

## ABSTRACTS

### I. INCIDENTAL RADIOGRAPHIC FINDINGS FOLLOWING INJURY: DEDICATED ATTENTION RESULTS IN IMPROVED CAPTURE, DOCUMENTATION AND MANAGEMENT

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**PURPOSE:** With liberal use of CT imaging for the management of trauma patients, incidental findings (IFs) are common and represent a major patient care and medical-legal concern. Consequently, we began an initiative to capture, notify, and document IFs and their in-hospital management with a dedicated incidental finding coordinator (DIFc). We hypothesized a DIFc would increase IF capture and promote notification, follow-up and documentation of IF events.

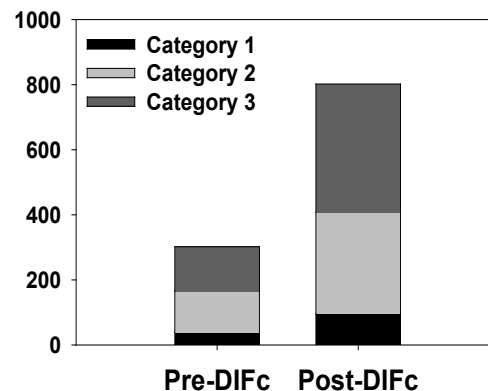
**METHODS:** A quality improvement project to record IFs post-injury was initiated at our level I trauma center (4/07-3/08, Pre-DIFc). Due to inadequate documentation of IF management we implemented a DIFc (4/08-3/09, Post-DIFc). The DIFc identified IFs daily from trauma admission radiology final reads. IFs were divided into 3 categories based upon significance. Category-1: attention before discharge, Category-2: follow-up with primary doctor within 2 weeks, Category-3: no follow-up required. For Category-1 IFs, in-hospital consultation of the appropriate service was verified. Upon discharge, patient notification, follow-up and documentation of events were confirmed. Certified mail or telephone contact was used to notify either the patient or primary doctor in those who lacked appropriate notification and documentation of such events.

**RESULTS:** Admission rates, mean age, and proportion of patients in IF categories were similar across the two periods. Implementation of a DIFc resulted in over a 165% increase in IF capture ( $n=802$  vs  $n=302$ ,  $p<0.001$ ). Patient notification and follow-up was initiated and appropriate documentation of management was confirmed in 99.8% of patients.

**CONCLUSIONS:** As imaging quality and the mean age of the population increases, IFs will become more frequent post-injury. Implementation of a DIFc resulted in over a 2.5-fold higher capture rate

## ABSTRACTS *(continued)*

of IFs and resulted in near complete patient notification, initiation of follow-up, and documentation of IF in-hospital management. Inadequate management of IFs may delay appropriate care and potentially result in morbidity or even mortality. Dedicated attention to IFs with an incidental finding coordinator represents a potential solution to this patient care and medical-legal dilemma.



### NOTES

### 2. COMPARISON OF OUTCOMES AFTER LAPAROSCOPIC VERSUS OPEN APPENDECTOMY FOR ACUTE APPENDICITIS AT 185 ACS NSQIP HOSPITALS

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**PURPOSE:** Outcomes after laparoscopic (LA) vs. open (OA) appendectomy have been based upon single institution trials and studies of administrative data. Our objectives were to assess 30-day outcomes after emergency LA vs. OA for acute appendicitis and to examine factors influencing the utilization and duration of surgical approach with multi-institutional clinical data.

**METHODS:** Using the American College of Surgeons National Surgical Quality Improvement Projects (ACS NSQIP) database (2005-2007), patients were identified who underwent emergency appendectomy for acute appendicitis at 185 participating hospitals. Multivariable logistic regression models, which included propensity score adjustment for possible treatment selection bias, were constructed to assess the association between surgical approach (LA vs. OA) and risk-adjusted overall morbidity as well as individual complications. A multivariable logistic regression model was also constructed to assess the relationship between surgical approach and hospital academic affiliation. Length of stay (LOS) and operative times were compared via univariate analysis.

**RESULTS:** Of 16,775 patients, 11,816 (70.4%) patients underwent LA and 4,959 (29.6%) patients underwent OA. Patients who underwent OA were significantly older with more comorbidities compared to those who underwent LA. Patients treated with LA were less likely to die (0.10% vs. 0.44%,  $P < 0.0001$ ) and less likely to experience any adverse event (11.1% vs. 5.3%, OR 0.67, 95% CI 0.58-0.76) compared to those who underwent OA. Patients treated with LA were also less likely to develop individual complications except for organ/space surgical site infections. Patients treated at academic-affiliated versus community hospitals were more likely to undergo LA than OA (52.9% vs. 46.1%,  $P < 0.0001$ , OR 1.18, 95% CI 1.10-1.27). While LOS after LA and OA

were similar at academic and community hospitals, the operative duration at academic centers was significantly longer for both LA and OA (LA: 53 vs. 41 min,  $P < 0.0001$ ; OA: 56 vs. 44 min,  $P < 0.0001$ ).

**CONCLUSIONS:** Within ACS NSQIP hospitals, LA is associated with lower overall and individual morbidity, except for organ/space surgical site infection. LA is more likely to be performed and is associated with slightly longer operative times than OA at academic versus community hospitals.

### NOTES

**3. CYST ASPIRATION ANALYSIS: MUCIN OR CARCINOEMBRYONIC ANTIGEN - WHICH IS BETTER?**

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**PURPOSE:** Differentiation between the various pathologies presenting as a cystic pancreatic lesion is clinically important but often challenging. We have previously advocated the performance of endoscopic ultrasound (EUS) with aspiration and determination of mucin and carcinoembryonic antigen (CEA) content. The aim of this study is to report the results of this ongoing protocol and determine the relative importance of mucin and CEA within these cysts in the diagnostic process.

**METHODS:** The institutions prospectively maintained pancreatic cyst database was accessed to identify patients who had undergone pancreatic EUS and cyst aspiration as part of their evaluation. Only those patients who had subsequently undergone resection were selected, with histopathology being the gold-standard for comparison.

**RESULTS:** During the period January 2000 to July 2009, 174 patients with pancreatic cystic disease underwent surgery of which 121 had an EUS with aspiration attempted at our institution with specimens sent for mucin and CEA. Based on histopathology, 79 mucinous lesions were identified including 44 cystadenomas and 35 intraductal papillary mucinous neoplasms [IPMN], and 42 non-mucinous lesions. The median cyst CEA levels were significantly higher in the mucinous lesions group at 826 versus 2.7 ng/mL (p=0.001).

**CONCLUSIONS:** It would appear that assessment of mucin and CEA are complementary, with the best profile obtained when the results are assessed together, with a high sensitivity and NPV, and a low NDLR. However, the low sensitivity, PPV means that the combination is not optimal and further studies are ongoing to define a more reliable combination of markers.

	<b>Sensitivity</b>	<b>Specificity</b>	<b>PPV</b>	<b>NPV</b>	<b>PDLR</b>	<b>NDLR</b>
<b>Mucin</b>	0.62	0.60	0.74	0.45	1.55	0.63
<b>CEA</b>	0.52	0.85	0.87	0.49	3.47	0.56
<b>Mucin or CEA</b>	0.87	0.5	0.77	0.68	1.74	0.26
<b>Mucin &amp; CEA</b>	0.27	0.95	0.91	0.41	1.80	0.77

PPV = positive predictive value; NPV = negative predictive value; PDLR = positive diagnostic likelihood ratio; NDLR = negative diagnostic likelihood ratio.

**NOTES**

### 4. ENDOSCOPIC, ENDOLUMINAL FUNDOPLICATION FOR GASTROESOPHAGEAL REFLUX DISEASE: INITIAL EXPERIENCE AND LESSONS LEARNED

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**PURPOSE:** There have been several devices developed to create an antireflux barrier endoscopically for the treatment of gastroesophageal reflux (GERD). All have either failed to provide long-term symptom relief, were associated with significant complications, or were otherwise removed from the market. A new device, the EsophyxR (Endogastric Solutions, Redmond, WA), experimentally provides the closest approximation to a standard Nissen fundoplication. This is a report of an initial experience with this device.

**METHODS:** Patients considered candidates for endoscopic fundoplication include those with symptomatic GERD, a small (<2 cm) hiatal hernia, objective pathological evidence of GERD, and an absence of other esophageal motility disorders. The procedure was done under general anesthesia, with a surgeon operating the device and an endoscopist operating the gastroscope. I-fasteners were placed from the esophagus to the gastric cardia with the goal of creating an approximately 270 to 300 degree fundoplication approximately 3 to 4 cm in length. Symptom severity was measured with the GERD-HRQL instrument (best possible score 0, worst possible score 50). Patients were followed for complications and symptom improvement.

**RESULTS:** 17 patients had an endoscopic fundoplication attempted. 2 could not be completed due to inability to pass the device. Of the 15 patients undergoing endoscopic fundoplication, 11 had the typical symptoms of GERD, 4 laryngopharyngeal reflux (LPR) symptoms, 3 had recurrent symptoms after a Nissen fundoplication. There was 1 major complication, a gastric mucosal tear leading to bleeding and need for blood transfusion. 12 patients (80%) reported satisfaction with their symptom relief. Of those dissatisfied, 2 had LPR and 1 associated gastroparesis. The median GERD-HRQL score improved from 25 (range 6-40) to 5 (range 0-20).

**CONCLUSIONS:** Endoscopic fundoplication with the Esophyx device is feasible with satisfactory initial results. Endoscopic fundoplication appears best suited for patients with small hiatal hernias and mild to moderate typical symptoms.

### NOTES

### 5. EXPRESSION OF THE SONIC HEDGEHOG PATHWAY MOLECULES IN SYNCHRONOUS FOLLICULAR ADENOMA AND PAPILLARY CARCINOMA OF THE THYROID GLAND IN PREDICTING MALIGNANCY

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**PURPOSE:** Recent studies have shown that the Sonic Hedgehog (Shh) pathway plays an important role in tumorigenesis and cancer formation. The Shh pathway is required for the normal development of the thyroid gland, but when activated due to gene mutation or over-expression, it may stimulate thyroid tumor cell proliferation. This study seeks to determine whether molecules involved in the Shh pathway, including Patched (Patch), Smoothed (Smo), and Shh, are equally over-expressed in synchronous follicular thyroid adenoma (FTA) and papillary thyroid carcinoma (PTC).

**METHODS:** Paraffin-embedded tumor blocks from thyroidectomy specimens of eighteen patients with synchronous FTA and PTC were retrieved. Immunohistochemical staining of Patch, Smo, and Shh was performed on the paraffin embedded tissue in order to detect over-expression. The tumors were graded negative and positive. The tumor was considered positive for over-expression if more than 10% of the tumor cells were positive for the tested molecule of the Shh pathway.

**RESULTS:** Between February 2000 and October 2007 a total of eighteen cases of synchronous FTA and PTC of the thyroid gland were recorded at Rush University Medical Center. The patients' age ranged from 14 to 77 years with a mean age of 50.4. Fourteen (78%) of the patients were female and four were male. Follicular adenoma nodules ranged in size from 0.3 cm to 3.8 cm with a mean size of 1.3 cm. Papillary carcinoma nodules ranged in size from 0.5 mm to 2.5 cm with a mean size of 0.5 cm. Eight patients had total thyroidectomies, 7 had near total thyroidectomies, and 3 had lobectomies. Upon completion of immunohistochemical staining, five specimens had no residual tumor and were removed from analysis. Of the remaining thirteen, immunohistochemical results were as follows: Patch over-expression was seen in 5 of 13 (38%) follicular adenomas and 5 of 13

(38%) papillary carcinomas. Smo was over-expressed in 5 of 13 (38%) follicular adenomas and 3 of 12 (25%) papillary carcinomas. Shh was over-expressed in 4 of 13 (31%) follicular adenomas and 11 of 13 (85%) papillary carcinomas.

**CONCLUSIONS:** The over-expression of the three molecules involved in the Shh pathway (Patch, Smo, and Shh) was similar in FTA (38%, 38%, and 31% respectively). Of the three Shh pathway molecules tested, Shh proves to be a more sensitive indicator of malignancy, showing over-expression in 85% of PTC. The Shh molecule may become an important diagnostic marker in selective cases, where the cytologic or histologic features are not sufficiently characteristic to differentiate a follicular adenoma versus a papillary carcinoma.

### NOTES

**6. DIFFERENT PATTERNS OF CANCER INCIDENCE AMONG AFRICAN-AMERICAN AND CAUCASIAN RENAL ALLOGRAFT RECIPIENTS**

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**PURPOSE:** It is well established that Cauc RARs are at increased risk for cancer (ca) development when compared with the general population, with skin ca being the most frequent tumor type and occurring with the highest rate ratio. In contrast, there is a paucity of data available regarding ca incidence in separately-analyzed AA RARs, with a few reports demonstrating a decreased risk for developing non-melanoma skin ca vs. Cauc RARs, but no study examining the comparative incidence and relative distribution of other post-renal transplant malignancies according to race.

**METHODS:** We examined the incidence of de novo ca occurring in 582 AAs out of 694 total adult RARs (84% of cases) transplanted at our center from 1/1/84 to 12/31/07 and followed through 6/30/09, with median age 45, 66% male, and mean follow-up 4.3 years. Patients (pts) received cyclosporine or tacrolimus + mycophenolate mofetil or azathioprine ± prednisone for maintenance therapy. All pts were followed locally by our physicians for the entire duration of their transplant, allowing reliable capture of all ca cases. Since AAs account for 25% of RARs in the US, we sought to compare our AA cohort to a large, registry-derived, non-US Cauc control group that would be similar with regard to geographic location, immunosuppressive drug protocols, and age/sex parameters. Along these lines, we identified 11,155 RARs in the Canadian Organ Replacement Registry (CORR) transplanted from 1981-1998, with demographics 97% Cauc; 91% >= age 20; median age 40; 63% male; and mean follow-up 7.3 years in whom non-skin ca incidence was reliably noted with >95% accuracy via record linkage with the Canadian Cancer Registry through 12/31/99 (Am J Transplant 2007; 7: 941). Comparison of non-skin cancer incidence between AA and CORR groups was performed using &#967;2 or Fisher's exact test as appropriate.

**RESULTS:** There were no skin ca in our AA group. Non-skin ca incidence according to type is given for both groups in Table 1. Despite shorter follow-up, the overall incidence of ca, as well as that of prostate, renal cell, pancreatic, and esophageal ca, was significantly higher in the AA group, while that of oral ca was higher in the CORR group. The incidence of other ca commonly occurring in the general population (breast, colon, lung) and of those known to occur with greatly increased relative risk in RARs vs the general population (PTLD, Kaposi's sarcoma) was not different between groups.

**CONCLUSIONS:** The overall incidence of non-skin cancers is higher in AA vs Cauc RARs, reflecting a significantly different relative distribution of cancer types which follows cancer incidence trends by race in the general population. The marked differences in both skin and non-skin ca incidence in RARs according to race have important implications with regard to the need for transplant programs to appropriately tailor ca education/awareness and pre- and post-transplant ca surveillance to the AA pt.

Table 1. Non-skin cancer incidence

Cancer type	AA (n = 582)	CORR (n = 11,155)	p value
All	10.14% (n = 59)	6.97% (n = 778)	0.004
Prostate	2.41%	0.33%	<0.0001
Renal Cell	1.89%	0.64%	0.0004
PTLD <sup>a</sup>	1.20%	1.12%	NS
Lung	1.20%	0.97%	NS
Colorectal	0.52%	0.46%	NS
Pancreas	0.52%	0.06%	0.01
Larynx	0.34%	0.07%	NS
Breast	0.34%	0.47%	NS
Esophagus	0.34%	0.04%	0.04
Cervix	0.17%	0.05%	NS
Oral	0.00%	0.73%	0.02
Melanoma	0.00%	0.18%	NS
Bladder	0.00%	0.21%	NS

<sup>a</sup>PTLD = post-transplant lymphoproliferative disorder

**NOTES****7. PROGRESSIVE POSTINJURY THROMBOCYTOSIS IS ASSOCIATED WITH THROMBOEMBOLIC COMPLICATIONS**

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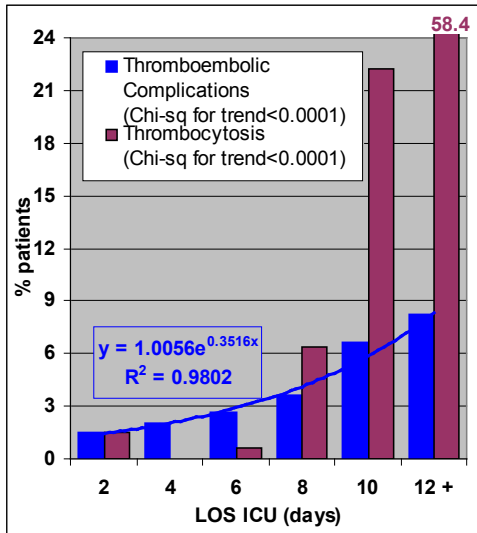
**OBJECTIVE:** Our previous investigation demonstrated that despite routine enzymatic chemoprophylaxis, a hypercoagulable state was identified by thrombelastography (TEG) in a cohort of critically ill surgical patients that was associated with thromboembolic events (TE). The contribution of platelet hyperactivity to the hypercoagulable state, however, remains unknown. We hypothesized that progressive post-injury thrombocytosis contributes to a hypercoagulable state that is associated with TE.

**METHODS:** 1440 injured patients surviving >48 hours were prospectively studied over 12 years. Variables evaluated associated with thrombocytosis (PLT>450K) included age, ISS, RBC/12 hrs, and TE (deep venous thrombosis, pulmonary embolus, mesenteric thrombosis, stroke, and arterial thrombosis). Time frame for the development of thrombocytosis was assessed at greater or less than 7 days post-injury. Logistic regression (LR) was used to identify independent variables predictive of thrombocytosis and to adjust the association of thrombocytosis with TE for other risk factors.

**RESULTS:** Mean ISS was  $29.3 \pm 0.3$ , RBC/12 hrs  $4.4 \pm 0.2$  units, and age  $37.4 \pm 0.4$  years. Thrombocytosis occurred in 447 (31%) of patients, and was noted almost exclusively >7 days post injury (440, 98%). Eighty patients (6%) developed TE and this was significantly associated with thrombocytosis ( $p=0.01$ ). LR indicated that higher ISS ( $p<0.0001$ ) and more RBC/12 hours ( $p=0.03$ ) both significantly predicted thrombocytosis, while age was not associated with it. TE were significantly associated with thrombocytosis ( $p=0.046$ , Odds Ratio=1.6, 95% Confidence Interval: 1.1-2.6) after adjustment for other risk factors. The rates of both thrombocytosis and TE increased significantly with length of stay (LOS) ( $p<0.0001$  for both, Figure). Furthermore, TE increased exponentially with longer LOS (Equation and  $R^2$  in Figure).

**CONCLUSION:** Thrombocytosis in critically injured patients receiving routine chemoprophylaxis is associated with thrombotic complications which increase exponentially with ICU length of stay. Further investigation is warranted to determine the degree to which thrombocytosis contributes directly to a hypercoagulable state. Differentiation of enzymatic from platelet hypercoagulability via TEG could help ascertain a potential role of anti-platelet therapy for prevention of TE.

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**NOTES**

**8. TOTAL PANCREATECTOMY AND AUTOLOGOUS ISLET TRANSPLANTATION AS A MEANS OF TREATING PATIENTS WITH HEREDITARY PANCREATITIS**

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**PURPOSE:** For patients with severe chronic pancreatitis, total or completion pancreatotomy with islet auto-transplantation (AICT) can alleviate pain and avoid the complications of diabetes. Several genetic mutations—specifically, PRSS1, CFTR, and SPINK1 are associated with hereditary forms of chronic pancreatitis. Few reports have focused on the benefit of this operation for this subset of patients.

**METHODS:** After IRB approval, a retrospective review of our Pancreatic Database was performed. Between February 2000 and July 2009, 118 patients were treated with total pancreatotomy and AICT for chronic pancreatitis. Patients with known genetic mutations were then selected for further analysis. Patient demographics, operative details, pre- and post-operative narcotic and insulin usage, and pre- and post-operative pain scores were recorded at routine clinic follow-up. Narcotic amounts were converted to morphine equivalents (MEQs) to standardize statistical analyses. In addition, quality of life questionnaires were administered to patients to investigate additional post-operative benefits or concerns.

**RESULTS:** Fourteen (12%) patients were identified as having genetic mutations. This included CFTR (n=8), PRSS (n=4), and SPINK1 (n=2) mutations. Mean patient age was 30 years (range 15-58) with a slight (57%) male predominance. Four (28.6%) patients had previous pancreatic surgeries prior to the AICT procedure. Patients required an average of 243 morphine equivalents (Range 30-1000 MEQ) for preoperative pain control with nine (64.3%) patients requiring greater than 150 MEQs daily. An average of 388,429 (range 25,025-845,050) islet equivalents (IEQ) or 5,555 IEQ/kg body weight (range 352-10,795 IEQ/kg) were isolated and transplanted. No patients were taking insulin prior to surgery; following resection with AICT, patients were discharged from the hospital with a daily average of 24 units of insulin (range 5-65) with four (28.6%) patients requiring fewer than 15 units

of insulin at the time of discharge. Average length of post-operative hospital stay was 12.9 days (range 9-22 days). At a mean follow-up of 13 months (range 1-35 months), patients required on average 11 units of insulin per day with eight (57.1%) patients requiring 15 or fewer units daily and three (35.3%) patients were insulin-independent. No patients had brittle diabetes or hypoglycemic attacks. Average daily narcotic usage at most recent follow-up decreased to 109 MEQs (range 0-510) ( $p < 0.05$ ). Five (36%) patients were completely narcotic-free.

**CONCLUSIONS:** In patients who suffer from chronic hereditary pancreatitis, pancreatic resection with autologous islet cell transplantation should be considered as a therapeutic option to reduce chronic abdominal pain while preserving endogenous endocrine function.

**NOTES**

**9. TWO STAGE BRACHIO-BASILIC TRANSPOSITION FISTULAS PROVIDE SUPERIOR PRIMARY AND SECONDARY PATENCY RATES FOR DIALYSIS ACCESS IN A SAFETY NET POPULATION**

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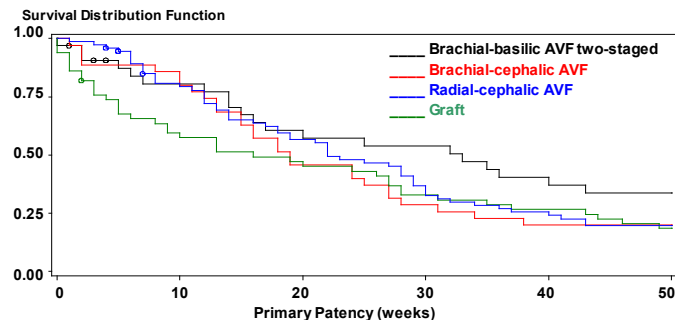
**PURPOSE:** National Kidney Foundation guidelines recommending aggressive pursuit of autogenous fistula (AF) for dialysis access in lieu of grafts has stimulated renewed interest in transposed brachio basilic fistulae (BB) as an alternate technique for upper arm access in patients who may not be candidates for a lower arm radio-cephalic (RC) or forearm brachiocephalic (BC) fistula. We hypothesized that in our safety net population, where RC and BC are often not possible, BB would provide cumulative patency rates superior to grafts (G) and equivalent to radio-cephalic (RC) and brachiocephalic (BC) fistulae.

**METHODS:** We retrospectively analyzed our most recent 3-year experience with dialysis access procedures from our prospective dialysis data base at our metropolitan safety net hospital. Procedures were grouped as follows: RC, BC, G, and BB. Primary outcome was thrombosis-free fistula patency. Secondary outcomes were primary failure, time to use, need for intervention, incidence of access related complications, and primary as well as secondary patency. Differences in age, sex, race, renal function (MDRD), baseline diagnoses [diabetes (DM), hypertension (HTN), coronary artery disease (CAD), and peripheral vascular disease (PVD)] as well as number of previous accesses were adjusted in the analysis. Logistic regression (LR) was used to identify independent predictors of primary failure, and Kaplan-Meier plots assessed differences in primary patency rates. Log of the time variables was used to approximate normal distribution.

**RESULTS:** 193 patients received: BB: 33 (17%), BC 35 (18%), RC 75 (39%), G 50 (26%). Primary patency means differed marginally between groups (ANOVA, P=0.08), and when grafts were excluded from the analysis, there was no difference between primary patency in all AF techniques. (p=0.88, power 90% for differences >3%). Kaplan Meier plots further showed that there was a difference between grafts

and other procedures in early patency (1st 10 weeks; Log Rank=0.0006 Wilcoxon p=0.0004 (Figure) Furthermore, secondary patency did not vary significantly between groups. (p=0.62). In univariate analysis, RC and G were more likely to fail primarily when compared to BB or BC. (p=0.05), and underlying hypertension conferred a lower risk of primary failure (p=0.01). LR stepwise selection showed that underlying diagnoses of PVD, DM and CAD conferred a significantly higher risk of primary failure compared to those with hypertension (p<0.001, odds ratio=4.1; 95% confidence interval: 1.71-9.59), as well as the presence of previous access (p=0.04, odds ratio=2.4, 95% confidence interval: 1.008-5.67)

**CONCLUSIONS:** In a safety net population, our results suggest that two stage, brachio-basilic transposition fistulas provide cumulative patency rates equivalent to brachiocephalic and radio-cephalic fistulas and superior to grafts. Although two procedures are required, leading to a longer maturation time, BB provides reliable AF and should be considered the next choice when RC and/or BC are not possible.



**NOTES**

**NOTES****10. FAST SCAN – IS IT WORTH DOING?**

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**PURPOSE:** Over the last decade, focused assessment with sonography for trauma (FAST) has increasingly become the initial diagnostic modality of choice in trauma patients. However, it is still questionable whether its use results in underdiagnosis of intra-abdominal injury. It also remains questionable whether a positive FAST scan affects clinical decision making in hemodynamically stable blunt trauma (HSBT) patients as evidenced through abdominal CT scan use.

**METHODS:** We reviewed our prospectively maintained trauma database. In trauma patients at our institute, FAST exams are performed by surgery residents, and are considered positive when free intra-abdominal fluid is visualized. Abdominal CT scan, diagnostic peritoneal lavage (DPL) or exploratory laparotomy findings were used as confirmation of intra-abdominal injury.

**RESULTS:** In our 7 year study period, 2,980 trauma patients were evaluated at our institute, out of which 2,130 patients underwent a FAST scan. 18 patients had inconclusive FAST, while 7 patients died on arrival, leaving 2,105 patients for our analysis. There were total 86 true positive FAST scans. All HSBT patients who had a positive FAST (68/86) were confirmed by CT scan. Patients who directly underwent exploratory laparotomy (17/86) or DPL (1/86) as confirmation either had penetrating trauma or were hemodynamically unstable. There were 1,907 true negative FAST scans, with 1,201 confirmed by CT and rest by observation. There were 107 (5.08%) false negative FAST scans, out of which 30 (28%) subsequently required exploratory laparotomy. 5 patients had false positive FAST scans. FAST scan had a sensitivity of 44.6%, a specificity of 99.7%, and positive and negative predictive values of 94.5% and 94.7% respectively. Accuracy was 94.7%.

**CONCLUSIONS:** Given the low sensitivity, a negative FAST scan without confirmation by CT scan, may result in missed intra-abdominal injuries. It is further seen that in all FAST positive HSBT patients, confirmation is preferred through the use of a CT scan for

better understanding of the intra-abdominal injuries and to decide on operative versus non-operative management. Thus, use of FAST scan in HSBT patients may not be worthwhile. It should be reserved for hemodynamically unstable patients with blunt trauma or patients with penetrating trauma.

### NOTES

### II. PANCREATIC SURGERY: EVOLUTION AT A HIGH-VOLUME CENTER

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**PURPOSE:** Over the past decade, advances in imaging have identified more asymptomatic pancreatic cysts. More recently, minimally invasive pancreatic procedures have been developed. In addition, volume/outcome data for pancreatectomy have led to increased referrals to regional centers. However, no analysis has been performed to determine whether the indications for surgery or the types of pancreatic operations have changed at a high-volume center. Therefore, the aims of this analysis were to determine whether the spectrum of disease or the types of pancreatic procedures have evolved with regionalization.

**METHODS:** From 1996 through 2009, 1,884 pancreatic procedures were performed at our high-volume center. These procedures included 1,006 pancreatoduodenectomies, 513 distal pancreatectomies, 166 pancreatojejunostomies, 61 Beger/Frey procedures, 53 central pancreatectomies, 47 total pancreatectomies, and 38 enucleations. The underlying diagnosis, the pancreatic procedure, and the 30-day mortality were ascertained. Outcomes for 1996-2003 were compared to those for 2004-09.

**RESULTS:** The number of patients undergoing pancreatic operations increased significantly ( $p < 0.01$ ) from 90/yr in 1996-03 to 212/yr in 2004-09. Interestingly, no change was observed in the spectrum of disease: perimampullary cancer 37 vs 38%, chronic pancreatitis 20 vs 17%, and cystic neoplasms 20 vs 17%. However, the types of procedures changed with an increase in pancreatoduodenectomy (50 vs 55%,  $p < 0.03$ ) and a decrease in pancreas preservation procedures (pancreatojejunostomy, Beger/Frey, central, enucleation) (21 vs 14%,  $p < 0.01$ ). In addition, pylorus preservation (64 vs 82%,  $p < 0.01$ ), splenic preservation (2 vs 23%,  $p < 0.001$ ), and distal pancreatectomy performed laparoscopically (0 vs 32%,  $p < 0.001$ ) all increased in 2004-09. Moreover, 33% of 98 distal pancreatectomies, pancreatojejunostomies, enucleations and central

pancreatectomies as well as 5% of 131 pancreatoduodenectomies were performed laparoscopically this past year. Finally, 30-day mortality has improved from 2.5% in 1996-2003 to 1.7% in 2004-09.

**CONCLUSIONS:** These data suggest that in the modern era of pancreatic surgery 1) the spectrum of disease has not changed but 2) relatively more pylorus preservation with pancreatic head resections, splenic preservation with distal pancreatectomy and laparoscopic pancreas preserving procedures are being performed. We conclude that patients with pancreatic disease requiring surgery have benefited from regionalization.

### NOTES

### 12. SURVEILLANCE AFTER SURGICAL TREATMENT OF MELANOMA: FUTILITY OF ROUTINE CHEST RADIOGRAPHY

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**PURPOSE:** Current recommendations by the National Comprehensive Cancer Network and other groups suggest that follow-up of Stage IB and higher cutaneous melanoma may include chest radiography (CXR) at 6-12 month intervals. However, the utility and clinical impact of CXR as a tool in melanoma recurrence surveillance has been called into question. The aim of this study was to determine the clinical efficacy of routine CXR for recurrence surveillance in cutaneous melanoma.

**METHODS:** Post-hoc analysis was performed on data from a prospective, randomized, multi-institutional study on melanoma  $\geq 1.0$  mm in Breslow thickness. All patients underwent local tumor excision and sentinel node biopsy, with yearly CXR and clinical assessment during follow-up. Results of routine CXR were compared with clinical disease states over the course of the study.

**RESULTS:** 3619 patients were enrolled, and over a median follow-up of 67 months (range 1-135), 459 patients (17.8%) had a recurrence, most commonly regional lymph nodes followed by solid organs. Review of CXR results (see Table) showed that 4226 CXR were obtained in 1241 patients either prior to, or in the absence of initial recurrence. To date, 88% (n=3729) of CXR are associated with no evidence of recurrence. In patients who recurred, only 7.6% (n=38) of surveillance CXRs "abnormal". Overall, 99.2% (n=4188) CXRs were read as "normal" or found to be false positive (read as "abnormal", but without evidence of recurrence upon investigation). Only 0.9% (n=38) of all CXRs obtained were true positives ("abnormal" CXR, with confirmed first known recurrence). Among these true-positives, 35 patients had widely disseminated disease (multi-organ or bilateral pulmonary metastases). Only three patients (0.2% of patients) had isolated pulmonary metastases amenable to resection. Sensitivity and specificity for surveillance CXR in detecting initial recurrence were 7.6% and 96.5% respectively.

**CONCLUSIONS:** The routine use of surveillance CXR provides no clinically useful information in the follow-up of patients with melanoma. CXR does not detect recurrence at levels sufficient to justify its routine use and, therefore, cannot be recommended as part of the standard surveillance regimen for these patients.

**Table: Chest Radiograph (CXR) Result vs. Disease State**  
**CXR Result (n=4226)**

Disease State	Abnormal	Normal	Totals
Recurrence (CXR Obtained Prior to First Recurrence)	38	459	497
No Recurrence while undergoing CXR Surveillance	130	3599	3729
<b>Totals:</b>	168	4058	

**NOTES**

**13. MALPRACTICE LITIGATION FOLLOWING THYROIDECTOMY: THE ROLE OF RECURRENT LARYNGEAL NERVE INJURIES, 1989 TO 2009**

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**PURPOSE:** Recurrent laryngeal nerve (RLN) injuries remain a concerning complication for both surgeons and patients. RLN monitoring has gained popularity in recent years despite a lack of evidence showing decreased rates of RLN injury when it is used. Given the increasing rates of thyroidectomies performed annually in the US, we sought to explore malpractice litigation with respect to RLN monitoring.

**HYPOTHESIS:** With greater public awareness and surgeon use of RLN monitoring, we hypothesize an increase in its use in malpractice litigation in thyroid surgery.

**METHODS:** Using the LexisNexis legal database, a retrospective review of all federal and state cases decided by jury trial was performed using the search terms “thyroid,” “surgery,” and “medical malpractice.” Data selected from 1989 to 2009 was compiled including patient name, year and state of the court’s decision, outcome of the trial, type of complication, any mention of RLN monitoring, and jury awards.

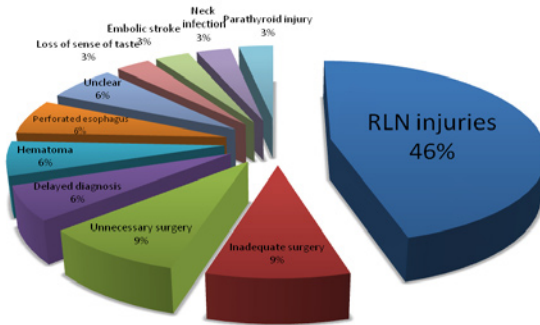
**RESULTS:** One hundred forty-three medical malpractice cases from the search were retrieved. After review, many cases involved an unrelated issue and simply noted previous history of thyroidectomy; others involved RLN injury after other neck procedures such as cervical spine discectomy. A total of 33 cases in which the alleged negligence occurred following a thyroidectomy were used for analysis. 15 (46%) of these involved RLN injury (see graph). Five cases involved bilateral injury, five were unilateral and five were unspecified. Interestingly, no mention of RLN monitoring was noted in any of the 33 cases. Seven cases ruled in favor of the patient, and eight in favor of the surgeon. Interestingly, in the five cases with bilateral RLN injury, four favored the surgeon, whereas of the unilateral injuries, three decisions favored the patient. The jury awards granted for the seven cases ruling in the

patient's favor ranged from \$150,000 to \$3.7 million.

**CONCLUSIONS:** Although RLN monitoring has become more pervasive in the public arena, there is no evidence that its use or nonuse has played a role in malpractice litigation in the last 20 years. RLN injury remains a cause of malpractice litigation.

**NOTES**

**Sources of Litigation After Thyroid Surgery**



**NOTES**

**14. ANTIPLATELET AGENTS, COUMADIN AND EPIDEMIC INTRACRANIAL HEMORRHAGE**

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**PURPOSE:** Over the past decade 1) reliance on CHADS2 scores to indicate Coumadin in AFib and 2) the use of strong anti-platelet agents in vascular disease have increased the prevalence of anticoagulation in the elderly. We studied the relationship of traumatic intracranial hemorrhage (TICH) to anticoagulation (AC) in that period in a stable, medically well-served population.

**METHODS:** We performed retrospective review and analysis of TICH patients aged  $\geq 55$  treated at a Level I Trauma Center (TC) during the index periods 1999-2000 (T1) and 2007-2008 (T2). Demographics; presence and type of AC as well as indications for AC and outcomes were studied. Chi-squared analysis was performed.

**RESULTS:** A total of 526 patients age  $\geq 55$  with TICH were seen in T1 and T2. Mean age was identical (77.6 in T1 vs 77.5 in T2, NS). The rate of elderly TICH in our total TC population doubled from T1 to T2 (6.2% vs 12.3%  $p < 0.0001$ ). There was a marked increase in the use of strong anti-platelet agents (Plavix / Aggrenox) in the elderly TICH population between T1 and T2 (2.2% vs 10.3%  $p = 0.002$ ). Surprisingly, we found no increase in AFib or in coumadin use in TICH and there was no change in CHADS2 scores in all AFib patients or in the AFib patients on AC between T1 to T2. Overall mortality rate of TICH remained the same between T1 and T2 (12.4% vs. 12.2%, NS). Mortality of TICH was higher on coumadin than off AC in T1 (26.1% vs 7.9%,  $p = 0.04$ ). Current mortality on Coumadin has fallen and is only marginally higher than off AC (14.9% vs 11.8%,  $p = 0.44$ ). The mortality of TICH on strong anti-platelet agents is now similar to mortality on coumadin (15% vs. 17%, NS).

**CONCLUSIONS:** There is an epidemic of TICH in the elderly. Where Coumadin use for AFib is well-established strong anti-platelet agents are catching up as risk factors. Where CHADS2 scores are still increasing

coumadin use, TICH in the elderly may increase even more. Aggressive reversal of coumadin-related AC may be improving TICH outcomes but strong anti-platelet agents are difficult to reverse and are increasing causes of death and disability in TICH.

**NOTES**

**15. A SINGLE INSTITUTION'S EXPERIENCE WITH SILS CHOLECYSTECTOMY COMPARED TO STANDARD LAPAROSCOPIC CHOLECYSTECTOMY**

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**PURPOSE:** The advent of natural orifice transluminal endoscopic surgery (NOTES) and single incision laparoscopic surgery (SILS) has brought renewed attention to cholecystectomy due to the promise of improved cosmesis and less parietal trauma. Small series have demonstrated the feasibility of SILS. Our series adds to the literature by demonstrating a variety of ancillary techniques that may be employed to perform SILS safely, and compares our early SILS experience to that of our laparoscopic cholecystectomies.

**METHODS:** We performed a retrospective chart review of patients who underwent SILS cholecystectomy between the dates of 2/15/2008 and 4/1/2009. These patients were compared to an equal number of randomly selected patients undergoing laparoscopic cholecystectomy during the same period. We identified twenty-five attempted SILS cholecystectomies which were included in our analysis.

**RESULTS:** SILS cholecystectomy was successfully performed in twenty-one patients, with only four patients requiring conversion to LC. No patients in either group had acute cholecystitis. The critical view of safety was documented in twenty of twenty-one patients undergoing a successful SILS cholecystectomy compared to all patients undergoing LC or SILS converted to LC. Operative time was significantly longer in the SILS group. Complications were minor and comparable between the SILS and laparoscopic cholecystectomy groups. In nine patients (43%) a suture passer helped retract the gallbladder. In eight patients (38%) one or two prolene sutures placed by means of a Keith needle helped retract the gallbladder over the liver and/or helped retract the infundibulum. In two patients at least one supplemental 5mm port was utilized. In five patients (24%) no supplementary retraction was necessary.

**CONCLUSIONS:** SILS cholecystectomy is technically more challenging than LC, but can be performed safely by experienced laparoscopic surgeons with results comparable to LC. Ancillary techniques may improve the safety of SILS cholecystectomy by insuring that the critical view of safety continues to be obtained.

Table. Results

	<b>SILS (n=25)</b>	<b>LC (n=25)</b>	<b>p value</b>	<b>stat</b>
<b>Operative time (min)</b>	100.76	64.52	.000	T-Test
<b>EBL (ml)</b>	14.20	8.80	.351	T-Test
<b>Critical view</b>	24	25	***	Chi-square
<b>Pain on discharge (1-10)</b>	2.53	2.72	.724	T-Test
<b>Complications</b>	3 readmissions	1 pneumonia 1 retained CBD stone		
<b>LOS (days)</b>	.20	.28	.590	T-Test

**NOTES**

### 16. GASTROESOPHAGEAL REFLUX DISEASE AFTER LUNG TRANSPLANTATION: PATHOPHYSIOLOGY AND IMPLICATIONS FOR TREATMENT

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**PURPOSE:** Gastroesophageal Reflux Disease (GERD) is thought to be a risk factor for the development or progression of chronic rejection after lung transplantation. However, the prevalence of GERD and its risk factors of hiatal hernia and gastroparesis after lung transplantation are still unknown. In addition, the prevalence of Barrett's esophagus, a well-documented complication of GERD, has never been determined in these patients. The purpose of this study is to determine the frequency of these risk factors and complications of GERD in lung transplant patients.

**METHODS:** Thirty-five consecutive patients underwent a combination of esophageal function testing (esophageal manometry and pH-monitoring), upper endoscopy, barium swallow, and gastric emptying scan after single lung transplantation, double lung transplantation, or re-transplantation.

**RESULTS:** In this patient population, the prevalence of GERD was 51% (18/35 patients: 15 patients had GERD on pH-monitoring, whereas 3 patients had evidence of aspiration on bronchoscopy and refused pH-monitoring). Among these patients with GERD, 4 patients have already been re-transplanted, whereas none of the patients without GERD required re-transplantation (22% vs. 0%,  $p < 0.05$ ). The prevalence of biopsy-confirmed Barrett's esophagus was 12% (2/16 patients: 1 patient with scleroderma and 1 with emphysema). No patient demonstrated hiatal hernia on barium swallow (0/15 patients). The prevalence of gastroparesis was 36% (5/14 patients: 2 patients with alpha-1 antitrypsin deficiency, 1 with idiopathic pulmonary fibrosis, and 2 with cystic fibrosis).

**CONCLUSIONS:** Our study shows that after lung transplantation: (a) half of patients had GERD, and that GERD was more common after

re-transplantation; (b) Barrett's esophagus is as frequent as it is in the general population with GERD; (c) conversely, hiatal hernia is rare; and (d) gastroparesis is present in more than one-third of the patients. We conclude that GERD is frequent after lung transplantation, and that gastroparesis and Barrett's esophagus should always be suspected after lung transplantation, as they are common risks factors and complications of GERD in this patient population.

### NOTES

**17A. TIME FROM DIAGNOSIS TO DEFINITIVE SURGICAL TREATMENT OF OPERABLE BREAST CANCER IN THE ERA OF MULTIMODAL IMAGING**

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**PURPOSE:** In the last decade, the surgical management of breast cancer has changed, due in part to the use of multimodal breast imaging (mammography, ultrasound, and MRI). However, the benefit of this information is controversial. An argument against the routine use of additional imaging modalities is that it lengthens the time between diagnosis and surgery. The primary objective of this study is to determine if the use of multimodal breast imaging has influenced the time between the diagnosis of an operable breast cancer and definitive surgery over the past decade. A secondary objective was to determine if a higher number of biopsies, imaging studies, or specifically MRIs lead to a higher chance of having a mastectomy.

**METHODS:** Patients treated at a large academic medical center with operable breast cancer between February 1, 1998 and August 31, 2009 with complete medical records were retrospectively reviewed. Three 6-month periods were identified at 5-year intervals, and fifty patients from each group were randomly selected.

**RESULTS:** Time to treatment significantly increased over the study time period (mean of 21.8 days in 1998, 31.3 days in 2003, 41.1 days in 2008, 1998 vs 2003  $p = .005$ , 1998 vs 2008  $p = <.001$ , 2003 vs 2008  $p = .013$ ). As the number of imaging studies increased, so did the time to treatment (mean number of days for zero biopsies 23.2, for 1 biopsy 32.6, for 2 biopsies 42.4, and for 3 or more biopsies 54.9. 0 vs 1 biopsies:  $p = .027$ , 0 vs 2 biopsies:  $p = <.0001$ , 0 vs  $\geq 3$  biopsies:  $p = <.0001$ , 1 vs 2 biopsies:  $p = .04$ , 1 vs  $\geq 3$  biopsies:  $p = .0007$ , 2 vs  $\geq 3$  biopsies:  $p = .04$  Correlation Coefficient 0.52). In 2008, the only study year in which MRI was routinely used, patients with an MRI had a longer median time to treatment of 43 vs. 32 day days for those who did not ( $p$ -value 0.054). Neither a higher number of biopsies, a higher

number of imaging studies, or the addition of an MRI to the diagnostic work-up were significantly associated with a higher chance of having a mastectomy ( $p$ -values 0.10, 0.58, and 0.33).

**CONCLUSIONS:** The time to treatment of operable breast cancer has increased over the past 10 years. Multimodal breast imaging is associated with this increase. MRI is also associated with a treatment delay. The effect of this increase on the type of surgery chosen and the impact on subsequent outcomes is unknown. Greater understanding of the benefits and risks of these imaging modalities is needed.

**NOTES**

### **18A. PSEUDOANGIOMATOUS STROMAL HYPERPLASIA OF THE BREAST: A CONTEMPORARY APPROACH TO ITS CLINICAL AND RADIOLOGIC FEATURES AND IDEAL MANAGEMENT**

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Loyola University Medical Center, Maywood, IL

**PURPOSE:** Pseudoangiomatous stromal hyperplasia (PASH) is a benign proliferative lesion of the breast first described in 1986 by Vuitch, but the clinical relevance, presentation and optimal treatment remains incompletely described. Case reports and small series have been reported, but no scientifically derived standard exists for appropriate management. To our knowledge, this is the largest series reported in the surgical literature. We review the clinical, radiologic and histopathologic features and appropriate management of this unusual condition.

**METHODS:** Clinical records of 80 patients diagnosed with PASH between 2000 and 2009 were retrospectively reviewed. Review of data included analysis of pertinent clinical, radiologic, histopathology studies and follow-up data.

**RESULTS:** We identified PASH in 80 patients over a nine year period. Mean follow-up was 3.34 years (0.45-9.42). Age ranged from 12 to 65 years with a mean of 43.2 years and 95% were female. 72% were premenopausal and 79% had a history of oral contraceptive use. Lesions were palpable in 45/80 (56%) and the remainder were found on suspicious mammographic, ultrasound or magnetic resonance imaging (MRI). Four males were found to have a diagnosis of gynecomastia with PASH in final pathology. Core biopsy was performed in palpable or radiologically visible lesions in 65/80 (81%). In 42/65 (65%) patients, PASH was diagnosed by core-needle biopsy and in 38/80 (47%) it was diagnosed at the time of surgical excision. Core biopsy failed to diagnose PASH in 35% that were ultimately found by excisional biopsy. Of lesions found by core biopsy, 27/65 (33.8%) were managed with observation versus 38/65 (58%) that underwent surgical excision. Those managed by observation had a recurrence rate of 7/27 (26%) versus a recurrence rate of 5/38 (13%) in the surgical excision group. A diagnosis of cancer or carcinoma in situ was seen in 30% at or before the diagnosis of PASH.

**CONCLUSIONS:** PASH may present as a palpable mass, radiologic lesion or incidentally in pathology specimens. Its clinical relevance and optimal treatment has been infrequently documented in the surgical literature. Since it can be mistaken for angiosarcoma inadvertently based on its microscopic appearance, a timely diagnosis is prudent for optimal management. Due to nonspecific findings on imaging, biopsy should be performed on all suspicious lesions to rule out malignancy. PASH is often seen with other benign lesions, but has also been seen amongst cancerous or precancerous lesions. Close surveillance is necessary given its recurrence rate of 13-26%. A diagnosis found on core biopsy in the absence of suspicious radiologic features may be managed with clinical follow-up and imaging in a six month interval. Growth, suspicious radiologic findings or inconclusive biopsy warrants surgical excision. Treatment should be based on certainty of the diagnosis as well as reliability of patient follow-up and preference of the physician.

### **NOTES**

**19A. VERIFICATION OF PROFICIENCY IN BASIC SKILLS FOR PGY1 RESIDENTS**

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**PURPOSE:** The American College of Surgeons (ACS) and the Association of Program Directors in Surgery (APDS) established a three-phase skills curriculum for all surgery residents. Phase I involves basic surgical skills instructional modules, and a Verification of Proficiency (VOP) assessment. The purposes of this project are to study and refine the beta versions of the Phase I VOP instruments, as a first step towards developing a national proficiency examination for basic surgical skills in PGY1 residents.

**METHODS:** After undergoing teaching and practice sessions in our skills lab, all PGY1 residents from general surgery and four surgical specialty programs were tested on the 11 non – specialty specific basic surgical skills prior to performing these in clinical situations. Performances were videotaped with an automated video capturing system. Deidentified videos were scored by surgical faculty on the system's web-based interface, using the ACS / APDS VOP Rating Forms. These include a checklist for feedback purposes, a global rating of time and motion, and an overall final rating stating whether the individual demonstrates proficiency or requires additional practice. Residents scored as needing additional practice on this final rating were deemed to have failed that VOP. The data were analyzed to elicit patterns of results in the ratings.

**RESULTS:** 23 residents underwent VOP assessment over a two year period. The pass rates are summarized below. In total, 15 (65%) residents failed at least one module, 11 (48%) failed at least two modules and only 8 (35%) passed all VOP modules at the first attempt. 9 (75%) residents failed two or more VOPs in 2008 compared with only 2 (18%) in 2009 (P<.05). Residents who failed underwent a period of remediation and subsequently retested until deemed proficient. Scrutiny of the scoring patterns revealed inter-rater differences in a number of check list items, particularly in knot tying skills.

**CONCLUSIONS:** More focused skills instruction and rater training occurred in 2009, due to concern at the high failure rate in 2008. These interventions may explain the improved pass rate from 2008 to 2009. The ease of use and feasibility of these evaluations is essential for widespread acceptance as part of the ACS/APDS curriculum. As a method of formative evaluation, VOP provides a framework to determine individual learner progress towards proficiency in the skills laboratory. The inter rater differences identified during the study will provide invaluable information towards refining the beta versions of the VOP instruments as a step closer to developing a national final proficiency examination for basic surgical skills in PGY1 residents

VOP	Pass Rate 2008	Pass Rate 2009
Chest drain	100%	100%
Airway	83%	73%
Central line	75%	72%
Sub cuticular	91%	100%
Vertical mattress	100%	91%
Simple interrupted	83%	91%
Deep one handed knot	58%	91%
Surface one handed knot	66%	100%
Deep two handed knot	66%	100%
Surface two handed knot	75%	100%
Instrument tie	83%	91%

**NOTES**

**NOTES****20A.** DO PRE-CLINICAL BACKGROUND AND CLERKSHIP EXPERIENCE IMPACT SKILLS PERFORMANCE IN AN ACCELERATED INTERNSHIP PREPARATION COURSE FOR SENIOR MEDICAL STUDENTS?

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**PURPOSE:** Dedicated skills courses for 4th year medical students (MS) may help prepare MS for surgical internship, especially since technical skills development in medical school is highly variable. We analyzed the impact of pre-clinical background and clerkship experience on skills confidence and performance in a 4th year MS internship preparation course.

**METHODS:** A comprehensive skills course for senior MS matching in a surgical specialty was conducted each spring from 2006 through 2009 over several weekly sessions. Students were surveyed pre-course for background skills (eg music, athletics) and clerkship experience, and pre- and post-course for their confidence in performing various tasks. Student were assessed with five suturing and knot tying tasks pre- and post-course and a final written exam. Data are mean  $\pm$  SD and statistical analyses were performed by two tailed t test, linear regression, and ANOVA.

**RESULTS:** Sixty-five 4th year students were enrolled (38 male, 27 female). Most common specialties were general surgery (N=22) and orthopedics (N=16). 35 students were elite level musicians (N=16) or athletes (N=19) and 8 were regular video gamers. Total night call experience 3rd year was  $23.3 \pm 10.7$  nights ( $7.3 \pm 4.3$  surgical call) and 4th year  $10.5 \pm 7.4$  nights ( $7.2 \pm 6.8$  surgical call). Students reported limited experiences with first call responsibility for in-hospital pts (43% had zero experience) or presenting an acute on-call pt problem to a resident or attending (18% had zero experience). Suturing task times improved significantly from pre- to post-course for all 5 tasks (total combined task times pre-course  $805 \pm 202$  sec vs post-course  $627 \pm 168$  sec ( $p<0.0001$ )). Confidence levels for 8 skills categories including management of on-call problems also improved significantly ( $p<0.05$ ). Written final exam proficiency (score  $\geq 70\%$ ) was achieved by 81% of

students. Pre-course background variables significantly associated with outcome measures were: athletics with pre-course suturing and one-handed knot tying ( $p < 0.05$ ); planned specialty tying with an instrument pass ( $p = 0.012$ ); suturing confidence levels and pre-course suturing and total task times ( $p = 0.024$ ); and number of nonsurgical call nights with confidence in managing acute on-call problems ( $p = 0.028$ ). No significant correlation was found between background variables and post-course performance.

**CONCLUSIONS:** Completion of an accelerated senior MS skills course results in comparable levels of student performance post-course across a variety of pre-clinical backgrounds and clerkship experience. Further studies are needed to analyze student night call experience and whether such experience is adequate preparation for surgical internship.

### NOTES

### 21A. REVIEW OF OUTCOMES OF PRIMARY LIVER TUMORS IN CHILDREN: OUR INSTITUTIONAL EXPERIENCE WITH RESECTION AND TRANSPLANTATION

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**PURPOSE:** Surgical intervention plays a significant role in the management of primary liver cancer in children. Recent improvements in diagnostic modalities, pre- and post-operative chemotherapy, and surgical technique have all led to improved survival in these patients. Both hepatic resection and orthotopic liver transplantation are effective operations for pediatric liver tumors, and the decision of which intervention to pursue is based upon pre-operative extent of disease. This is a review of our institution's experience with operative management of pediatric liver cancer over an 18-year period.

**METHODS:** A retrospective chart review from 1990 to 2007 identified patients who were 18 years old or younger who underwent an operative intervention for primary liver cancer. Demographics, type of operation, intra-operative details, pre- and post-operative management, as well as outcomes were recorded for all patients. Standard statistical methods were used for comparison and outcome analyses.

**RESULTS:** Fifty-seven patients underwent operative intervention for primary liver cancer, 30 of which underwent resection, with the remaining 27 undergoing orthotopic liver transplantation. The mean age at diagnosis was 45.6 months. Twenty patients had Stage 1 or 2 disease and 36 patients had stage 3 or 4 disease. Fifty-one (89%) patients received pre-operative chemotherapy. Post-operative chemotherapy was given to 92% of patients. Mean overall and intensive care unit length of stay were 16.2 and 5.8 days, respectively. 31% of patients had a post-operative complication, including hepatic artery thrombosis ( $n = 6$ ), biliary stricture ( $n = 2$ ), incarcerated omentum ( $n = 1$ ), Horner's syndrome ( $n = 1$ ), urosepsis ( $n = 1$ ), and pneumothorax ( $n = 1$ ). Only three patients had a recurrence of their cancer. There was one peri-operative mortality from cardiac arrest. Disease-specific survival was 90%.

**CONCLUSIONS:** Operative intervention plays a critical role in the management of primary liver cancer in the pediatric population. Neoadjuvant chemotherapy can be given if the tumor seems unresectable at diagnosis. If chemotherapy is unable to downstage the tumor, orthotopic liver transplantation becomes the patient's best option. Our institution has had considerable experience with both resection and liver transplant in the treatment of pediatric primary liver cancer, with good long-term outcomes.

**NOTES****22A. TRENDS IN AGE FOR HEPATOPORTOENTEROSTOMY IN THE UNITED STATES: ANALYSIS OF THE KIDS' INPATIENT DATABASE**

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**PURPOSE:** Biliary atresia is a rare but devastating disease for which hepatoportoenterostomy (HPE) remains the primary surgical intervention. Increased age at the time of HPE has been associated with an unfavorable outcome. In this study we examine trends in age at the time of HPE and explore factors associated with more timely diagnosis and treatment.

**METHODS:** Patients undergoing HPE for biliary atresia were identified in the Kids' Inpatients Database from 1997, 2000, 2003, and 2006. Mean age at surgery among the various eras was compared using an analysis of variance. Patient and hospital factors associated with later treatment were compared using a logistic regression model for HPE before or after 60 days of life.

**RESULTS:** Of 192 patients, 13.5% had surgery in 1997, 13.5% in 2000, 36.5% in 2003, and 36.5% in 2006. Median age at surgery was 64 days in 1997, 57.5 days in 2000, 69 days in 2003, and 64 days in 2006 ( $P=0.80$ ). Hispanic and African-American patients were more likely to undergo HPE after 60 days of life compared to white patients (OR 3.6 95%CI 1.1-11.7  $P=0.04$ , OR 2.0 95%CI 0.7-5.5,  $P=0.19$ ). Compared to hospitals in the Biliary Atresia Research Consortium (BARC), non-BARC hospitals trended toward delayed HPE (OR 2.3 95%CI 0.9-6.2,  $P=0.10$ ). Eight-nine percent of patients were treated at non-BARC hospitals and 71% were treated at non-children's hospitals.

**CONCLUSIONS:** While early HPE is associated with improved outcomes for children with biliary atresia, our study shows the mean age at surgery has not significantly changed over two decades. Socioeconomic factors, along with hospital and clinical factors, play a role in the early treatment of biliary atresia.

**NOTES**

**NOTES****23B. IMPACT OF STANDARDIZED TRAUMA DOCUMENTATION TO THE HOSPITAL'S BOTTOM LINE**

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**PURPOSE:** The dichotomy between clinical and hospital revenue generation for delivery of trauma care is well established. Many trauma programs require hospital support for fiscal survival. We evaluated the impact of standardized clinical documentation to the hospital's bottom line at our ACS Verified Level I trauma center.

**METHODS:** Standardized documentation for initial contact, subsequent contact and critical care were created with a focus on accuracy and efficiency. Documentation was completed jointly by residents and faculty following standard guidelines of linkage. Trauma service characteristics, case mix index (CMI), reimbursement rate, payer distribution, and hospital revenue were compared before and after standardization. Analysis was performed using Microsoft Excel®.

**RESULTS:** A 24 % increase in Net Income, constituting \$1.45 million, was realized from the prior fiscal year despite a 12% reduction in patient volume. Per admission profitability was increased by 42%. Collection rates and payer mix were unchanged. Contracts did not undergo significant renegotiation. Statistically significant increases in both ISS and CMI were seen ( $p < 0.05$ ) following program implementation in November of FY 09. LOS was significantly reduced.

**CONCLUSIONS:** Standardized trauma documentation results in significant fiscal gains through more appropriate Case Mix Index determination. Case Mix Index mirrors increases in ISS. Added benefits of reduction of LOS were also seen and are attributed to a program based standardized team approach to trauma care delivery.

INSERT GRAPH 217

**NOTES**

### **24B.** A NOVEL METHOD OF PROGRESSIVE TEMPORARY ABDOMINAL CLOSURE

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**PURPOSE:** To describe our experience with a novel method of temporary abdominal closure (TAC) that permits frequent reassessment of the abdominal contents and progressive reapproximation of the fascial edges without compromising definitive fascial closure outcomes.

**METHODS:** We have developed a novel method of TAC, a Frequent Assessment Temporary Abdominal Closure (FASTAC), by suturing a plastic drape to the fascia and using the drape tails to prevent fascial adhesions to the underlying abdominal contents. The records of all patients who underwent planned relaparotomy at a tertiary referral hospital between January 2003 and December 2008 were reviewed. Data collected included patient demographics (age, gender), indication for operation, number of operations, length of TAC placement, hospital length of stay (LOS), method of definitive abdominal closure, and subsequent ventral hernia repair. Data are as expressed mean  $\pm$  standard error.

**RESULTS:** One hundred and thirty three patients underwent 308 TACs, including 16 patients who had a FASTAC placed for open abdomen management. There were no differences in age or gender distribution between FASTAC and TAC patients. FASTAC remained in place for a significantly longer period than TAC ( $12.8 \pm 1.6$  days vs.  $6.93 \pm 0.83$  days,  $p=0.02$ ), allowing for more frequent relaparotomy ( $4.13 \pm 0.85$  vs.  $1.36 \pm 0.2$ , FASTAC vs. TAC,  $p<0.001$ ). Primary closure, skin grafting, and dermal substitute use rates in patients in whom FASTAC was utilized were not significantly different from those not receiving FASTAC. There was no difference in the number of subsequent hernia repairs in patients receiving FASTAC vs. TAC. FASTAC patients had a significantly longer LOS during initial admission ( $52.4 \pm 8.2$  days vs.  $26.4 \pm 1.7$  days, FASTAC vs. TAC,  $p<0.001$ ), suggesting selective FASTAC placement in a more complicated patient population. Materials for FASTAC incurred a hospital charge of only \$38 compared to \$350 for a large piece of Silastic, the most commonly placed TAC in our institution.

**CONCLUSIONS:** In the patient with a complex open abdomen, FASTAC is a novel, cost-effective method of TAC that allows for frequent bedside intra-abdominal surveillance, maintains abdominal domain, and does not compromise abdominal closure outcomes

### **NOTES**

**25B. PARATHYROIDECTOMY FOR HYPERCALCEMIC CRISIS: 40 YEARS' EXPERIENCE AND LONG-TERM OUTCOMES**

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**PURPOSE:** Hypercalcemic crisis is an uncommon but serious and potentially life-threatening complication of markedly elevated serum calcium levels most commonly due to sporadic primary hyperparathyroidism (SPHPT). The purpose of this study is to evaluate the results and long-term outcomes of patients surgically treated for hypercalcemic crisis.

**METHODS:** The records of 1310 patients with SPHPT who underwent parathyroidectomy at a single institution from April 1970 through July 2009 were reviewed. Patients treated for secondary, tertiary, or familial hyperparathyroidism were excluded. From this group, 88 patients were surgically treated for hypercalcemic crisis, defined as having signs and symptoms of acute calcium intoxication and serum calcium levels  $\geq 14$  mg/dL. Pre- and post-operative symptoms and laboratory values and rates of operative failure and recurrence were compared to 1222 patients without crisis. Operative failure was defined as elevated serum calcium and parathyroid hormone (PTH) within 6 months of operation. Recurrence was defined as elevated serum calcium and PTH levels after 6 months of post-operative eucalcemia.

**RESULTS:** Mean preoperative serum calcium (15.6 vs. 11.8 mg/dL) and PTH (792 vs. 231 pg/mL) levels were significantly higher among patients presenting with hypercalcemic crisis ( $p < 0.0001$ ). Postoperatively, the mean calcium levels were similar (9.54 vs. 9.47 mg/dL,  $p = 0.4$ ), although PTH levels were higher in the crisis group (86.5 vs. 56.6 pg/mL,  $p = 0.004$ ). Alteration in mental status as a presenting symptom was significantly more prevalent among those in crisis (12.5% vs. 2.8%,  $p < 0.0001$ ), as was pancreatitis (3.4% vs. 0.2%,  $p = 0.003$ ). The crisis patients were more likely to have an ectopic gland in the mediastinum (10.2% vs. 2.4%,  $p = 0.001$ ), significantly larger glands (2.4 vs. 1.7 cm,  $p < 0.0001$ ) and parathyroid carcinoma (4.5% vs. 0.6%,  $p = 0.004$ ). Crisis patients had a lower rate of operative success

81/88 (92%), compared to 1185/1222 (97%) in the non-crisis patients ( $p = 0.02$ ). Of the 7 crisis group operative failures, 2 were due to missed additional glands in multiglandular disease; 2 were due to parathyroid carcinoma; 1 was a misdiagnosis of sarcoidosis; 1 was a misdiagnosis of unknown etiology; 1 was an ectopic retropharyngeal gland. There was no difference in recurrence rates (2.3% vs. 2.1%,  $p = 0.7$ ). Mean overall follow-up was 59 months.

**CONCLUSIONS:** Hypercalcemic crisis patients are appropriately treated by expeditious parathyroidectomy, but have slightly lower rates of initial operative success than non-crisis SPHPT patients. The lower success rates mostly appear to be due to reasons not specific to hypercalcemic crisis. In this series however, long-term results demonstrate similar serum calcium levels between crisis and non-crisis patients at a mean follow-up of nearly 5 years.

**NOTES**

**26B. ROBOTIC DISTAL PANCREATECTOMY: COST-EFFECTIVE?**

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**PURPOSE:** Minimally invasive surgical techniques in pancreaticobiliary surgery have been increasingly used in the past decade. This is most evident with regard to resection of the distal pancreas. Robotics is being used by some centers to further develop the existing laparoscopic experience. Advanced laparoscopic and robotic technology is not inexpensive. However, we hypothesized that laparoscopic and robotic distal pancreatectomy are cost-effective. To investigate this, we compared the direct costs and short term outcomes associated with concurrent open, laparoscopic and robotic distal pancreatectomies performed during a 1 year period at a single institution.

**METHODS:** Between August 2008 and August 2009, 77 distal pancreatectomies were performed at a single, high volume, tertiary, academic medical center. All resections were performed using standard open, laparoscopic, or robotic approaches. Retrospective analysis of prospectively collected patient data was undertaken regarding patient demographics, short term outcomes, and direct cost.

**RESULTS:** In the study period there were 32 open, 28 laparoscopic, and 17 robotic distal pancreatectomies performed. Patient age, ASA score and pancreas specimen length were equivalent in all 3 groups. The indication for operation varied with laparoscopic (conventional and robotic) cases having a greater percentage of patients with cystic neoplasms (49%) and fewer patients with malignancy (29%) compared to open cases (16% and 47%, respectively). (see results table)

**CONCLUSIONS:** Cost-effectiveness is one of the practical burdens associated with the introduction of surgical innovation. This study examines an initial experience with robotic distal pancreatectomy compared to concurrent conventional laparoscopic and open approaches. Differences in the spectrum of disease limit comparisons to the open group. Nonetheless, these data indicate that direct

hospital costs are comparable between all groups. They also suggest a shorter length of hospital stay in patients undergoing robotic versus conventional laparoscopic or open approaches. Finally, these data indicate a higher spleen and splenic vessel preservation rate with a robotic approach at the expense of increased operative time. In summary, a robotic approach to distal pancreatectomy is safe and cost-effective.

Approach	Spleen preserved	Splenic A/V preserved	Conversion	EBL (ml)	OP time (min)	LOS (days)	Morbidity	Mortality	Total Cost
Open	12%	9%	NA	681	245	8	29%	3%	\$16,059
Lap	29%†	18%	14%	667	222	6†	32%	0%	\$12,986
Robot	65%*†	65%*†	6%	279	298*†	4*†	18%	0%	\$10,588

\* vs Lap p<0.05; † vs Open p<0.05

**NOTES**

### **27B. COLLATERAL DAMAGE: THE EFFECT OF PATIENT COMPLICATIONS ON THE SURGEON'S PSYCHE**

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**PURPOSE:** To investigate the effect of complications on the surgeon's emotional state, clinical performance, and characterize coping mechanisms.

**METHODS:** A 21-question survey was distributed to the membership of the Midwest Surgical Society and to attending surgeons of various subspecialties within the Grand Rapids community. Responses to the survey were anonymous. Significance was assessed at p-value less than 0.05.

**RESULTS:** There were 104 respondents (89.3% male, with a mean age of 52 years), with a response rate of 26%. The average number of years in practice was 19.2, with 76.5% of the time spent in clinic work and 46.4% of the time spent performing procedures. Most respondents trained in an academic program (41.3%), followed by 34.6% in a hybrid community program with academic affiliation and 28.8% in a community program. A clinical fellowship was completed by 58.3%. The primary areas of current practice included general surgery (70.2%), trauma (36.5%), critical care (26.9%) and vascular surgery (16.3%). The majority of participants experienced their first patient complication that had a significant emotional impact on them during residency (52.9%). Most respondents felt that this did not impair their professional functioning (76.9%), while 11.6% felt that it did. Broken down by gender, 15% of the men and 0% of the women responded that the complication affected their job performance ( $p = 0.35$ ). Further analysis showed that if a major complication was first experienced after residency, it had a higher likelihood of causing impairment ( $p < 0.008$ ). Surgeons dealt with complications by primarily discussing with a surgical partner or a family member 86.5% and 53.8% of the time, respectively. Alcohol use or other substance use increased in 4.8% of respondents as a result of a complication and its emotional impact. The majority of respondents (59.6%) felt it was difficult to handle the emotional effects of complications throughout their careers and this ability did not

improve with experience. However, 28.9% felt their ability to handle the emotional impact of complications has changed throughout their career and felt it is easier to deal with these effects.

**CONCLUSIONS:** This is the first study to examine the impact of complications on a surgeon's clinical performance. Surgeons from all specialties experience complications, but most develop coping mechanisms, with a low rate of alcohol or substance abuse. However, majority of respondents agreed that it was difficult to handle the emotional effects of complications throughout their careers. Perhaps a structured support system could be developed to assist surgeons in dealing with their emotional response to patients' complications.

### **NOTES**

**28B. IMPACT OF ANASTOMOTIC LEAK UPON OUTCOMES FOLLOWING ESOPHAGECTOMY**

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**PURPOSE:** Anastomotic complications are frequently encountered in the setting of esophagectomy. The development of anastomotic leaks and/or strictures can be associated with significant morbidity and impairment of quality of life. In the current study, we evaluated the outcomes of patients who developed anastomotic complications following esophagectomy to elucidate the impact of these events on morbidity, mortality and subsequent need for dilation.

**METHODS:** We retrospectively analyzed the clinical course of 185 patients undergoing transhiatal esophagectomy for cancer from 2001-2009. Patients with confirmed anastomotic leaks were identified and classified with the following scale:

Class 1: Radiographic leak only, No intervention

Class 2: Leak requiring opening of the wound, cervical drainage

Class 3: Significant disruption of anastomosis with peri-anastomotic abscess and associated pleural or mediastinal collection

Class 4: Gastric Tip Necrosis with anastomotic separation

Post-operative strictures were defined as a symptomatic anastomotic narrowing on barium swallow requiring two or more dilations. Primary surgical endpoints included leak management strategy, complications, mortality and need for dilation. Statistical comparisons were performed with the t-test and Fisher's exact test.

**RESULTS:** Transhiatal esophagectomy was performed in 185 patients (126 male, 59 female). Mean age was 64.5. Anastomotic leaks were encountered in 18 patients (9.7%); 13/19 (72.2%) were Class 1 or 2

leaks. Anastomotic leaks were associated with higher morbidity (83.3% vs. 48.5%, p=0.006), mortality (5.5% vs. 3.0%), and stricture formation (66.7% vs. 21.6%, p=0.0002). The only mortality among leak patients was a Class 4 leak. Increasing leak class is associated with an increased need for postoperative dilations [Table].

**CONCLUSIONS:** Anastomotic integrity following esophagectomy has a significant impact on perioperative course and long-term swallowing. Even radiographic leaks (Class 1) or those requiring cervical drainage only (Class 2) were associated with important post-operative morbidity compared to patients with no leak. In addition, the spectrum and extent of post-operative anastomotic leaks following esophagectomy appears to correlate with post-operative course. A more formal radiographic and endoscopic leak classification system appears justified.

**Table**

	n	Morbidity (%)	Mortality (%)	Stricture (%)	Dilations (mean)
Leak	18	15 (83.3%)	1 (5.5%)	12 (66.7%)	4.2
Class 1	9	6 (66.7%)	0 (0%)	6 (66.7%)	2.5
Class 2	4	3 (75%)	0 (0%)	2 (50%)	2.7
Class 3	3	2 (66.7%)	0 (0%)	3 (100%)	10
Class 4	2	2 (100%)	1 (50%)	1 (50%)	6
No Leak	167	81 (48.5%)	5 (3.0%)	36 (21.6%)	1.1

**NOTES**

**NOTES****29. POST-OPERATIVE PARATHYROID HORMONE TESTING REDUCES SYMPTOMATIC HYPOCALCEMIA AND ASSOCIATED EMERGENCY ROOM VISITS AFTER TOTAL THYROIDECTOMY**

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**PURPOSE:** The purpose of this study was to reduce symptomatic hypocalcemia and eliminate associated emergency room visits after thyroidectomy through the usage of quick parathyroid hormone (PTH) testing within 4 hours of surgery and a protocol to treat PTH deficient patients.

**METHODS:** After 1/1/06, 271 consecutive patients underwent total thyroidectomy with post-operative PTH testing (Group 1). Patients with PTH levels <10pg/ml were treated according to a newly instituted protocol with 0.25ug calcitriol BID and 2-6g of calcium carbonate daily for one week. Patients with PTH levels  $\geq$  10pg/ml were treated with calcium only. Group 2 consisted of 100 consecutive patients who had total thyroidectomy prior to 2006 who did not have PTH testing and were treated according to surgeon preference and serum calcium levels. The two groups were compared with regard to outcomes with ANOVA and Chi-squared (SPSS, Inc.).

**RESULTS:** Patients in the two groups were similar with regard to age, gender, and thyroiditis. However, patients in Group 1, who had PTH testing, had higher post-operative calcium levels ( $p < .005$ ). Also, patients in Group 2 had a higher rate of malignancy. Importantly, patients in Group 1 had a lower incidence of symptomatic hypocalcemia (7% vs. 17%,  $p = .005$ ). Furthermore, the number of patients who made visits to the ER was significantly lower in patients who had PTH testing compared to those who did not (1.8% vs. 8.0%,  $p = .008$ ).

**CONCLUSIONS:** Post-operative PTH testing reliably identifies patients at risk for hypocalcemia after thyroid surgery. Moreover, PTH testing reduces hypocalcemia and associated emergency room visits after total thyroidectomy. Therefore, patients with a post-operative serum PTH level <10pg/mL after thyroid surgery should be placed on calcitriol and calcium to prevent symptomatic hypocalcemia.

	Mean Age (years)	Percent Female Gender	Percent Malignancy	Percent Thyroiditis	Post-Op Calcium (mg/dL)	Symptomatic Hypocalcemia	ER Visits
Group 1	49 ± 2	79%	43 %	14 %	8.7	7%	1.8%
Group 2	44 ± 1	80%	54%	16%	8.5	17%	8.0%
p value	.40	.25	.04	.41	<.005	.005	.008

**NOTES**

**30. IS RESECTION OR INTERNAL DRAINAGE A MORE EFFECTIVE OPERATION FOR DISCONNECTED LEFT PANCREATIC REMNANT (DLPR) FOLLOWING PANCREATITIS?**

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**PURPOSE:** Up to 10% of patients develop discontinuity of their pancreatic duct after an episode of severe pancreatitis resulting in a disconnected left pancreatic remnant (DLPR) that presents clinically as obstructive pancreatitis, a pancreatic fistula, or a pancreatic pseudocyst. Surgical treatment options include: remnant resection via distal pancreatectomy [DP] with its short-term risk of perioperative complications and diabetes, or parenchymal-sparing internal drainage [ID] with its long-term risk of symptom recurrence. Given these temporally distinct risks, the optimal surgical option remains uncertain. This study is designed to analyze the overall effectiveness (both short + long-term) of surgery in patients with DLPR.

**METHODS:** A retrospective, IRB approved protocol identified all patients with radiographic confirmation of DLPR (CT + ERCP/MRCP) who had operation (DP or ID) at our tertiary care medical center between 11/1995 and 9/2008. Seventy-six patients were identified, 42 (55%) had DP and 34 (45%) had ID. Inpatient, outpatient, and outside medical records were analyzed for patient demographics, co morbidities, operative indications, operation, and postoperative clinical course as well as long-term outcome including: recurrent pancreatitis, pseudocyst, fistula, reoperation, postoperative diabetes, and survival. Follow-up was completed to July 2009 by outpatient clinic visit or telephone interview (mean F/U = 33 mos.). Outcomes were compared using a t-test for continuous variables, Fisher's exact test for categorical variables, with a p value < 0.05 taken as significant.

**RESULTS:** Etiology of DLPR was acute pancreatitis in 59 (73%) and chronic pancreatitis in 17 (22%). The median age was 52 yrs. (range 18-85) and 57% were male. Forty patients (53%) had pancreatic pseudocyst [24 (60%) DP, 16 (40%) ID]; 26 (34%) had a pancreatic fistula [13 (50%) DP, 13 (50%) ID]; and 10 (13%) had obstructive pancreatitis [5 (50%) DP,

5 (50%) ID]. There were no significant differences in periop morbidity (19% vs. 6%), 90-day mortality (0 vs. 0), or in-hospital length of stay (11 days vs. 9 days). Long-term outcomes are given below:

**CONCLUSIONS:** Both distal pancreatectomy (DP) and internal drainage (ID) have comparably low rates of perioperative morbidity, mortality, and hospital length of stay. Based on disease recurrence, reoperation rates, postop diabetes, and long-term mortality, both operations are equally effective options in patients with DLPR.

	Recurrent			Need for Reoperation	Postop Diabetes	Overall Mortality
	Pancreatitis	Pseudocyst	Fistula			
DP (N=42)	4 (10%)	1 (2%)	2 (5%)	2 (5%)	5 (12%)	5 (12%)
ID (N=34)	3 (9%)	0	1 (3%)	0	1 (3%)	3 (9%)

**NOTES**

**31. DONOR CHARACTERISTICS IN 1,000 CONSECUTIVE SIMULTANEOUS PANCREAS-KIDNEY (SPK) TRANSPLANTS**

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**PURPOSE:** Unlike with other solid organ transplants, in pancreas transplantation there are no objective laboratory or histological criteria to judge the quality of the donor organ. The purpose of this study was to analyze information commonly collected for SPK donors in an attempt to correlate these parameters to pancreas graft survival. This analysis was performed at our center in 1,000 consecutive SPK transplants from December 1985 to December 2007, representing the world’s largest experience.

**METHODS:** Donor age, height, weight, body mass index (BMI), serum glucose, serum amylase, serum lipase, cause of death, death with cardiac function, and the use of vasopressors were analyzed. Cox proportional hazards models were used to correlate these parameters with pancreas graft survival.

**RESULTS:** Overall 1-month, 6-month, 1-year and 20-year survival for the pancreas was 95.1%, 90.1%, 87.5%, and 36.4%, respectively. There was a significant correlation between poorer outcomes and donor age (p=0.0001), BMI (p=0.0037) and donor weight (p=0.0365). Serum glucose, amylase and lipase had no significant influence (p>0.08). Pancreas grafts from closed head trauma victims without abdominal injuries performed no better or worse than other grafts (p=0.6585), as was the case with organs from donors with cardiac death (DCD) (p=0.7736). The use of vasopressors also did not influence graft survival (p=0.9196).

**CONCLUSIONS:** To achieve optimal results in pancreas transplantation, one should attempt to select younger donors with a low BMI. Laboratory parameters potentially influenced by the resuscitation protocols have no predictive value and should not be used to decline a donor. The visual and tactile inspection by an experienced donor surgeon is of paramount importance.

**NOTES****32. THE DEVELOPMENT OF GOLD NANOPARTICLE AS FUNCTIONAL DELIVERY SYSTEM FOR ISLET TRANSPLANT**

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**PURPOSE:** islet transplantation has emerged as an alternative therapy to for Type I diabetes, but shows variable success. A long-standing goal in islet transplantation and research has been the development of a highly efficient system for the delivery of molecular cargos to islets. Since islets are clusters of approximately 1000-2000 cells it is difficult to deliver molecular cargos uniformly among the islet cells; with only the islet periphery being efficiently transfected or transduced. In addition, these viral and non-viral delivery systems can compromise islet function, pose potential oncogenic risks, and increase immunogenicity. Gold nanoparticles(AuNPs) can be taken up by different cells and represent an ideal alternative. When functionalized with alkylthiol-terminated oligonucleotides, the alkylthiol-terminated modified antisense DNA-AuNPs complex has been demonstrated to have superior features including resistance to nuclease degradation, high efficacy to enter different cell types without auxiliary agents and unique binding properties. Therefore, we hypothesized that AuNPs could provide a unique vehicle to deliver molecular cargos uniformly to islets.

**METHODS:**A Cy5-labeled thiol-modified DNA(5'-Cy5-CAG CTG CAC GCT GCC CTG AAA AAA AAA A-Thiol-3') was conjugated onto 13±1nm citrate-stabilized NPs(~3nM DNA per 1ml of 10nM colloid) and then transfection efficacy was tested in rodent and human islets using confocal microscopy and flow cytometry. Impact of AuNPs on islet function was evaluated in vitro using simultaneous measurement of dynamic insulin secretion, calcium influx, and mitochondrial potentials changes. Transfected human islets were also transplanted into nude mice for in vivo graft function.

**RESULTS:**(1) Confocal observation showed very high uptakes of AuNPs in both rodent and human islets, including the core of islets. Flow cytometry indicated more than 98% AuNPs positive cells after 48hrs transfection.(2)The multi-parametric islet functional assay demonstrated that short and long-term transfected islets preserved

biphasic insulin secretion, accompanied with normal mitochondrial function and calcium signaling in response to glucose and KCL.(3) When transplanted into diabetic nude mouse, the AuNP-transfected human islets reversed diabetes as efficiently as untransfected control. A glucose tolerance test showed similar graft function as control islets. (4) In vivo biodistribution indicated that pancreatic islet cells have more transfection than acinar cells although there is no observable difference between islet cells.

**CONCLUSIONS:** This is the first time that the alkylthiol-functionalized type of AuNPs delivery system has been applied in an islet study showing high efficacy of transfection and normal in vivo and in vitro islet function. The development of AuNPs as functional in vivo and ex vivo delivery system for molecules delivery and gene regulation is under investigation for islet transplantation and diabetes research.

**NOTES****33. RECURRENT HYPERPARATHYROIDISM AND FOREARM PARATHYROMATOSIS AFTER TOTAL PARATHYROIDECTOMY**

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**PURPOSE:** In hyperparathyroidism due to Multiple Endocrine Neoplasia I (MENI) or renal failure (RF), the type of initial parathyroidectomy is felt to determine the rate of recurrent hyperparathyroidism and the ease and risks of reoperation. Because the optimal surgical approach is controversial, we compared our institutional experience with total parathyroidectomy and immediate forearm autotransplantation (TPFA) to subtotal parathyroidectomy (SP).

**METHODS:** A prospective multi-surgeon database was queried for patients treated for either MENI or secondary/tertiary hyperparathyroidism by TPFA or SP at an academic center from 1980-2008. TPFA was defined as resection of 4 pathologically confirmed parathyroid glands with immediate autotransplantation into the brachioradialis muscle, and SP was defined as pathologic confirmation of 3.5 gland resection. Patients with incomplete parathyroid exploration were excluded from analysis. Outcomes examined included interval to, sites, and tissue patterns of recurrence. Parathyromatosis was defined histologically as miliary seeding of muscle and/or soft tissue at reoperation. The Fisher's exact test was used for comparison, with a p-value <0.05 considered statistically significant.

**RESULTS:** Of 271 patients followed for a mean of 3.6 years, 30 (11%) have required reoperation for recurrent hyperparathyroidism to date. Overall, reoperation was more common after TPFA (12/47, 26%) than after SP (18/224, 8%) (p=0.002). However this difference was entirely due to RF patients, who required reoperation much more frequently after TPFA than after SP (7/30, 23% vs. 10/209, 5%, p=0.002) at a mean of 5 and 6 years, respectively. In MENI patients the type of initial surgical procedure did not affect the likelihood of reoperation (TPFA 5/17, 29% vs. SP 8/22, 36%, p=0.74). Forearm parathyromatosis after TPFA was encountered in 6/12 patients (50%) and occurred in both MENI and RF (4/5, 80% and 2/7, 29% respectively, p=0.24). En bloc resection of fascia,

muscle, and soft tissues resulted in normocalcemia in all patients with forearm parathyromatosis with a mean follow-up of 3 years.

**CONCLUSIONS:** Use of TPFA in RF has a high risk of relatively short-term recurrence and should be abandoned in favor of SP. Even when performed by specialists, TPFA for RF or MEN1 has a high likelihood of complication by parathyromatosis (80% in MEN1) and at reoperation, the surgeon should be prepared for aggressive en bloc resection. We did not observe that the type of initial surgery in MEN1 affects the likelihood of reoperation. For these reasons SP may be preferable to TPFA in the initial treatment of MEN1 hyperparathyroidism.

### NOTES

### 34. ESOPHAGOGASTRODUODENOSCOPY-ASSOCIATED GASTROINTESTINAL PERFORATIONS: A SINGLE CENTER EXPERIENCE

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**PURPOSE:** Esophagogastroduodenoscopy (EGD) is a common procedure in the diagnosis and treatment of gastrointestinal disorders.

**AIM:** Our aim was to define the risk of perforation associated with EGD at a large volume institution and identify patients who require operative intervention.

**HYPOTHESES:** 1) Incidence of EGD-associated gastrointestinal perforation will be greater if an interventional procedure is performed (biopsy, dilatation, coagulation, or sclerotherapy) and 2) that patients without contrast extravasation on radiographic studies can be safely managed non-operatively.

**METHODS:** Retrospective review identified 72 patients from our institution plus 5 patients transferred from other institutions (46 women, 31 men; ages 20-95 years; median 70 years) who sustained EGD-associated perforations from January 1996 through July 2008. Percutaneous endoscopic gastrostomy, endoscopic ultrasonography, endoscopic retrograde cholangiopancreatography, transthoracic echocardiography and concurrent colonoscopy procedures were excluded.

**RESULTS:** 217,507 EGD procedures were performed (incidence of perforation = 0.03%). Overall, 124,844 EGDs included an interventional procedure and 92,663 were examination only. The incidence of perforation was similar (and uncommon) whether an interventional procedure was performed or not (0.04% vs. 0.03%,  $p = 0.181$ ). The most common site of perforation was the esophagus (51%) followed by duodenum (32%), jejunum (6%), stomach (3%) and common bile duct (3%). Seven patients had surgically altered upper gastrointestinal anatomy resulting in three jejunal and one common

bile duct perforation. Overall mortality of patients with a perforation was 17% with a morbidity rate of 40%. Thirty-eight patients (49%) were initially treated non-operatively. Of the 7 of 38 patients (18%) who failed non-operative management, failure was associated with free fluid (75% vs 23%,  $p < 0.01$ ) and contrast extravasation on computed tomography (33% vs 0%,  $p = 0.047$ ) and contrast extravasation on upper gastrointestinal series (33% vs 0%,  $p = 0.047$ ). The morbidity of patients who failed non-operative management was equivalent to those who underwent initial operative exploration (63% vs 61%,  $p = 0.917$ ), but there was a trend towards higher mortality (50% vs. 21%,  $p = 0.090$ ).

**CONCLUSIONS:** EGD is a procedure with a low rate of gastrointestinal perforation; however, perforations secondary to EGD are associated with substantive morbidity and mortality. Non-operative management of gastrointestinal perforation is safe in select patients if there is no evidence of contrast extravasation or free fluid on radiographic studies. If non-operative management fails, however, mortality appears to be greater than those patients treated with initial surgical management.

**NOTES****35. FEEDBACK FROM A STATEWIDE HOSPITAL CONSORTIUM IS ASSOCIATED WITH DECREASED MORBIDITY IN VASCULAR OPERATIVE PROCEDURES**

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**PURPOSE:** Regional surgical quality improvement consortiums are becoming more common. Ideally, improvement in patient care can be translated by timely feedback of process and outcome data. Herein we report the effectiveness of a statewide consortium focusing on vascular surgical procedures.

**METHODS:** The state wide quality surgical consortium was established in 2005 and currently has 24 hospitals that report vascular surgical cases, as well as general surgical cases, in a sampling manner consistent with the private sector NSQIP. Data is abstracted from onsite trained nurses using defined and validated pre, peri, and postoperative variables with 30 day follow up. Outpatient and emergent cases were excluded. We compared outcomes over the course of the consortium (Era I 4/05 – 3/07 and Era II 4/07 to 3/08) via univariable, and multivariable techniques.

**RESULTS:** Era I (N = 2453) and Era II (N=3409) cases were similar in age (mean 68 yrs), gender (61% male), RVU (mean = 21) and distribution of CPT codes. Both LOS and operative time decreased by 15% and 11%, comparing Era I to II ( $P < .001$ ). Mortality at 30d was not significantly different between Era I and II (2.7% vs. 2.5%,  $P=NS$ ), but morbidity was decreased (15.8% vs. 13.8%,  $P=.02$ ). Specific decreases were noted in sepsis and pulmonary, but not cardiac or renal complications. When evaluating both eras, modifiable variables for morbidity included increased length of operation (OR = 1.004, 95% CI = 1.003-1.005,  $P < .0001$ ), hypertension (OR= 1.46, 95% CI = 1.03-2.1,  $P = .03$ ), and blood transfusion (OR= 2.8, 95% CI = 2.04-3.88,  $P < .0001$ ). However, anemic patients (11%, Hct < 30) who were transfused were less likely to suffer morbidity (OR=.56, 95%CI = .47-.67,  $P < .0001$ ) than those transfused who were not anemic.

**CONCLUSIONS:** A statewide quality of care consortium with timely feedback of data was associated with decreased morbidity over a relatively short follow up period in vascular patients. Focusing on best processes in real world practice, such as appropriate transfusion and length of operation, may further improve vascular surgical outcomes.

### NOTES

### 36. MULTI-CENTER ANALYSIS OF CARDIAC INTERACTIONS WITH DIAPHRAGM PACING FOR VENTILATION: POSITIVE IMPLICATIONS FOR VENTILATOR WEANING IN INTENSIVE CARE UNITS

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**PURPOSE:** Diaphragm pacing (DP) has been used in a series of trials to help respiration and can replace positive pressure mechanical ventilation in tetraplegics. Tetraplegics are predisposed to bradycardia and atrioventricular block which may require cardiac pacemakers. Conceptual and bench experiments showed the theoretical possibility of DP stimulus causing an increase or decrease in paced cardiac events. This report will describe the results of DP use in patients with cardiac pacemakers which has implications for the temporary use of DP in intensive care unit patients to help in diaphragm conditioning and respiratory management.

**METHODS:** Prospective, multicenter, nonrandomized, controlled, interventional trials under FDA and/or IRB approval. DP involves laparoscopic diaphragm motor point mapping to identify the optimum site where stimulation will cause maximum diaphragm contraction. Two percutaneous intra-muscular electrodes are implanted in each hemi-diaphragm and diaphragm conditioning ensues through with a programmed pacing unit to maximize diaphragm movement for respiration. Perioperatively cardiac pacemakers were analyzed for device to device interactions with maximal DP settings and the most sensitive cardiac pacemaker settings. During cardiac pacemaker analysis post weaning from the ventilator the cardiac history was analyzed for adverse interactions.

**RESULTS:** From 2000 to 2009 over 250 subjects were implanted with over 250 patient-years of DP use. Here we analyze results of 19 tetraplegics (16 males) with cardiac pacemakers implanted with DP at 6 sites. Subjects were 19 to 61 years old and had DP implantation from 6 months to 24 years post injury. Cardiac pacemakers analyzed were from four different manufacturers and over ten different models. All patients were able to have diaphragm paced tidal volumes that exceeded their

basal needs with the final programmed setting having no device to device interactions. One electrode in one patient caused a cardiac paced event at maximal stimulation but through parameter changes no device interactions were noted with chronic use. In long term cardiac pacemaker analysis there have been no interactions. There was one unrelated death 20 months post implant from urosepsis. Removing mechanical ventilation with DP decreased pulmonary complications to zero from historical reports of 2 per year.

**CONCLUSIONS:** DP can be safely used in tetraplegics with cardiac pacemakers with no immediate or long term device to device interactions. This knowledge increases the safety profile for potential temporary DP use in complex intensive care units patients with underlying cardiac abnormalities where decreasing ventilator times is desirable in routine care and may be urgently needed in a pandemic. DP technology would decrease the time on ventilators by maintaining Type I muscle fibers and improving posterior lobe lung ventilation which decreases the secondary bacterial ventilator associated pneumonias.

### NOTES

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