.019$), happiness

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with surgery ($P= 0.001$) parameters and Cleveland Global Quality of Life score (0.78 ± 0.19 vs. 0.79 ± 0.18 , $p= 0.018$) were significantly higher in Group B.

In conclusion, stapled IPAA seems to be safer and provide better short, long-term outcomes, and QOL than hand-sewn IPAA.

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23. PERFORATED APPENDICITIS- IS EARLY LAPAROSCOPIC APPENDECTOMY APPROPRIATE?

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Introduction: The advantages of Laparoscopic Appendectomy (LA) in non-perforated appendicitis have been reported; however, in perforated appendicitis high LA conversion rates and a higher incidence of postoperative intra-abdominal abscess (IAA) vs. open appendectomy (OA) have been reported challenging a routine laparoscopic approach. In addition, for patients with peri-appendiceal abscess on preoperative CT imaging a non-operative approach with percutaneous drainage has been proposed. The aim of this study is to determine the role and safety of early laparoscopic appendectomy (LA) in adults with perforated appendicitis.

Methods: From 2006-2008, the 725 records of all appendectomy patients (16 years or greater) were retrospectively reviewed. Perforated appendicitis was confirmed by the operative findings and pathology report. Age, Gender, Length of stay (LOS), Post-operative IAA, Post-operative wound infection, and Total days of antibiotic therapy were determined. All patients were followed as outpatients for identification of post-discharge infections. Results were compared by Analysis of variance and Fisher's LSD test with significance at $p < 0.05$.

Results: One hundred seventy patients ($n=170$) with perforated appendicitis were identified in the 725 appendectomies. (23.5% incidence of perforation) Preoperative CT imaging was obtained in 90% (154/170 patients); however, only 51/154 (33%) CT scans were interpreted as perforated appendicitis preoperatively. Preoperative CT scan interpretation did not correlate with conversion during LA. The conversion rate from LA to OA was 17.5% (27/170 patients). The initial approach was open in 9.4% (16/170 patients). Hospital LOS was significantly lower in the LA group (3.5 days) compared to converted group (CA 7.1 days) and the OA group (6.9 days) ($p < 0.05$), but was similar in the CA compared to OA groups. The incidence of postoperative IAA was not significantly different between the 3 groups. (LA 11.8%, CA 11.1%, and OA 12.5%) The incidence of wound infection for the LA group (3.2%) was significantly lower than the CA (11.1%) and the OA (14.0%) group ($p < 0.05$) but was not different between the CA and OA groups. The total antibiotic duration of therapy was significantly lower in the LA group by 2.9 and 4.9 days respectively compared to CA and OA ($p < 0.01$) and was 2.0 days lower in the CA compared to the OA group.

Conclusions: Our results demonstrate that early LA for perforated appendicitis reduces LOS, duration of antibiotic therapy, and superficial wound infection rate compared to open or converted

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appendectomy. In addition, early LA does not increase postoperative IAA compared to CA or OA. Preoperative CT imaging is not sensitive for determining perforated appendicitis that results in conversion from LA to OA. We conclude that perforated appendicitis can be managed by early laparoscopic appendectomy safely in over 80% of patients with improved outcomes compared to open appendectomy.

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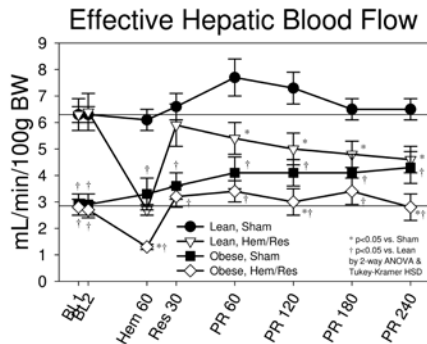
24. OBESITY-INDUCED HEPATIC HYPOPERFUSION PRIMES FOR HEPATIC DYSFUNCTION FOLLOWING RESUSCITATED HEMORRHAGIC SHOCK

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Background: Obese (compared to non-obese) blunt trauma patients (BMI > 30) are at increased risk for organ dysfunction, lengthy hospital stay, infection, prolonged mechanical ventilation and mortality. Obesity and non-alcoholic steatohepatitis (NASH) produce a low grade systemic inflammatory response (SIRS) with compromised hepatic blood flow, which increases with body mass index. We hypothesized that obesity further aggravates liver dysfunction by reduction in blood flow following resuscitated hemorrhagic shock (HEM).

Study Design: Clinical Arm: Retrospective study of obese versus non-obese trauma patients admitted to intensive care unit (ICU), evaluated for clinical outcomes stratified by injury severity score (ISS). Experimental Arm: Age-matched Zucker rats (Obese, 400-500g & Lean, 200-280g) were randomly assigned to four groups (n=10/group): 1) Lean, Sham; 2) Lean, HEM and resuscitation (HEM/RES); 3) Obese, Sham; and 4) Obese, HEM/RES. HEM was 40% mean arterial pressure (MAP) for 60 minutes; RES was return of shed blood + 2 volumes of saline. Hepatic blood flow (HBF) using galactose clearance, liver enzymes and inflammatory cytokines were measured over 4 hours after completion of RES.



Results: Obese trauma patients (n=45 obese vs. 891 non-obese) with relatively minor injuries (ISS<10) had increased complications (40.0% vs. 18.5%) and length of stay days (ICU: 7.4 vs. 2.0; hospital:

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12.5 vs. 5.8). Obese rats had increased MAP, heart rate, glucose, and creatinine at baseline (BL), required less blood withdrawal (mL/gram) to maintain 40% MAP, and RES did not restore BL MAP. As seen in figure, obese rats had decreased HBF at BL and during HEM/RES, which persisted 4 hours post RES. ALT and BUN were elevated compared to Lean, HEM/RES at 4 hours post-RES. Pro-inflammatory cytokines were elevated post-RES.

Conclusions: Our data indicate that obesity alone significantly contributes to trauma outcomes. Our experimental observations suggest that obesity compromises vascular control and impairs hepatic blood flow following HEM/RES resulting in a greater hepatic injury. The pro-inflammatory state of NASH seen in obesity appears to prime the liver for a more intense ischemic insult following trauma.

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25. CONTEMPORANEOUS MANAGEMENT OF ESOPHAGEAL PERFORATION

G Abbas, MJ Schuchert, BL Pettiford, JP Landreneau, TA Zikos, JR Landreneau, AM Oostdyk, A Pennathur, A Kilic, JR Landreneau, JD Luketich, RJ Landreneau.

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Purpose: Esophageal perforation is an important therapeutic challenge. Little consensus currently exists regarding the optimal management strategies for this heterogeneous group of patients. In the current analysis, we compared the clinical presentation and therapeutic interventions employed in patients diagnosed with esophageal perforation, with particular attention to the decision-making regarding operative and non-operative treatment. We hypothesized that patients with minimal mediastinal contamination at the time of diagnosis could be managed successfully with non-operative treatment modalities.

Methods: A retrospective review of 119 consecutive patients with esophageal perforation from 1998-2008 was performed. Demographics, cause of perforation, clinical presentation, diagnostic methods and management results were evaluated. The decision to operate was based upon the extent of mediastinal contamination and systemic sepsis rather than cause of perforation. Statistical analysis included t-tests and two-sample proportion tests.

Results: Spontaneous (Boerhaave's) perforation occurred in 44 (37%) patients. Perforation related to endoscopic procedures (n=70, 59%) and foreign body ingestion (n=5, 4%) constituted the remaining patients. Median time to diagnosis among all patients was 12 hours (1 to 120 hrs). Nine patients (13%) required esophagectomy after instrumental perforation in the setting of obstructive pathology (5 cancers; 4 peptic strictures). The remaining 48 patients with instrumental perforations undergoing surgery were managed with repair and drainage. All 34 patients undergoing surgery for spontaneous perforations were treated with esophageal repair. Overall mortality was 12%, with intrathoracic perforations having 18% mortality, cervical (8%) and GE junction (3%). Patients undergoing non-surgical therapy had a shorter hospitalization (13 vs. 24 days), fewer complications (36% vs. 62%) and less mortality (4% vs. 14%) compared to those undergoing surgical intervention.

Conclusions: An approach to esophageal perforation based upon injury severity, degree of mediastinal and pleural contamination is of paramount importance. Instrumental perforation associated with obstructive lesions may require esophagectomy. Primary repair is suggested for spontaneous perforations requiring surgery. Though surgical management remains the standard in the majority of patients

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with esophageal perforation, in selected patients non-operative management can be successfully implemented. With improvements in CT diagnostics and image-guided percutaneous interventions, selected patients with both instrumental perforation and Boerhaave's syndrome can be managed conservatively with a low morbidity and mortality if favorable radiographic and clinical characteristics are present.

TABLE: COMPARISON OF SURGICAL AND NON-SURGICAL MANAGEMENT OF ESOPHAGEAL PERFORATION		
	Surgical (n=91)	Non-surgical (n=28)
Age	65.3	56.3
Instrumentation (n=75)	57 (76 %)	18 (24 %)
Spontaneous/Boerhaave's (n=44)	34 (77%)	10 (23%)
Cervical (n=26)	15 (58%)	11 (42%)
Thoracic (n=61)	49 (80%)	12(20%)
GE Junction (n=32)	27 (84%)	5 (16%)
Length of Stay (days)	24.0	13.0*
Complication (%)	61.5	35.7*
Mortality (%)	14.3	3.6*

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26. LAPAROSCOPIC APPENDECTOMY: SIGNIFICANT REDUCTION IN POST-OPERATIVE ABDOMINAL AND PELVIC ABSCESS FORMATION WITH STERILE WATER IRRIGATION.

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University of Illinois College of Medicine at Peoria, Children's Hospital of Illinois, Peoria, IL

Introduction: Laparoscopic appendectomy (LA) has become the preferred method of treating appendicitis. Our earlier report and others demonstrated a higher rate of abdominal and pelvic abscess (APA) formation following LA compared to traditional open appendectomy. We hypothesized that irrigation with sterile water might decrease the rate of abscess formation post LA.

Methods: An IRB approved retrospective analysis of hospital and outpatient clinical records of all 324 children who underwent LA from May 1999 to January 2008. All cases were performed at a children's hospital by pediatric surgeons and general surgery residents. Irrespective of the extent of disease, over 98% of cases were completed laparoscopically. Data was analyzed with SPSS 15.0 for Windows. Our first 63 LA cases were performed from May 1999 to December 2002 and form the control group for this report (Group I). The study group of 191 patients had LAs performed from July 2004 to January 2008 (Group II). All of the patients in the study group had documented irrigation with sterile water. The aim was to clear all blood, purulent fluid and particulate matter using adequate sterile water irrigation to achieve this endpoint. Cases between August 2003 and May 2004 (n=69) were not included in the analysis as they represent a transition period of change of practice that lacked reliable irrigation data.

Results: There was no statistically significant difference between groups I and II in terms of gender, age, or rates of acutely inflamed, perforated or normal appendices. Surgery duration was 60.9 minutes for Group I and significantly shorter for Group II – 48.3 minutes ($p = 0.001$). Conversion rate to open appendectomy was 4.8% in Group I and 2.1% in Group II ($p = 0.37$). The rate of APA formation with saline irrigation was 9.5% in Group I; this decreased to 2.62% in Group II with sterile water irrigation ($p < 0.02$). There was no significant difference in the rate of wound infection, duration of post-operative ileus or post-operative length of stay between the groups. The total complication rate was significantly lower in Group II (see table for details).

Conclusion: Sterile water irrigation significantly reduces the incidence of post-operative abdominal and pelvic abscess formation following

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laparoscopic appendectomy. This was achieved without any increase in the duration of surgery or other complications.

	Group I	Group II	p - value
n	63	191	
Age in years (SD)	10.54 (32)	12.02 (6.8)	0.1
Surgery duration in minutes (SD)	60.9 (21.8)	48.3 (17.2)	0.001 *
Conversion rate - %	4.8	2.1	0.37
Acute - %	55.6	68.1	0.09
Ruptured - %	25.4	20.9	0.49
Normal - %	19	11	0.13
Wound infections - %	6.3	5.8	0.77
Abdominal or Pelvic abscess rate - %	9.5	2.6	0.03 *

SD : Standard deviation

* : statistically significant

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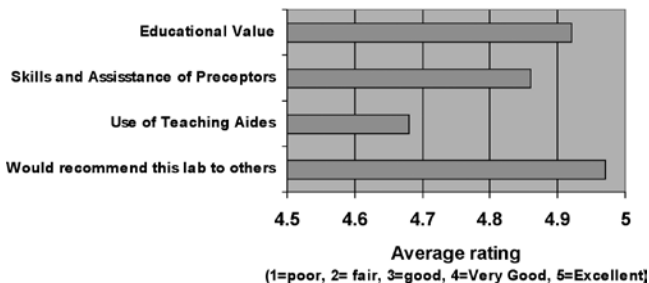
27. BACK TO BASICS: USE OF FRESH CADAVERS IN VASCULAR SURGERY TRAINING

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Purpose: Surgical trainees face many obstacles in learning basic surgical anatomy and technique. Pressure for quicker operative times, introduction of an eighty-hour work week, rising numbers of endovascular procedures replacing open surgery, increasingly ill patients, and the presence of fellowship training programs can limit resident exposure to not only surgical anatomy and skills, but to attending faculty as well. Our goal was to design a vascular exposures course using fresh frozen cadavers to promote dissection and suturing skills, develop a three-dimensional platform to maximize visual-spatially the two dimensional world of endovascular therapy, foster interaction with Vascular Surgery faculty, promote teamwork between residents to accomplish course goals and measure the satisfaction of the residents with the course.

Methods: A pilot program was created with fresh frozen cadavers used to teach basic vascular surgical anatomy and operating skills to junior and mid-level general surgery residents. The course was organized by the Department of General Surgery, the Division of Vascular Surgery with a primer created by general surgery residents and fellows and taught by Vascular Surgery staff. Trainees completed a general questionnaire and evaluation at the completion of the course utilizing the following scale: 1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent.

Cadaver Lab Resident Satisfaction Survey



Results: Forty-five general surgery residents participated in six independent sessions offered over a twenty-four month period. Data from two questionnaires were entered into a spreadsheet and analyzed. In the informal questionnaire, 45 of 45 residents found the course

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met their expectations. Fresh frozen cadaver material was found optimal by all participants. Forty-four of 45 (97.8%) residents rated the educational value of the course with a perfect score (5 = Excellent) and would recommend the course to others. The most common comment was how the teaching of the course by surgical attendings and fellows made the course relevant and a team-building experience.

Conclusions: Fresh frozen cadavers provide an excellent opportunity to teach basic open vascular surgery principles of dissection and suturing to general surgery residents while fostering positive interaction with vascular staff and promoting interest in vascular surgery. Sharing cadavers between multiple disciplines in the Department of Surgery can help with cost-containment.

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28. POC RAPID THROMBOELASTOGRAPHY IDENTIFIES HYPERCOAGULABILITY AND PREDICTS THROMBOEMBOLIC EVENTS IN SURGICAL PATIENTS

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Background: Despite routine practice of thromboprophylaxis, the frequency of adverse thromboembolic events (TE) in surgical patients remains a substantial problem. Furthermore, the timing and incidence of hypercoagulability which predisposes to these events is unknown, and institutional screening programs remain costly, serving primarily to establish a diagnosis after an event has occurred. Emerging evidence suggests that Point of Care (POC) Rapid Thromboelastography (r-TEG) provides a real time analysis of comprehensive thrombostatic function, representing an analysis of both enzymatic and platelet components of thrombus formation. r-TEG permits accurate, goal directed diagnosis and subsequent treatment of hypercoagulable states. We hypothesize that r-TEG could be used as a screening tool to identify hypercoagulable states in surgical patients and queried whether the test predicts subsequent thromboembolic events

Methods: r-TEG analyses were performed on 71 critically ill surgical intensive care unit patients over a 4 month period. Patients with a thrombotic event prior to r-TEG were excluded. Hypercoagulability was defined as Clot Strength (G) >12.4 dynes/cm², and Maximum Amplitude (MA) >72mm. Variables of interest for identifying hypercoagulability and thromboembolic events included gender, operating hospital service, injury patterns, ISS score, ICU stay, transfusion within first 24 hours, and thromboprophylaxis. Chi-square tests and Fisher's exact tests were used for categorical variables and independent samples t-tests or Wilcoxon rank sum tests were performed for continuous variables. All tests were 2-sided with significance of P<0.05.

Results: 36 patients (51%) were hypercoagulable and 35 patients (49%) had normal r-TEG analyses. 75% received thromboprophylaxis during the study period. The only baseline difference between study groups for hypercoagulability risk was a transfusion within the first day (18% hypercoagulable group, 48% normal group, p=0.04). 11.3% of patients overall had a thromboembolic event which required full anticoagulation. In the normal group, there were no events recorded, however, in the r-TEG identified hypercoagulable group, 8 patients (22.2%) had a TE (p=0.005) (See Table). The only significant predictor of a TE was elevated r-TEG values (p=0.005).

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Conclusion: These preliminary results show that r-TEG identifies hypercoagulability and predicts subsequent thromboembolic events in surgical patients. Further study is necessary to define optimal prophylactic treatment strategies for patients with r-TEG proven hypercoagulability.

Perioperative Variables with g/MA elevated vs. G/MA normal

Variable	Hypercoagulable G > 12.4 and MA > 72 n = 36	Normal G ≤ 12.4 and MA ≤ 72 n = 35	P-value
Male	69%	77%	0.46
Trauma Service	61%	60%	0.92
High Risk Injuries	56%	63%	0.53
ICU stay	94%	91%	0.67 ^b
Thromboprophylaxis	78%	71%	0.54
ISS Score (mean±SD, n)*	25.0 ± 10.2 (n=16)	20.5 ± 12.3 (n=11)	0.31
Transfusion within first 24 hours (n)*	18% (n=22)	48% (n=21)	0.04
TE	22.2%	0%	0.005 ^b

* Only applies to trauma population.

a Wilcoxon rank sum test

b Fisher's exact test

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29. LOCAL WOUND p38 MAPK INHIBITION ATTENUATES BURN INDUCED CARDIAC DYSFUNCTION

LM Hoesel, AF Mattar, S Arbabi, AD Niederbichler, KR Ipaktchi, GL Su, MV Westfall, SC Wang, MR Hemmila

University Of Michigan, Ann Arbor, MI

Purpose: Topical inhibition of p38 mitogen-activated protein kinase (MAPK) within burn wounds attenuates the local and systemic inflammatory response and reduces acute lung injury. In this study we investigate the effects of local activated p38-MAPK inhibition on burn-induced cardiac dysfunction. We hypothesized that cardiac dysfunction following burn injury may be minimized by local dermal p38-MAPK inhibition.

Methods: Using a standardized model of scald burn injury, rats were given a 30% total body surface area partial thickness burn or sham injury. Wounds were treated with a p38-MAPK inhibitor (SB) or vehicle. Cardiac function was assessed by systemic blood pressure measurements which were recorded in vivo followed by in vitro assessment of sarcomere contraction in single cell suspensions of isolated cardiomyocytes. Statistical analysis was performed using ANOVA with Tukey's post-hoc test. A p-value < 0.05 was considered statistically significant.

Results: Systolic blood pressure or maximal left ventricular pressure, diastolic blood pressure and mean arterial pressure in vivo were all markedly reduced following burn injury. These functional deficits were abolished when measured 24 hours after burn injury following local inflammatory signaling disruption using a topical activated p38-MAPK inhibitor (Figure 1, $p < 0.01$). Similarly, peak cardiomyocyte sarcomere contractility in vitro was markedly reduced following burn injury but significantly improved when p38-MAPK was inhibited locally ($0.10 \pm 0.02 \mu\text{m}$ burn+vehicle vs. $0.15 \pm 0.02 \mu\text{m}$ burn+SB, $p < 0.01$). In vitro incubation of normal cardiomyocytes with homogenate from burned skin or burn serum resulted in a similar pattern of impaired cardiomyocyte contractility. These effects were reversed in normal cardiomyocytes exposed to burn skin homogenates treated with a local activated p38-MAPK inhibitor. Based on Western blot analyses, cardiac p38-MAPK activation was not affected by local dermal blockade of activated p38-MAPK arguing against systemic absorption of the inhibitor and indicating the involvement of systemic cytokine signaling.

Conclusion: In summary, topical activated p38 MAPK inhibition within burned skin attenuates release of pro-inflammatory mediators and prevents burn induced cardiac dysfunction following thermal injury. These results support inhibition of burn-wound inflammatory

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signaling as a new therapeutic approach to prevent potential post-thermal injury multi-organ dysfunction syndrome.

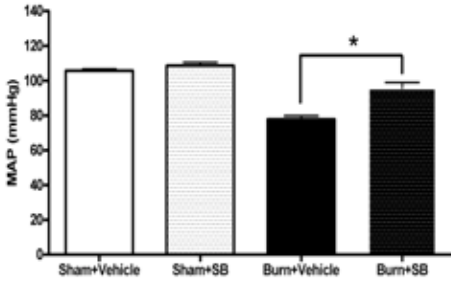


Figure 1. In vivo measurement of mean arterial pressure (MAP) 24hrs after burn injury.
* $p < 0.01$ (ANOVA).

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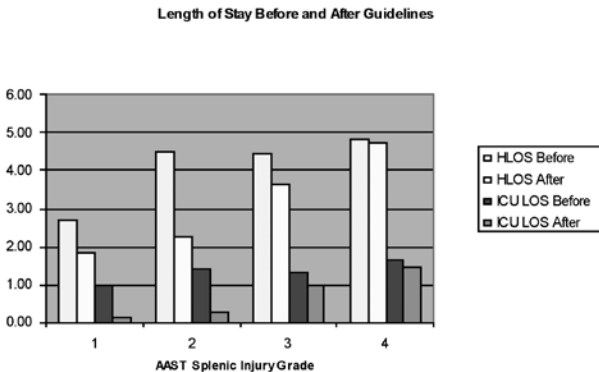
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30. IMPACT OF SPLENIC INJURY GUIDELINES ON HOSPITAL STAY AND CHARGES IN PATIENTS WITH ISOLATED SPLENIC INJURY

B Izu, M Ryan, R Markert, AP Ekeh, MC McCarthy
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Purpose: The purpose of this study is to assess the impact of care guidelines for patients with isolated blunt splenic trauma on length of stay (LOS) and patient charges.

Methods: Review of the hospital trauma registry identified patients admitted with blunt splenic injury over an eight-year period. Splenic injury guidelines were initiated midway through this time period. Patients with other significant injuries were excluded from analysis. Hospital LOS, intensive care unit (ICU) LOS and patient charges before and after the guidelines were compared. Patients were also grouped according to their American Association for the Surgery of Trauma (AAST) splenic injury grade, I-V.



Results: One-hundred thirty-nine patients with isolated splenic injuries were identified; four patients were excluded because of comorbid disease that significantly extended their hospital stay. Sixty-five patients were admitted before and seventy patients after implementation of the guidelines. ICU and HLOS were significantly decreased after the guidelines (ICU LOS: 1.35 days before, 0.80 after, $p < 0.01$, HLOS: 4.17 before, 3.27 after, $p < 0.01$). When grouped by AAST grade, only grade II injuries had a significant decrease in ICU LOS (1.43 days before, 0.29 after, $p < 0.01$). Both grade I and II injuries had a significant decrease in HLOS (grade I: 2.71 days before, 1.86

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after, $p < 0.01$, grade II: 4.5 before, 2.29 after, $p < 0.01$). Other injury grade decreases in LOS were not statistically significant. Adjusted hospital charges showed an increase overall following the guideline implementation (mean hospital charges before \$23,129; after, \$24,117, $p = 0.60$), but this was not significant.

Conclusion: Implementing guidelines for the observation of blunt splenic injury significantly decreased the overall HLOS and ICU LOS at our institution. However, hospital charges remained the same. Trauma programs should institute splenic injury guidelines to reduce resources needed for the care of isolated splenic injuries.

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31. 1200 ABSCESSSES OPERATIVELY DRAINED: AN ANTIBIOTIC CONUNDRUM?

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Introduction: The incidence of soft tissue infections due to antimicrobial resistant pathogens is increasing. This study was designed to evaluate the epidemiology of surgically drained soft tissue abscesses.

Methods: This retrospective study evaluated 1200 consecutive patients from 2002 to 2008 who underwent surgical incisional drainage (I&D) in the main operating theatre for soft tissue abscess(es). Patients were excluded if the abscesses were perirectal or hydradenitis. Patient demographics, hospital length of stay (LOS), surgical location, disposition, microbiological studies and antibiotic(s) prescribed for the infections were collected. Data are mean \pm SD, $p < 0.05$ was considered significant.

Results: Of 1200 cases ($> 90\%$ inpatient) identified with an I&D, 1006 patients had intraoperative cultures performed. Primary operative sites were upper extremities (32.1%) or lower extremities (23.3%), buttock, not perirectal (13.2%), and abdominal wall (8.5%). Abscesses were present in more than one site in 9% of patients. The 1817 positive isolates identified consisted of gram positive aerobes (65%), gram negative aerobes (11.4%), anaerobes (22.9%) and fungi (0.7%). Only a single organism was found on culture in 47.7% of all patients. In the IVDA population, >2 organisms were identified in 45% of patients. In all patients, the most prevalent gram positive organism was *Staphylococcus aureus*, 29.5%, and 80.5% of these were methicillin-resistant *Staphylococcus aureus* (MRSA). MRSA was prevalent in 65% of diabetic patients vs 87% in non-diabetic patients, $p < 0.001$. In addition, MRSA was present 80% in the IVDA population vs 67% in the non-IVDA population, $p = 0.17$. Initial antibiotic(s) selected included ampicillin/sulbactam (66%), clindamycin (8%), vancomycin (7%), and cefazolin (6%). LOS increased in diabetic patients, 4.2 ± 5.1 vs 2.9 ± 4.8 days, $p = 0.003$ with no difference in MRSA or IVDA patients. In 82% of the MRSA patients, the initial antibiotic prescribed did not cover the pathogen, $p < 0.001$. In patient with anaerobes, initial antibiotic selection did not cover the pathogen(s) 26% of the time.

Conclusions: Gram positive aerobes plus anaerobes represented approximately 85% of the pathogens in our patient population with the anaerobic rates being underestimated we believe due to culture technique. Intra-operative cultures can be useful in directing antibiotic therapy post-operatively. MRSA gram positive aerobes and anaerobes coverage should be employed in the initial antibiotic management of

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large soft tissue abscesses drained under anesthesia. From this data, clindamycin may be more efficacious alternative at a slightly reduced cost compared to our current approach.

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32. COMPLETION PANCREATECTOMY AND DUODENECTOMY FOR RECURRENT MEN-1 PANCREATIC ENDOCRINE TUMORS

PG Gauger, GM Doherty, NW Thompson

University of Michigan, Ann Arbor, MI

Purpose: An established surgical option for initial treatment of MEN-1 associated pancreatic endocrine tumors (PETs) is a distal pancreatectomy, enucleation of pancreatic head tumors, and duodenotomy for resection of duodenal tumors (if hypergastrinemia is present). This strategy may control progression of pancreatic tumors for MEN-1 patients. However, not all eventual recurrences are amenable to re-operative enucleation. This report describes the feasibility and outcomes of completion pancreatectomy and duodenectomy in those patients.

Methods: 34 patients with MEN-1 underwent initial distal pancreatectomy, enucleation of PETs in the pancreatic head, and duodenotomy to excise duodenal tumors. Seven of these 34 patients (21%) have ultimately required remedial completion pancreatectomy and duodenectomy for tumor recurrence in the pancreatic head with recurrent hypergastrinemia. Retrospective review of clinical data and outcomes was performed. Descriptive statistics are reported as median (range) or mean \pm SD.

Results: Age at time of completion pancreatectomy was 41 years (27-51) compared to 33 years (20-40) at the time of the initial standard operation. No patients had developed liver metastases in the interim. Mean body mass index was 31 ± 10 . Mean operative time was 478 ± 144 minutes. Mean estimated blood loss was 1229 ± 1255 mL. Pathology revealed multiple pancreatic tumors in 7/7 patients (100%), metastatic lymph nodes in 5/7 (71%), and duodenal tumors in 4/7 (57%). There was no operative mortality and 6/7 patients are currently alive (86%). Pre-operative gastrin levels were $925 + 915$ pg/mL while post-operative gastrin levels are 103 ± 91 pg/mL (normal 25-111 pg/mL). Severe diabetes mellitus is managed with an insulin pump in 3 patients and standard insulin therapy in the remainder. Mean Hemoglobin A1C levels are 9.1 ± 4.3 % (normal 3.8-6.4 %). Mean follow up is 34 ± 22 months.

Conclusions: The standardized initial operative approach of distal pancreatectomy with enucleation of pancreatic head PETs, and duodenotomy for hypergastrinemia, may provide primary tumor control and may prevent distant metastatic disease. However, the pancreatic and duodenal lesions of MEN1 are multifocal and recurrence can be progressive in the pancreatic head and duodenum. Completion pancreatectomy and duodenal resection is arduous but feasible and outcomes are acceptable. Considering the radical nature

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of this eventual treatment course, individual consideration should be given to the occasional MEN-1 patient amenable to initial alternative pancreatic resections which preserve pancreatic mass.

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33. INSTITUTIONAL PROTOCOL IMPROVES TEMPORARY INFERIOR VENA CAVA FILTER RETRIEVAL RATE

SH Ko, B Reynolds, D Nicholas, LH Alarcon, MS Makaroun, AB Peitzman, JS Cho

University of Pittsburgh, Pittsburgh, PA

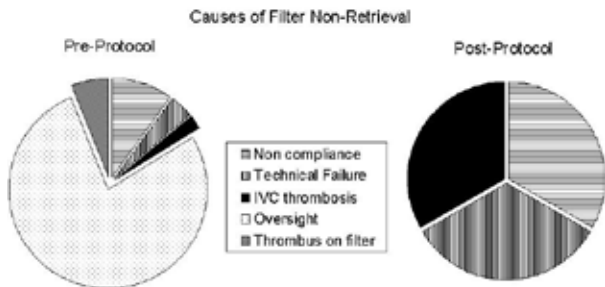
Objectives: In the trauma population, the use of retrievable inferior vena cava (IVC) filters (RIVCF) is rapidly gaining acceptance in patients at high-risk for venous thromboembolism. Although intended to be temporary, RIVCF are more often than not left in place even when they are no longer needed. This study reports the impact of an institutional protocol developed for prospective follow-up of trauma patients who received RIVCF on retrieval rates at a level 1 trauma center.

Methods: A review of an institutional Trauma Registry identified 97 consecutive patients (64 males & 33 females, mean age 44.3 ± 18.8 years) who received RIVCF between 1/2004 and 2/2007 (Group I) before the protocol was instituted. Under the protocol, 61 consecutive trauma patients (44 males & 17 females, mean age 16.9 ± 17.3 years) underwent temporary IVC filter insertion between 8/2007 and 7/2008 (Group II) and were prospectively followed. The Cook Gunther-Tulip retrievable filters were used in all patients. Patients who received a nonretrievable filter were excluded. The filter retrieval rates and causes of permanence were analyzed between the two groups. Eligibility for filter retrieval was determined by patient's death (9 pts), medical necessity for the filter (14 pts), physician preference (11 pts) and patient's refusal (8 pts). Data are presented as frequency, percentage and mean \pm SD; Fisher's exact test and risk ratio (RR) with related 95% confidence interval (C.I.) were used. A p value of ≤ 0.05 was considered significant.

Results: Technical success rates of insertion were 100% in both groups. There were no procedure-related complications. Filter retrieval eligibility criteria were met in 85% (79/93) of patients in Group I and in 66% (37/56) of patients in Group II. Of those eligible, retrieval-attempt rates were 44% (35/79) in Group I vs. 95% (35/37) in Group II ($p < 0.001$, RR 2.14 [95% CI 1.65-2.77]). Clinician's oversight of the filter accounted for 88% (39/44) of failure of retrieval-attempt and patient's non-compliance for the rest in Group I; in Group II, the latter accounted for all such failures. Filter retrieval was accomplished in 37% (29/79) in Group I and in 84% (31/37) in Group II ($p < 0.001$, RR 2.29 [95% CI 1.65-3.15]). Intraoperative findings of the presence of thrombus on filter (3 pts) and filter-related complications (3 IVC thromboses and 4 technical failures) precluded filter retrieval (Fig). No retrieval procedure-related complications occurred.

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Conclusion: An institutional protocol for prospective monitoring of filter status in patients with temporary IVC filtration significantly increases filter retrieval rate.



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34. RISK FACTORS FOR RETAINED SURGICAL FOREIGN BODIES: A META-ANALYSIS.

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Introduction: Retained surgical foreign bodies (RSFB) constitute a theoretically preventable surgical morbidity. Despite numerous case reports and single institution series, few large studies exist addressing RSFB. Most published reports lack the statistical power needed to detect clinically important differences in many of the examined variables. This meta-analysis evaluates the cumulative published data for any previously unrecognized RSFB-related clinical and systematic risk factors.

Methods: Eighteen clinical series and retrospective case-control studies with potential relevance were considered for this analysis. Two retrospective, case-control studies of RSFB-related risk factors contained group comparisons between patients with and without RSFB, thus qualifying for further statistical analysis. Comprehensive Meta Analysis Software (BioStat, Inc., Englewood, NJ) was used to analyze the following proposed risk factors for RSFB: Patient age and gender; Body-mass index; Presence/absence of surgical count; Incorrect surgical count; Duration of operation; Blood loss >500 mL or blood transfusion; Emergent operation; Operation after hours; Unexpected change in operation; >1 major procedure performed; Shift changes for nursing staff; >1 surgical team involved. Statistical significance was set at $\alpha = 0.05$ (two-tailed).

Results: After analyzing the data from qualified studies, the involvement of more than one surgical team was confirmed to be significantly associated with RSFB. Four variables were confirmed not to be significantly associated with RSFB. Of note, six variables found to be significant in only one of the two studies were determined to be statistically significant in this meta-analysis. In addition, duration of operation and operation after 5PM, while not statistically significant in either of the two studies, were found to be significantly associated with the occurrence of RSFB by meta-analysis. Detailed study results are shown in the table below.

Conclusions: This analysis shows that 9 of 13 previously studied variables were significantly associated with the presence of RSFB. These findings provide a meaningful foundation for future performance improvement initiatives and clinical studies of RSFB occurrence and prevention. Further, large prospective studies evaluating effects of specific changes at the institutional/systematic level (i.e., universal surgical counts, radiographic verification of RSFB absence, radio-frequency labeling of surgical instruments and sponges)

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on the incidence of RSFB should be undertaken using variables derived from the current analysis.

Variable	Gawande <i>et al.</i>	Lincourt <i>et al.</i>	Current analysis
Patient age	NS (p=0.390)	NS (p=0.500)	NS (p=0.280)
Female gender	NS (p=0.600)	NS (p=0.190)	NS (p=0.280)
EBL >500 mL or blood transfused	NS (p=0.430)	NS (p=0.230)	NS (p=0.108)
Shift changes for nursing staff	NS (p=0.160)	NS (p=0.610)	NS (p=0.200)
Duration of operation	NS (p=0.200)	NS (p=0.080)	Sig (p=0.031)
Operation after 5 pm	NS (p=0.260)	NS (p=0.110)	Sig (p=0.038)
Body mass index	Sig (p=0.040)	NS (p=0.430)	Sig (p=0.047)
Surgical count not performed	Sig (p=0.001)	NS (p=0.250)	Sig (p=0.023)
Emergency surgical procedure	Sig (p<0.001)	NS (p=0.090)	Sig (p<0.001)
Unexpected change in surgery	Sig (p<0.001)	NS (p=0.170)	Sig (p<0.001)
>1 major procedure performed	NS (p=0.310)	Sig (p=0.004)	Sig (p=0.003)
Incorrect surgical count	NS (p=0.440)	Sig (p=0.010)	Sig (p=0.015)
>1 surgical team involved	Sig (p=0.050)	Sig (p=0.020)	Sig (p=0.002)

Table. Results of the current meta-analysis of risk factors associated with RSFB.

Legend: Shaded box - statistically significant variable/value, *Numbers in parentheses indicate p-value, EBL – estimated blood loss.

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35. LAPAROSCOPY-ASSISTED LIVE LIVER DONATION: A SINGLE CENTER SERIES

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Introduction: Minimally invasive liver surgery is a rapidly advancing field. Published anecdotal reports of laparoscopy-assisted (LA) live liver donation (LLD) have demonstrated the potential of this technique. In this report, we present a series of LA LLD wherein we compare both donor and recipient outcomes to a cohort of open LLD to demonstrate equivalent safety and efficacy of this approach.

Methods: We have performed 108 LLD at our institution since 1998. We analyzed 33 LA LLD and compared them to the most recent 33 open LLD in order to minimize experience bias. Through a retrospective chart review, we looked at donor and recipient outcome measures relevant to both approaches. LA LLD was performed through a small epigastric incision, using 2 additional laparoscopic port sites. For open LLD, we used the same epigastric incision in combination with a right subcostal extension.

Results: Donor demographics including age, gender, and BMI were equivalent in both groups. Mean operative times (LA 265 minutes, open 316; $p=.0004$) were significantly shorter in the LA cohort. Intra-operative blood loss and transfusion requirements were similar (only one patient in the open group required a non-autologous transfusion post-operatively), as were graft to recipient ratios (LA 1.17, open 1.26; $p=.38$). Mean ICU and hospital lengths of stay (LOS) were not different between the two groups (LA 1.2 and 4.3 days, open 1.1 and 3.9; $p=NS$). There were 7 readmissions within 30 days in each group. Readmission for pain control occurred only in the open group ($n=3$). The modified Clavien scale for living donors was used to classify donor complications; 15 grade 1 or 2 complications occurred in the LA group and 14 in the open group ($p=0.66$). No grade 3 or 4 complications occurred in either cohort. Liver function tests (LFTs) (AST, ALT, T. Bilirubin) as a surrogate for liver recovery were similar in both groups at one week. Recipient demographics including age, gender, BMI, MELD, HCV, HCC were equivalent between the groups. No significant differences were found in outcomes variables such as ICU and hospital LOS, 30 day readmission rates, the incidence of vascular (hepatic artery and portal vein thrombosis) or biliary complications. LFTs were similar in both groups at one week. Unadjusted actuarial Kaplan-Meier one-year graft survival rates for recipients of LA and open LLD were 79% and 82% respectively ($p=0.69$), and the one-year patient survival rates were 82% and 97% respectively ($p=0.06$). Using Cox regression methods, recipient age and HCV status were significant predictors of outcome, but not LA vs open approach.

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Conclusions: Our experience suggests that LA LLD is safe and effective, comparing favorably with open LLD. In addition to the physical and psychological benefits of a minimally invasive approach, no adverse effects were identified attributable to LA LLD in either donor or recipient outcomes.

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36. LONG-TERM OUTCOMES OF LAPAROSCOPIC HELLER MYOTOMY FOR ACHALASIA

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Purpose: To report the long-term outcomes of laparoscopic Heller myotomy (LHM) for achalasia of the esophagus.

Methods: A single-institution retrospective review of patients undergoing LHM for achalasia between 1992 and 2003 was conducted. Only patients with at least 5 years of clinical follow-up were included in this analysis. LHM failure was defined as recurrence of symptoms to preoperative severity or the need for reoperation (redo myotomy or esophagectomy). Fisher's exact test and unpaired t-test were used for statistical comparisons, with a two-tailed p-value less than 0.05 considered significant.

	Acute Recurrence (n=6)	Delayed Recurrence (n=3)	No Recurrence (n=37)	Sig. (p-value)
Multiple prior therapies	6 (100%)	3 (100%)	9 (24%)	0.00004†
Time to recurrence	2 months	60 months	-	0.0004
Preoperative LESF	7.8 mmHg	19.8 mmHg	33.0 mmHg	0.0033*, 0.035†

* acute versus delayed recurrence † recurrence versus no recurrence

Results: A total of 46 patients (26 males; mean age=51 years) with a primary diagnosis of achalasia underwent LHM. All patients had a concomitant partial fundoplication (42-Toupet; 4-Dor). There were no perioperative deaths and 4 (9%) overall complications that were managed successfully. At a mean follow-up of 6.4 years (range 5.0 to 9.8 years), 37(80%) patients remained free from failure. Multiple prior therapies (botulinum toxin injection, endoscopic dilatation, and/or previous myotomy) had been employed in all patients with failed LHM as compared to only 9(24%) patients undergoing successful surgery (p=0.00004). The time to symptom recurrence was acute (mean time after LHM=2 months) in 6 patients and delayed (mean time=60 months) in the remaining 3 (p=0.0004). Preoperative resting lower esophageal sphincter pressure (LESF) was significantly higher in the delayed cohort as compared to those failing acutely (mean= 19.8 vs 7.8 mmHg, p=0.0033). Patients undergoing successful surgery had a higher LESF than both failure groups (mean=33.0 mmHg, p=0.035).

Conclusions: LHM is safe and affords durable symptomatic relief in 80% of patients in the long-term. Previously treated patients who fail LHM and have a low preoperative LESF tend to recur acutely.

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Conversely, patients with multiple prior therapies and a high LESP may benefit from LHM for several years before recurring. Those who remain free from symptom recurrence have a significantly higher LESP than those who fail. Therefore, preoperative LESP appears to be a reliable predictor of the durability of LHM.

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