

Background: Anal adenocarcinoma (AA) is a rare form of malignancy, accounting for 5-10% of all anal cancers. To date, there is no standardized treatment for this tumor, with different combinations of chemotherapy, radiation, local excision (LE), and abdominoperineal resection (APR) used in management.

Objective: Using a national registry, we analyzed patterns of care and outcomes of anal adenocarcinoma.

Methods: Adults diagnosed with AA were identified in the Surveillance, Epidemiology, and End Results database (2004-2019). Exclusion criteria were unknown stage, overlapping lesions of the anus and rectum, and >1 lifetime diagnosis of cancer. Six main patterns of care were identified: chemoradiation (CRT)+APR, CRT+LE, CRT alone, upfront APR, LE only, and alternative treatments, including any combination other than the previously listed standards. In patients with localized or regional disease, multinomial and Cox proportional hazard regressions were employed to analyze factors associated with patterns of care and determine the 5-year overall (OS) and disease-specific survival (DSS).

Conclusion: Results: Of 1,040 patients, 48% were female, median age was 67 years, and 18% had distant metastases. The majority were Caucasian (65%) and lived in urban areas (86%). Among 746 patients with localized or regional disease, 22% underwent CRT+APR, 14% CRT+LE, 18% CRT alone, 8% upfront APR, 22% LE only, and 17% alternative treatments. In multinomial analysis with CRT+APR as reference, gender, race, and marital status were not associated with type of treatment. However, age >75, rural location, tumor size, and regional involvement were significantly associated with treatment modality (Table 1). Five-year OS and DSS were highest for LE only (67% and 85%) and lowest in the alternative group (34% and 48%). Five-year OS and DSS for the remaining groups were as follows: CRT alone 44% and 55%, upfront APR 66% and 71%, CRT+LE 65% and 74%, CRT+APR 61% and 67%. After adjustment for available confounders, CRT+APR, CRT+LE, and upfront APR had similar outcomes, while CRT alone and alternative treatments were associated with worse prognosis. Conversely, patients undergoing LE only had improved DSS. Additionally, age >75, single status, poor differentiation, and regional disease were independently associated with lower OS and DSS.

Conclusions: In this population-based cohort, we observed significant heterogeneity in the treatment of AA, confirming the lack of a standardized approach. Age, tumor size, and disease stage were the main factors characteristics associated with selection of a treatment with early-stage cases undergoing LE with or without CRT, while more advanced cancers received CRT+APR. Both treatment modalities had good outcomes in appropriately selected patients, while omission of surgical intervention in the setting of CRT was associated with worse OS and DSS suggesting a relevant role of primary tumor resection in AA management.

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Table 1. Factors associated with treatment modality in the management of anal adenocarcinoma.

Characteristics	Treatment modality					
	OR (95% CI)					
	<i>CRT+APR</i>	<i>CRT+LE</i>	<i>CRT alone</i>	<i>Upfront APR</i>	<i>LE only</i>	<i>Alternative treatments</i>
Age						
18-64	Ref					
65-74	Ref	1.43 (0.79-2.59)	1.55 (0.87-2.74)	1.62 (0.74-3.53)	0.95 (0.51-1.78)	1.01 (0.52-1.96)
>75	Ref	2.73 (1.33-5.62)	4.31 (2.22-8.37)	6.07 (2.68-13.76)	4.62 (2.34-9.15)	7.97 (4.12-15.42)
Living area						
Urban	Ref					
Rural	Ref	0.31 (0.13-0.72)	0.46 (0.23-0.94)	0.52 (0.20-1.38)	0.79 (0.41-1.52)	0.54 (0.26-1.11)
Tumor Size						
0-2 cm	Ref					
2.1-5cm	Ref	0.41 (0.20-0.82)	0.75 (0.36-1.58)	0.71 (0.30-1.67)	0.12 (0.06-0.26)	0.86 (0.38-1.95)
>5cm	Ref	0.33 (0.13-0.84)	0.94 (0.39-2.25)	0.93 (0.32-2.70)	0.20 (0.07-0.54)	1.00 (0.39-2.61)
SEER Stage						
Local	Ref					
Regional	Ref	0.42 (0.25-0.71)	0.60 (0.36-0.98)	0.41 (0.21-0.80)	0.06 (0.03-0.13)	0.58 (0.34-0.98)
Ref = Reference; OR = Odds Ratio; CI = Confidence Interval; CRT = Chemoradiotherapy; APR = Abdominoperineal Resection; LE = Local Excision						
P<0.05						
Adjusted for gender, race, and marital status.						

Cholecystectomy Following Initiation of Elexacaftor, Tezacaftor, Ivacaftor for Patients with Cystic Fibrosis: A Preliminary Review

A Chandra, A Jadhav, A Sridhar, Alexander H, J Harmon

Background: Surgical interventions for patients with cystic fibrosis require careful preoperative evaluation and preparation to assure safe and optimal patient outcomes. The introduction of elexacaftor, tezacaftor, and ivacaftor (ELX/TEZ/IVA) as triple therapy for cystic fibrosis has been suggested to be associated with an increased incidence of biliary disease requiring surgical intervention. This is offset by the remarkable improvements in cystic fibrosis symptoms in patients who tolerate triple therapy. Dysfunction of chlorine transporters in cystic fibrosis is known to interrupt the alkalization and hydration of bile within the gallbladder and biliary tree, resulting in an increased incidence of gallstone formation. However, there is limited detail in the literature describing their impact on surgical biliary disease management. Current discussions are limited to case-specific outcomes and theory.

Objective: Our objective was to analyze surgical outcomes in cystic fibrosis patients treated with ELX/TEZ/IVA reported in the literature to require cholecystectomy.

Methods: This preliminary literature review investigated clinical trials and individual case-studies. We followed PRISMA guidelines that directed the identification of clinical trials. We limited our literature review to reports published in the English language after January 1st 2019.

Conclusion: Other investigators have reported that 102 patients out of 11,951 required cholecystectomy after initiating ELX/TEZ/IVA triple therapy. We have identified an additional 10 patients in the literature who required cholecystectomy within 1 year of initiating triple therapy. Seven of these patients were female, and the average age was 31 ± 5 years. Six patients had prior biliary disease. Nine of the ten patients were previously treated by disease-modifying agents prior to starting triple therapy. The average interval between the initiation of triple therapy and surgery was 70 days. 50% of patients presented with an exacerbation of chronic disease. Of the five patients who presented with acute cholecystitis, three presented during a pregnancy. No thirty day complications were reported in this cohort.

Despite major clinical improvements reported following initiation of ELX/TEZ/IVA in patients with cystic fibrosis, case-reports continue to be registered where surgical intervention is required for biliary disease after initiating triple therapy. Preliminary review of the literature suggests a relationship between the initiation of triple therapy and the need for cholecystectomy.

Date of Publication	Age	Sex	Prior biliary disease	Previous CF modulator use	BMI	Treatment-surgery interval (days)	Cholelithiasis
2020	38	F	Y	Yes	22	27	Y
2020	33	M	N	Yes	24	1	Y
2020	28	M	Y	Yes	19	3	Y
2020	28	M	Y	Yes	23	1	Y
2020	26	F	N	Yes	23	14	Y
2020	27	F	N	Yes	24	1	Y
2021	28	F	Y	Yes	22	132	N
2022	33	F	Y	Yes	NA	7	Y
2022	29	F	N	Yes	NA	183	Y
2023	38	F	Y	No	NA	335	Y
Average	31				23	70.4	

Worse patient outcomes after endoscopic resection of proximal malignant colonic polyps

L Weaver, SL Mott, A Shaukat, WB Gaertner, R Madoff, GB Melton, I Hassan, P Goffredo

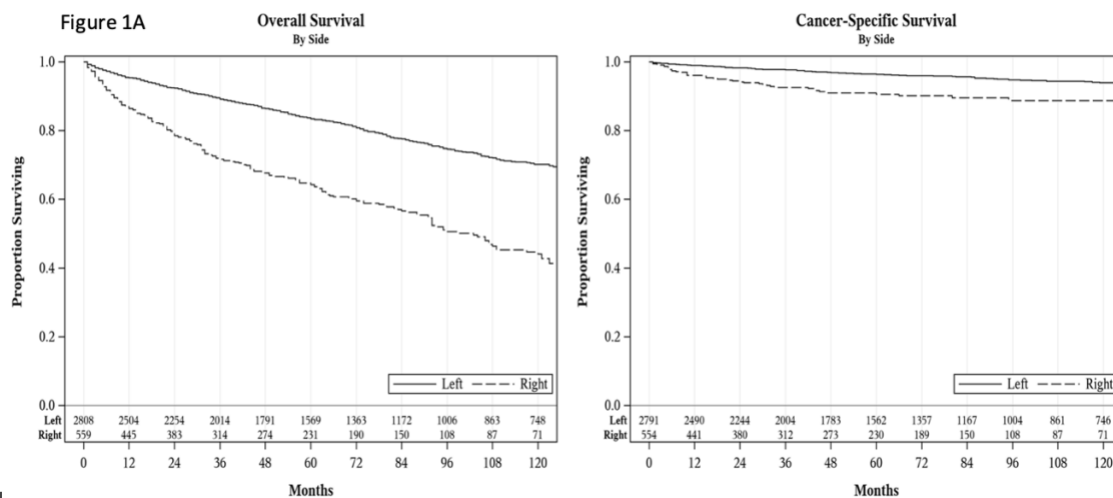
Background: A malignant polyp is defined as one with cancerous cells infiltrating the submucosa (pT1). Endoscopic resection is considered an appropriate treatment for T1 polyps with favorable characteristics, including negative margins, low histologic grade, and no angiolymphatic invasion. While right-sided location has been associated with worse prognosis in advanced stage colon cancer, current evidence on the prognostic implication of laterality in T1 polyps is limited. We hypothesized that malignant polyps located proximally, similar to right-sided colon cancers, would be associated with worse outcomes than distal T1 polyps following curative endoscopic resection.

Objective: The Surveillance, Epidemiology, and End Results (SEER) database was analyzed to identify adult patients with a T1NxMx colon adenocarcinoma who underwent endoscopic polypectomy alone between 2003 and 2019. Patients with overlapping or unknown tumor locations, treated with radiation or chemotherapy, or more than one lifetime diagnosis of cancer were excluded. Cox proportional hazard models were employed to estimate the effect of patient and disease characteristics on overall survival (OS) and cancer-specific survival (CSS).

Methods: The Surveillance, Epidemiology, and End Results (SEER) database was analyzed to identify adult patients with a T1NxMx colon adenocarcinoma who underwent endoscopic polypectomy alone between 2003 and 2019. Patients with overlapping or unknown tumor locations, treated with radiation or chemotherapy, or more than one lifetime diagnosis of cancer were excluded. Cox proportional hazard models were employed to estimate the effect of patient and disease characteristics on overall survival (OS) and cancer-specific survival (CSS).

Conclusion: Despite the excellent 5-year survival of endoscopically managed pT1 polyps, proximal location within this population-based cohort was independently associated with a significantly lower OS and CSS. This observation substantiates the fact that tumor location is a relevant prognostic factor for colon cancer even at very early stages. Therefore, these data suggest that laterality should be considered when determining management and/or surveillance protocols of endoscopically excised pT1 polyps.

Figure 1: Survival of T1 Colon Adenocarcinoma Based on Tumor



Splenic flexure adenocarcinoma: A national cohort analysis of extent of surgical resection and outcomes

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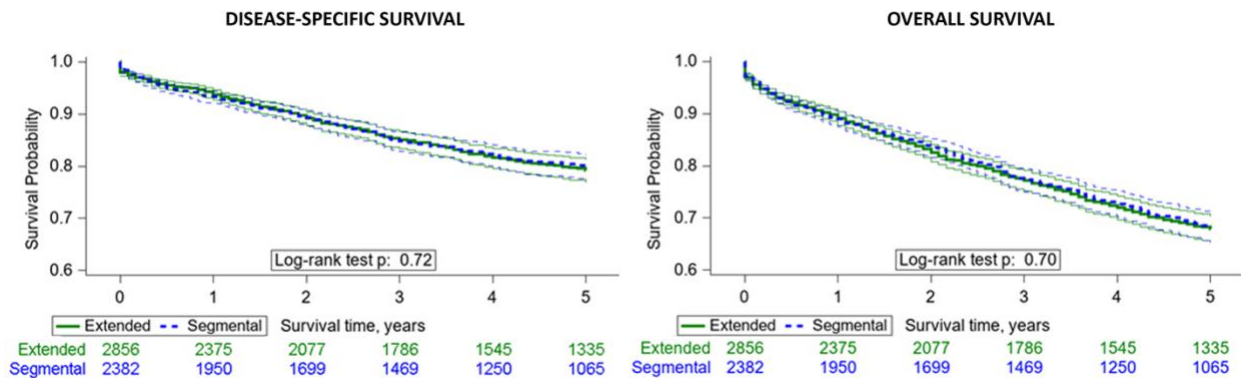
Background: The optimal extent of resection for splenic flexure adenocarcinoma remains debated. These tumors straddle the left and right-sided vasculature with lymphatic drainage in a watershed area; current guidelines recommend either segmental or extended colectomy.

Objective: To analyze surgical management of splenic flexure tumors and compared outcomes between approaches.

Methods: The Surveillance, Epidemiology, and End Results database was queried for adults with Stage I-III splenic flexure adenocarcinoma, 2004-2019.

Results: Of 5,238 patients, 55% underwent extended colectomy. Compared to segmental colectomy, these patients were more likely to have advanced stage. On multivariable analysis, age \leq 65 remained independently associated with extended colectomy. Although fewer nodes were examined in segmental colectomy (median 14 vs. 16, $p=0.4$); these remained comparable after adjustment.

Conclusions: Nationally, we observed similar rates of segmental and extended colectomy for splenic flexure adenocarcinoma. Extended colectomy was not more common in stage III disease, indicating lack of stage migration, and was not associated with better oncologic outcomes. These observations support current practice involving either approach, which should be tailored to patient-related factors and preferences, while considering technical aspects and quality of life.



Surgical Potpourri I | Clinical Science | Transplantation Surgery

An Institutional Commitment: a Historical Analysis of Islet Allograft Research at the University of Minnesota Department of Surgery, 1973-1979

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Background: Islet allograft transplantation (IAT) is an experimental intervention for Type I diabetes mellitus (T1DM) that attempts to resolve hypoglycemic unawareness and establish insulin independence as an alternative to whole organ pancreas transplantation. David Sutherland and John Najarian performed the first clinical IAT at the University of Minnesota in 1974.

The courageousness of the early clinical work by these investigators speaks to the vision of the Department of Surgery (DOS) and its commitment to revolutionizing beta cell transplantation.

Objective: This historical review describes the contributions of the University of Minnesota's DOS in the development of islet allotransplantation through analysis of the department's academic output from 1973-1979 and considers the factors leading to the emergence of the UMN as a world-leading islet transplantation center. This historical review explores the institutional commitment, academic output, and investigator participation in basic and clinical islet transplantation in the early era of human islet transplantation.

Methods: We analyzed archival material at the Wangensteen Historical Library, where the compiled publications of the UMN DOS from 1973-1979. Publications were included that discussed IAT which were tabulated and calculated as a proportion of the department's total publications for each year. We calculated the percentage of publications, number of investigators, and basic vs clinical research.

Conclusion: In the decade preceding the introduction of human islet allotransplantation trials, there was a proliferation of research on islet cell isolation and graft survival in animal models. With the appointment of John Najarian, MD as the chief of the DOS in 1967, a major effort was made to commit institutional resources towards islet transplantation at the University of Minnesota. The DOS academic output speaks to their commitment to IAT. Between 1973 and 1979, the proportion of publications that discuss IAT ranged from 0% to 8.3% of DOS's total academic output. The proportion of clinical publications to basic science publications increased from 0% to 60% over the period. The number of authors affiliated with IAT ranged from 0 in 1973 to 13 in 1977; the total number of authors over the time period was 31 investigators. The accelerated commitment of institutional resources and to the discovery of innovative techniques in islet transplantation represented quintessential translational research. A historical review of the DOS's commitment between 1973-1979 informs our decision-making for how to commit valuable resources in basic and translational research to achieve the paradigmatic shifts necessary for medical innovation.

Year	Total Publications	Publications that discuss Islet Transplantation	Proportion of publications classified as clinical research vs basic research	Proportion of UMN Department of Surgery's academic output	Total Investigators involved in Islet Transplantation
1973	190	0	0% (0/0)	0.0%	0
1974	204	4	0% (0/4)	2.0%	11
1975	173	5	0% (0/5)	2.9%	7
1976	221	9	0% (0/9)	4.1%	5
1977	216	18	11% (2/18)	8.3%	13
1978	193	9	33% (3/9)	4.7%	12
1979	215	10	60% (6/10)	4.7%	12
All Years	1412	55	20% (11/55)	3.9%	31

Table 1. Results of archival review of compiled publications from the University of Minnesota's Department of Surgery 1973-1979.

Trauma Session | Clinical Science | Vascular Surgery

Blunt Celiac Artery Injuries - A single center case series

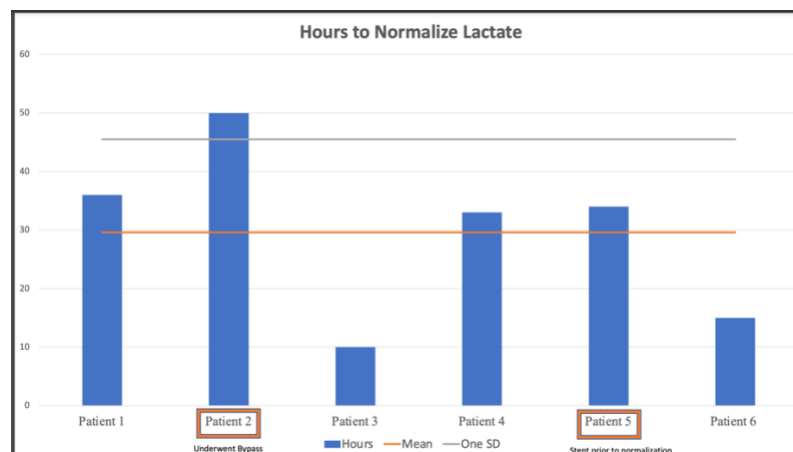
Diaz, Jessica; Davis, Nicholas

Background: Injury to the celiac artery (CA) via blunt mechanism is a rare type of blunt trauma injury accounting for 0.17% of traumatic injury pathologies, usually noted within a myriad of other traumatic injuries. Two case reports and a few case studies represent our current understanding for management of such injuries. The CA has collateral arterial flow from the superior mesenteric artery (SMA). This makes it difficult to assess the clinical significance of blunt CA injuries and predict which patients will need intervention. We hypothesized that liver function labs such as total bilirubin, bilirubin trends, initial lactate and time to lactate normalization could be predictive factors to risk stratify patients who were likely to require intervention in an attempt to better identify patients at risk for mesenteric ischemia and the associated increased mortality risk.

Objective: Six patients of 15145 (0.04%) blunt trauma admissions were included in our analysis. All were greater than 18 years of age, average age 30 (SD 12). Four (66%) were male. Average ISS was 35. Medical treatment included aspirin in 4 (66%) patients. Three (50%) patients' initial imaging demonstrated dissection with complete occlusion (one of which required open bypass), two demonstrated dissection with severe stenosis and one demonstrated complete occlusion without dissection as well as dissection of the SMA (underwent stenting). There was no identifiable bilirubin trend for those that needed intervention. Initial lactate was 6.2 (SD 2.4) and took an average of 29.6 hours to normalize (SD 14.7). Of the two patients who underwent intervention, one was stented prior to lactate normalization due to two vessel involvement (patient 5) and the other took 50 hours, one standard deviation above the mean, to normalize lactate (patient 2).

Methods: This is a retrospective analysis of blunt CA injuries at a Level I trauma center. All trauma admissions for blunt trauma from 2017-2021 were included. The AIS code for CA injuries was used to identify patients. All penetrating CA artery injuries were excluded. The charts were then analyzed for demographics, injury severity score (ISS), initial lactate and bilirubin, time to lactate clearance, treatment, need for intervention, and imaging modalities.

Conclusion: In this retrospective analysis we identified persistent lactic acidosis as a prominent risk factor for patients who are likely to need intervention as well as concomitant vascular injuries. The only patient with lactate normalization greater than 1 SD than the average ultimately underwent an iliohepatic bypass. Concomitant injury of the SMA and CA necessitates intervention irrespective of lab trends due to the risk of embolic or thrombotic complications to both the foregut and midgut. Lactate should be followed in trauma patients with blunt CA injury as persistent lactic acidosis despite adequate resuscitation is likely an indication of poor mesenteric perfusion and impaired liver clearance due to inadequate collateralization between the CA and SMA.



Development of a machine learning tool to predict symptomatic VTE at time of admission and time of discharge after severe traumatic injury

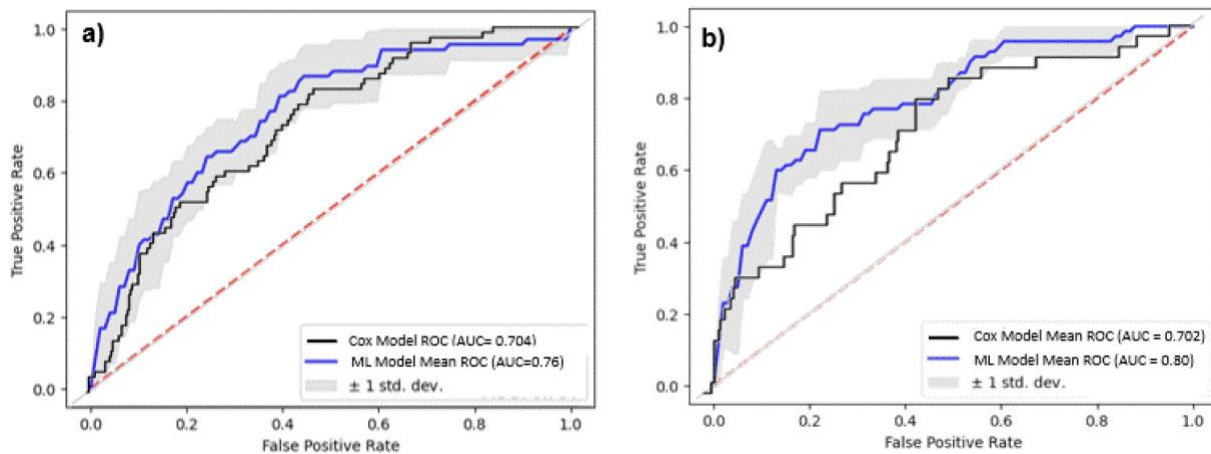
S Navarro, R Thompson, G Spears, K Bailey, J Immermann, N Yudin, M Park

Background: Reliable clinical indicators predictive of venous thromboembolism (VTE) in trauma patients at multiple time intervals, specifically at time of admission and time of discharge, have not been well outlined.

Objective: To describe and predict the risk of venous thromboembolism (VTE) on day of admission and on day of discharge for trauma patients with a multi-variate regression risk model and a classic machine learning model.

Methods: In a prospective, case-cohort study, all trauma patients (pts) who arrived as level 1 or 2 trauma activations, from June 2018 to February 2020 were considered for inclusion. A subset of pts who developed VTE and those who did not develop VTE after 90 days were identified from an institutional trauma patient database. Outcomes were defined as the development of a symptomatic VTE (either DVT or PE) within 90 days of discharge, for which we trained a multi-variate regression model and a classic machine learning model to predict the development of symptomatic VTE within 90 days at a) day of admission or at b) day of discharge using baseline clinical characteristics.

Conclusion: Among 393 trauma pts (ISS=12.0 [5.0, 19.0], hospital LOS=4.0 [2.0, 9.0] days, age=48 [28, 64] years, 71% male, 96% with blunt mechanism, mortality 2.8%), 36 developed inpatient symptomatic VTE during admission and 36 developed symptomatic VTE after discharge from the hospital within 90 days of injury. In a weighted, multivariate Cox model, day 1 any type of surgery (3.16 [1.49, 6.68]), increased age per 10 years (1.30 [1.13, 1.51]), and increased BMI per 5 points (1.08 [0.93, 1.25]) were predictors of incident symptomatic VTE on day of admission (C-statistic 0.704). In a weighted, multivariate Cox model, IVC filter placement (3.77 [0.91, 15.7]), increased patient age per 10 years (1.25 [1.08, 1.44]), and increased BMI per 5 points (1.11 [0.96, 1.28]) were the highest predictors of incident symptomatic VTE on day of discharge (C-statistic= 0.702). A machine learning model based off a support-vector machine (SVM, radial basis function) model was developed and validated with MV Cox models, with accuracy (0.78,0.82) and AUC (0.76,0.80) exceeding that of the Cox models at both time intervals (Figure 1). Machine learning models may allow for more accurate prediction of VTE for trauma patients on day of admission and at the time of discharge by enabling enhanced risk stratification of patients and serving a role as active clinical decision tools.



Partial Splenic Embolization for Trauma Patient with Bleeding Diathesis, Thrombocytopenia, and Consumptive Splenomegaly

F Lee, M Jabaay, J Zietlow

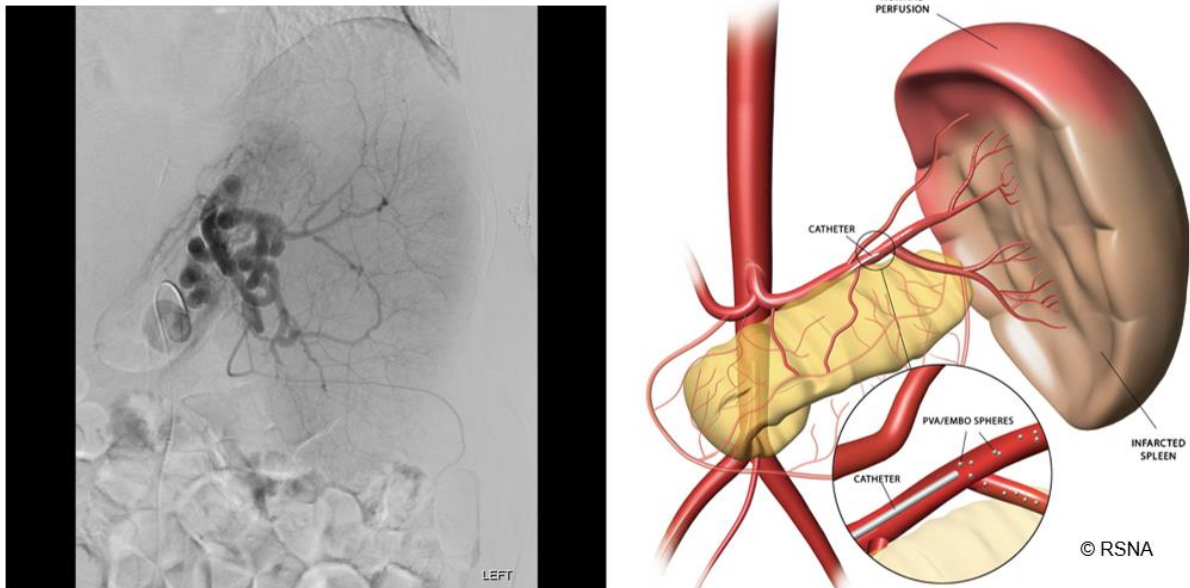
Introductions/Objective: Bleeding diathesis in the trauma patient can be complex and difficult to manage. Typically, coagulopathy is corrected and directed by thromboelastogram and bleeding profile. However, more than 60% of patients with bleeding diathesis have normal labwork. This phenomenon is called bleeding disorder of unknown cause (BDUC). In the trauma setting, these patients may require frequent transfusion. Furthermore, concomitant and persistent thrombocytopenia despite repeat platelet transfusion can preclude surgical intervention. We describe a trauma patient with persistent thrombocytopenia due to consumptive splenomegaly from an underlying autoimmune disorder who was not amenable to formal splenectomy. We discuss the novel role of partial splenic embolization as a solution and potential application in management of trauma patients.

Case Presentation: A 61 year old male with history of Still's disease, kidney transplant, and bilateral hip and shoulder replacement was admitted for traumatic brain injury, right 2 through 9 rib fractures with chest wall hematoma, and hip hematoma following a snowmobile accident. Hematomas were washed out with drain placement, along with surgical stabilization of rib fractures (SSRF) and discharged after one month of rehabilitation. He was readmitted for bleeding following chest drain removal in outpatient setting. He required frequent transfusions and multiple trips to the operating room for ongoing bleeding despite no obvious source, concerning for unknown bleeding diathesis. His rib plating hardware was found to be colonized with Staph epidermidis and despite salvage techniques of multiple irrigation/debridement, wound vac, and antibiotic beads, he required hardware explanation due to his bleeding diathesis. Hematology was consulted however work-up was negative, including for metallosis from his hip/shoulder replacements. His bleeding was conservatively and empirically managed with vitamin K, tranexamic acid, and desmopressin. His hospital course was prolonged due to persistent transfusion requirement for thrombocytopenia, believed to be driven by consumptive splenomegaly. Surgical splenectomy was contraindicated, and interventional radiology (IR) partial splenic embolization was considered and after careful deliberation, the patient elected to proceed and was successful and he no longer required daily transfusions and was discharged 10 days post-IR procedure.

Discussion: There are few case reports/series on partial splenic embolization by IR, mainly in the application of autoimmune and malignancy i.e. immune thrombocytopenic purpura (ITP) and myelofibrosis. The cause of this patient's consumptive splenomegaly is likely related to his Still's disease, an autoimmune condition with varied presentation, but mainly consisting of fever, rash, and arthritis. He was on daily prednisone for his Still's disease and kidney transplant immunosuppression, which is typically first-line medical management for common consumptive splenomegaly etiologies like ITP. A unique aspect of this patient's splenomegaly was that it was subclinical prior to his trauma. The high transfusion requirement during the early and acute phase of his trauma care may have worsened his consumptive splenomegaly and hypersplenism. The high transfusion requirement is secondary to his bleeding diathesis which had no identifiable cause despite multiple work-ups and hematology input. The only bleeding disorders seen in Still's disease is disseminated intravascular coagulation (DIC) and thrombotic thrombocytopenia purpura (TTP) which were ruled out in this patient. It is believed that his bleeding disorder may be related to amyloidosis resultant from his Still's disease, however the mechanism is poorly understood. The risk of partial splenic embolization in this coagulopathic and thrombocytopenic patient was high and could result in uncontrollable bleeding, however was a last resort option in the setting of his daily platelet transfusion requirement with no other alternatives.

Conclusion: This successful use of partial splenic embolization describes the potential role and application in the trauma setting for patients with consumptive splenomegaly who cannot undergo splenectomy due to profound thrombocytopenia. Factors that add complexity to the care of trauma patients include bleeding diathesis with negative work-up.

Figure 1: Fluoroscopy of IR partial splenic embolization (left) with illustration (right)



Understanding Self-Inflicted Firearm Injuries Through Prior Hospitalizations

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Background: Self-inflicted firearm injuries are a significant public health concern and account for approximately two-thirds of firearm deaths in the United States. Previous research has shown increased self-inflicted firearm injuries in rural populations compared to urban areas. We hypothesize that prior hospital admission before self-inflicted firearm injury event is related to different characteristics of prior hospitalizations in the urban and rural populations.

Objective: We identified 6,917 self-inflicted firearm injury admissions with 824 (11.9%) patients having prior admission to the hospital. The mortality rate between those with and without prior admissions was 29.9% and 36.3%, respectively ($P < 0.001$). Of those that survived, there were similar proportions in age groups and urban/rural designation. Rates for prior hospitalizations for suicide were 30.4% and 36.4% for the urban and rural cohorts, respectively. Prior to the self-inflicted firearm injury, urban and rural hospitalizations included: infection (26.7 v 20.2%), mental health (87.4 v 85%), drug/alcohol (31.3 v 28.3%), and injury (39.2 v 44.5%), respectively. No prior hospitalizations included other types of firearm injury. The most common diagnosis related groups were infection, mental health and medical-related problems.

Methods: The 2016-2020 Nationwide Readmission Database of the Healthcare Cost and Utilization Project was used to identify hospital admissions within the same year prior to a self-inflicted firearm injury in patients >12 .

Conclusion: We found an 11.9% rate of prior hospitalization prior to self-inflicted firearm injury admission. Despite known differences in the urban and rural populations, hospital admission diagnoses prior to self-inflicted firearm injury are similar between these two groups.

Clinical Outcomes and Costs of Retromuscular and Intraperitoneal Onlay Mesh Techniques in Robotic Incisional Hernia Repair

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Background: Despite the numerous advancements in surgical techniques and prosthetic materials, recurrence rates after ventral hernia repair (VHR) remain as high as 20%. Management of ventral and incisional hernias is not only complicated by the characteristics of the patient and the hernia, but also by the variety of treatment choices. Laparoscopic intraperitoneal onlay mesh placement (IPOM) offers several advantages, such as improved cosmesis and enhanced recovery. Still, it has been associated with mesh-related complications due to direct contact with the viscera. In response, there has been an increasing interest in extraperitoneal mesh placement. The Rives-Stoppa repair, which utilizes the retromuscular (RM) plane, has been successfully applied across the different approaches. However, it is deemed a challenging technique with a steeper learning curve

Objective: To compare clinical outcomes and financial cost of intraperitoneal onlay mesh (IPOM) versus retromuscular (RM) repairs in robotic incisional hernia repairs (rIHR)

Methods: Patients who underwent either IPOM or RM elective robotic IHR (rIHR) from 2012 to 2022 were included. Patients' demographics, operative details, postoperative outcomes, and hospital costs were directly compared.

Patients who underwent either IPOM or RM elective robotic IHR (rIHR) from 2012 to 2022 were included. Patients' demographics, operative details, postoperative outcomes and hospital costs were directly compared.

Results: 69 IPOM and 55 RM were included. Mean±Standard-Deviation of age and body mass index did not differ between both groups (IPOM vs RM: 59.3±11.2 vs. 57.5±14, p=0.423; 34.1±6.3 vs. 33.2±6.9, p=0.435, respectively). Comorbidities and hernia characteristics were comparable. Comparison of intraoperative variables is presented in the table below. Extensive lysis of adhesions was required more often in IPOM (18 vs. 6 in RM, p=0.034). Defect closure was achieved in 100% of RM vs. 81.2% in IPOM (p<0.001). Median (interquartile range) postoperative pain score was higher in RM than in IPOM [5(3-7) vs. 4(3-5), respectively, p=0.006]. Median length of stay (0 days) and same-day discharge rate did not differ between groups (p=0.598, p=0.669, respectively). Six (8.7%) patients in the IPOM group versus one (1.8%) patient in the RM group were readmitted to hospital within 30-day postoperatively (p=0.099). Perioperative complications were higher in IPOM (p=0.011; 34.8% vs. 14.5% in RM) with higher Comprehensive Complication Index® morbidity scores [0(0-12.2) vs 0(0-0) in RM, p=0.008], Clavien-Dindo grade-II complications (8 vs 0 in RM, p=0.009), and surgical site events (17 vs. 5 in RM, p=0.024). Recurrence rate was higher in IPOM (7.2%) vs. RM (1.8%) but did not statistically differ between both groups (p=0.226) with a follow-up of 57 (±28) months. Hospital costs did not differ between groups [IPOM: \$9,978 (7,031-12,926) vs. RM: \$8,961 (6,701-11,222), p=0.300]. Although postoperative complication costs were higher in IPOM (\$2,436 vs RM: \$161, p=0.020), total costs were comparable [IPOM: \$12,415 (8,700-16,130) vs. RM: \$9,123 (6,789-11,457), p=0.080].

Conclusion: Despite retromuscular repairs having lower postoperative complications than intraperitoneal onlay mesh repairs, both techniques offered encouraging long-term results in robotic incisional hernia repair at a comparable total cost.

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Comparison of intraoperative variables

Variables [median (IQR), n(%)]	IPOM (n=69)	RS (n=55)	<i>p</i>
Defect size, cm ²	9.6 (7.1-18.8)	15.7 (15.7-31.4)	<0.001
Mesh size, cm ²	150 (144-225)	300 (225-450)	<0.001
Total operative time, minutes	72 (54-112)	96.5 (71-132)	0.023
Estimated blood loss, mL	5 (5-5)	5 (5-5)	0.561
Intraoperative complication	2 (2.9)	2 (3.6)	0.492

IQR: interquartile range

Surgical Potpourri II | Clinical Science | Bariatric/Foregut

Portomesenteric Vein Thrombosis After Sleeve Gastrectomy: Case Series and Literature Review
R Lenz, A Chandra, A Jadhav, J Dhama, E Wise, D Leslie, S Ikramuddin, J Harmon

Background: Portomesenteric vein thrombosis is a rare, potentially life-threatening complication following laparoscopic sleeve gastrectomy procedures. Current efforts include identifying patients at higher risk for thrombosis, optimizing prophylaxis, and evaluating treatment options.

Objective: This paper aims to identify risk factors, symptomatic presentation, anatomic locations, causative factors, and outcomes of patients with PMVT after LSG.

Methods: We identified five patients with portomesenteric vein thrombosis as part of our healthcare system's five-year quality assurance review. We also identified an additional 11 patients reported in the literature during the same period.

Results: A total of sixteen patients were reviewed; 8 were female, average age was 38 years and average BMI was 41 ± 5.4 . Liver disease was present in 19% of patients in this series. All patients presented with abdominal pain associated with nausea and vomiting at an average of 15 ± 8 days [range 6-31 days] following laparoscopic sleeve gastrectomy. CT scans obtained to evaluate for possible postoperative complications demonstrated a variety of anatomic locations of the portomesenteric thrombi. One patient was identified to have low protein C and low antithrombin III levels. No patients in this series required surgical intervention; therapeutic anticoagulation was associated with 100% survival.

Conclusion: Patients in this series presented with stereotypical symptoms usually between 7-14 days following laparoscopic sleeve gastrectomy. CT scans with IV contrast ordered to evaluate for other more common postoperative complications were effective at identifying portomesenteric thrombosis in these patients. Therapeutic anticoagulation was an effective treatment in all patients; however, specific hypercoagulability abnormalities were rarely identified.

Patient Groups	Our Patients	Reported Patients
Number of Patients	5	11
Age	39 years	38 years
BMI	42	43
Female	80%	36%
Hepatic Cirrhosis	20%	18%
Surgery to Symptom Interval (Days)	11 ± 4	17 ± 9
Survival	100%	100%
Portal Vein Occlusion	80%	91%
Superior Mesenteric Vein Occlusion	20%	36%
Splenic Vein Occlusion	40%	55%

Surgical Potpourri II | Clinical Science | Bariatric/Foregut

30-Day Outcomes after Vertical-Banded Gastroplasty Revisional Operations: Data from MBSAQIP National Dataset, and an Endoscopic Alternative

A Scott, S Amateau, D Leslie, S Ikramuddin, E Wise

Background: The vertical banded gastroplasty (VBG) is a historic bariatric operation in which the upper stomach is vertically stapled, and the food-receptive pouch is reinforced with a silastic ring, leading to restrictive weight loss. Many VBG patients require ring removal, with or without conversion to alternative bariatric anatomy. Until recently, outcomes of patients undergoing VBG revisions were poorly defined, until this investigation utilizing the 2021 Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) national dataset.

Objective: The dataset included 251 patients who underwent conversion from VBG to sleeve gastrectomy (n=23), gastric bypass (n=222), or other anatomy (n=6) in 2021. Demographically, 92% of patients were female, and 21% of non-white race. Median age was 56 (50-64) years, and median BMI was 43 (37-49) kg/m². The most common indications included weight considerations (47%), reflux (25%), anatomic causes (e.g. stricture, fistula, ulcer; 10%), and dysphagia (7%). Key 30-day morbidity rates included reoperation (9%), readmission (11%), reintervention (4%), mortality (0.8%) and the composite endpoint (17%). These VBG conversion data are summarized in Table 1.

Methods: The 2021 MBSAQIP dataset was queried for patients who underwent a conversion from a VBG to other bariatric anatomy. Demographics, patient factors, surgical considerations and comorbidities were examined. Rates of key consequential outcome measures 30-day readmission, reoperation, reintervention, mortality and a composite endpoint (at least one of the four) were further calculated, to characterize safety of these procedures.

Conclusion: Relative to patients with primary procedures, VBG conversion patients were older and had a greater burden or comorbidities. They experienced higher rates of critical 30-day outcomes, underscoring the seriousness of these major revisional operations. Alternative strategies such as endoscopic ring removal with possible staged surgery may constitute a safer strategy for VBG revision.

Table on next page

Patient variable	Frequency (n=251)
Female gender	167 (n=232) (72%)
Age (years)	56 (50-64)
Non-white race	49 (n=229) (21%)
Initial body-mass index (kg/m ²)	43 (37-49)
Comorbidities	
Gastroesophageal reflux disease	147 (59%)
Any Cardiac History ^a	9 (3.6%)
Severe hypertension	142 (57%)
Hyperlipidemia	80 (32%)
Deep vein thrombosis	10 (4.0%)
Venous Stasis	3 (1.2%)
Hemodialysis	0 (0%)
Chronic renal insufficiency	1 (0.4%)
Therapeutic anticoagulation	18 (7.2%)
Diabetes mellitus	46 (18%)
Chronic obstructive pulmonary disease	8 (3.2%)
History of pulmonary embolus	8 (3.2%)
Obstructive sleep apnea	82 (33%)
Serum Laboratory Values	
Serum Albumin	4.0 (3.7-4.3)(n=191)
Hematocrit	41 (38-43)(n=228)
Creatinine	0.82 (0.71-0.95)(n=231)
Additional Factors	
Smoker	15 (6.0%)
Non-independent functional status American Society of Anesthesiologists Classification 3+	3 (1.2%)
Minimally Invasive Operation (non-open)	216 (8.6%)
237 (9.4%)	
Indication for Conversion	
Weight Considerations	118 (47%)
Gastroesophageal Reflux Disease	64 (25%)
Anatomic Causes	25 (10%)
Dysphagia	17 (6.8%)
Other	27 (11%)
Converted Procedure	
Roux-en-Y Gastric Bypass	222 (88%)
Sleeve Gastrectomy	23 (9%)
Other	6 (2%)
Key 30-Day Outcomes	
Reoperation	22 (8.8%)
Readmission	27 (11%)
Reintervention	11 (4.4%)
Mortality	2 (0.8%)
Composite (1+ of the 4 above)	42 (17%)

Table 1- Summary of Vertical Banded Gastroplasty (VBG) Conversion Cohort

All variables as defined in the 2021 MBSAQIP User Guide

^aDefined as at least one of previous myocardial infarction, percutaneous revascularization or cardiac surgery

Measures of central tendency in continuous variables expressed as median (interquartile range)

Surgical Potpourri II | Clinical Science | Hepatobiliary and Pancreas

Long-Term Results of Single-Site Robotic Cholecystectomy

G Kaoukabani, F Gokcal, O Kudsi

Background: Minimally invasive surgery has significantly improved cosmesis and clinical outcomes following either laparoscopic or robotic cholecystectomy. In an effort to minimize the number of incisions in multi-port procedures, single-site approaches have been developed. However, single-site robotic cholecystectomy (SSRC) can be technically challenging for novice surgeons and can be complicated by port-site incisional hernia.

Objective: To evaluate long-term complications and incisional hernia rates after single-site robotic cholecystectomy.

Methods: Methods: All patients who underwent single-site robotic cholecystectomy between February 2014 and December 2017 were reviewed. Pre-, intra-, and postoperative variables were analyzed. Complications were assessed using the Clavien-Dindo Classification (CD) and Comprehensive Complication Index (CCI®) scoring system. A follow-up combination of a telehealth visits, physical examination, and imaging studies were done to assess the occurrence of incisional hernias. Kaplan-Meier's time-to-event analysis was performed to calculate the estimated freedom from an incisional hernia.

Results: 211 patients who underwent SSRC were included. Mean±Standard Deviation (SD) age and body mass index were 45±16.6 years and 28±5 kg/m², respectively. 141 patients had an American Society of Anesthesiologists score of 2. The median (interquartile range) console time and skin-to-skin time were 18 (14-27) and 38 (29-51) minutes, respectively. No intraoperative complications or conversions to other approaches occurred in the entire cohort. Pathology results revealed mostly chronic cholecystitis and cholelithiasis (185 and 164 cases, respectively), with a lower number of acute cholecystitis (32). Over an average follow-up period of 77 months, nineteen (9%) patients experienced postoperative adverse events. Of those, 11 were surgical site complications. Clavien-Dindo grades were mostly CD-1 (3.3%) and CD-3B (3.8%) complications. CCI® scores ranged from 0 to 39.7. Two patients underwent an endoscopic retrograde cholangiopancreatography (ERCP) for a suspicion of a common bile duct stone; however, both ERCPs were normal. Eight (3.8%) patients experienced an incisional hernia. Estimated hernia-free time was found to be 100 (95% confidence interval = 99-101) months for the entire cohort.

Conclusion: This is the first study to describe long-term follow-up in single-site robotic cholecystectomy. In our experience, we demonstrated a low incisional hernia rate and favorable outcomes.

Intercostal nerve cryoablation with intercostal nerve block is superior to paravertebral blocks for pain control in pediatric patients undergoing minimally invasive pectus excavatum repair.

Swathi R. Raikot, Stephanie F. Polites, D. Dean Potter, Jr.

Background: Minimally invasive pectus excavatum repair (MIRPE) using the Nuss procedure is associated with significant postoperative pain. Multiple analgesic techniques including thoracic epidurals, paravertebral blocks (PVB), intercostal nerve cryoablation (INC), and intercostal nerve blocks (INB) are described. However, the optimal technique is unknown.

Objective: This retrospective study aimed to compare opioid use and length of stay among pediatric patients undergoing MIRPE with PVB versus INC and INB.

Methods: Patients aged ≤ 20 years who underwent MIRPE with bilateral INC and INB between January 2021 and March 2023 were compared to historical controls who underwent repair with bilateral percutaneous continuous infusion PVB between January 2018 and December 2020 by the same group of surgeons. Demographics, operative details, and clinical outcomes were compared using Chi-square and Kruskal-Wallis tests.

Results: Of 164 patients, 90 (55%) underwent repair with INC and INB, and 74 (45%) with PVB. Age, Haller index, and use of the second bar were comparable between the two groups (p>.05) (Table). While the operating time was higher for patients with INC and INB (median (IQR) - 110 (102, 122) vs. 69 (60, 82) minutes, p

Conclusion: Intercostal nerve cryoablation with intercostal nerve blocks reduces postoperative opioid use, polypharmacy exposure, and hospital length of stay compared to percutaneous paravertebral blocks for pain control in children undergoing MIRPE.

Table: Comparing demographics and outcomes between the analgesic techniques

	INC and INB 90 (55%)	PVB 74 (45%)	p value
Sex (males)	68 (76%)	58 (78%)	0.67 ¹
Age (years)	15 (14, 16)	15 (13.3, 16)	0.51 ²
Haller Index	3.8 (3.6, 4.3)	3.8 (3.6, 4.4)	0.46 ²
Use of Second bar	5 (5.6%)	6 (8.1%)	0.52 ¹
Duration of anesthesia (minutes)	195 (176, 206)	203.5 (182, 221.8)	0.022 ²
Operating time (minutes)	110 (102.3, 122)	69 (60, 81.5)	< 0.001 ²
Operating room time (minutes)	185 (169.3, 199)	193.5 (174, 209.6)	0.096 ²
Postoperative opioid use (OME/kg)	0 (0, 0.6)	6.9 (3.1, 10.4)	< 0.001 ²
Opioids prescribed at discharge (OME/kg)	0 (0, 0.53)	3.04 (0.8, 5.2)	< 0.001 ²
Total number of medications received postoperatively	6 (4, 7)	12 (10, 13)	<0.001 ²
Total number of medications received in hospital	13 (12, 15)	20 (18, 21)	< 0.001 ²
Length of stay in hours	30 (28, 33.8)	58.5 (54.6, 76.7)	< 0.001 ²
Length of stay in days	1 (1, 1)	2 (2, 3)	< 0.001 ²
Discharged on postoperative day 1	71 (79%)	1 (1.4%)	< 0.001 ¹

*Continuous variables are presented as Median (IQR)

¹Chi-square test

²Kruskal - Wallis test

When you hear hoofbeats think ECMO: a case of pericardial tamponade in a young female trampled by a steer

Louis Sand MD, Alex Coward MBBS, Derek Lombard MD

Introduction/Objective: Agricultural accidents in the United States account for significant morbidity and mortality, with a fatality rate in 2021 of 20 deaths per 100,000 workers compared with the national average of 3.6 deaths per 100,000 workers. In 2014, an estimated 12,000 youths were injured on farms. Traumatic pericardial tamponade is a relatively rare and lethal complication of injury to the chest, with as little as 50ml of blood able to cause tamponade in the acute setting. In this case report we describe a case of a farm-related traumatic pericardial tamponade requiring significant surgical and critical care treatment in a young patient who eventually made a full recovery.

Case Presentation: A 23-year-old female presented to the ED after she was kicked in the chest by a steer while it was being loaded into a truck. Per report, at the scene she stood up, complained of pain in her chest, and collapsed. She was intubated in the field and transported by air ambulance to Hennepin Healthcare. She was found to have a traumatic pericardial tamponade, and a pericardiocentesis was performed in the ED. She was taken emergently to the OR for median sternotomy with repair of a small left ventricular epicardial tear. This was complicated by cardiac arrest requiring open cardiac massage and defibrillation. She underwent central ECMO cannulation and was left in temporary chest closure and transported to the ICU. An EVD was placed the following day due to concern for poor neurologic exam, with imaging showing multifocal infarctions in bilateral frontal, parietal, and occipital lobes. Her neurologic exam slowly improved over the following days. She developed evidence of shock liver, shock bowel, and acute kidney injury, which slowly improved. She was decannulated from ECMO 3 days following her initial injury and her chest was closed. Her EVD was removed 5 days later, and she was extubated on hospital day 10. She was discharged to an acute rehabilitation facility 14 days after her initial injury. Just over 2 months from her original injury she was cleared to resume driving.

Discussion: The case highlights many important elements of trauma surgical and critical care management including pre-hospital critical care transport, emergency department interventions, urgency for operative intervention, ICU resuscitation, and post-hospital rehabilitation. The case highlights many important elements of trauma surgical and critical care management including pre-hospital critical care transport, emergency department interventions, urgency for operative intervention, ICU resuscitation, and post-hospital rehabilitation.

Conclusion: Trauma and critical care management requires an experienced multidisciplinary team before, during, and after hospitalization to maximize outcomes.

Introduction/Objective: Microwave ablation of liver tumors allows preservation of liver parenchyma with good oncologic outcomes. However, ablation of tumors in the caudate lobe is particularly challenging. Adjacent critical anatomy, particularly the biliary hilum, has led to caudate location being considered a relative contraindication to ablation. To date, no series have described laparoscopic microwave ablation of caudate tumors of the liver.

Case Presentation: We describe our early experience with laparoscopic microwave ablation of caudate tumors. In this retrospective review of a prospectively maintained single institution database, six patients with 6 primary or secondary caudate tumors underwent laparoscopic microwave ablation with no complications. At a median follow up of 10.5 months, five out of six patients are free of caudate recurrence.

Discussion: This single-institution case series of patients who underwent laparoscopic microwave ablation of caudate liver lesions demonstrates both safety and short-term efficacy. This single-institution case series of patients who underwent laparoscopic microwave ablation of caudate liver lesions demonstrates both safety and short-term efficacy.

Conclusion: Further studies will be required to evaluate long term local recurrence risk, as this may be higher than in other anatomic segments.

Ehrlichiosis muris Infection in an Immunocompromised Renal Transplant Patient

A Jadhav, A Chandra, R Bulander Jr, J Harmon

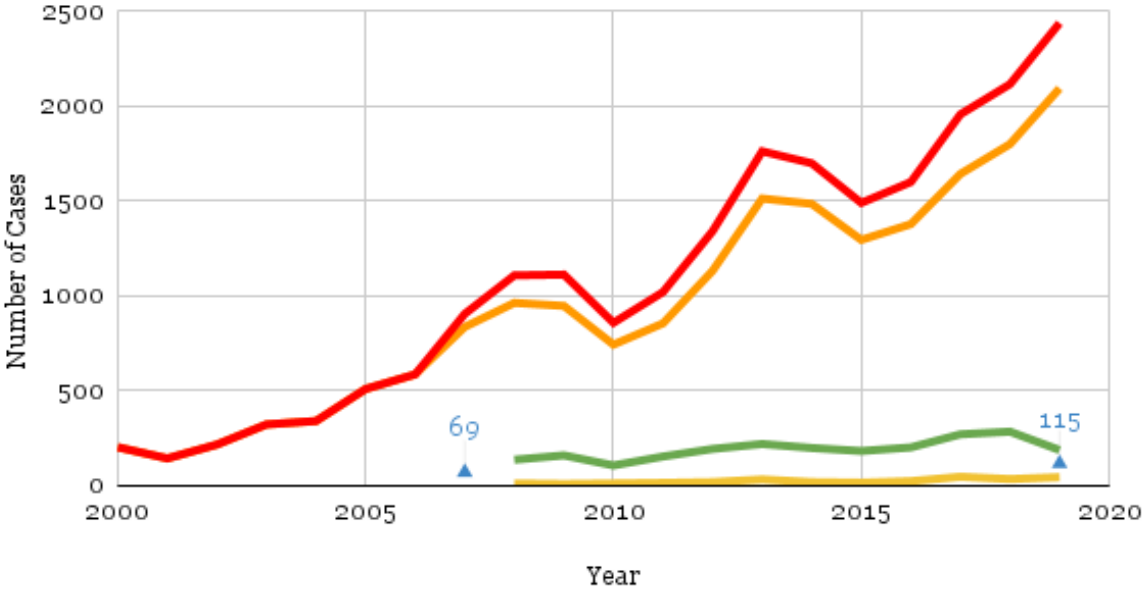
Introduction/Objective: Ehrlichia muris euclairensis (EMA), formerly known as Ehrlichia muris-like agent (EMLA), was discovered in 2009 as another cause of ehrlichiosis in humans. 69 EMA cases have been identified between 2007 and 2013 with a yearly increase in incidence. Treatment guidelines exist for certain strains, such as for Lyme disease (borne of the same tick), but are less defined for others. We wish to raise awareness within the surgical community of the rising incidence of ehrlichiosis infections, as they may be severe in transplant recipients and commonly present with sudden neurologic symptoms. This case report demonstrates unusual presentation of Ehrlichia muris infection in a renal transplant recipient with a recent tick exposure.

Case Presentation: A 70-year-old male renal transplant recipient on tacrolimus and mycophenolate mofetil, presented with confusion after a fall from standing height, following a one week history of fatigue, nausea, and diarrhea. The patient was febrile on admission to 101.4 °F and physical exam revealed no specific findings. CT scan of the head demonstrated an acute right posterior extra-axial hemorrhage with significant mass effect with 4 mm right-to-left midline shift. A thin walled brain cyst with a blood-fluid level was initially concerning for a brain abscess, but this was ruled out with repeat imaging. A Karius assay was positive for Ehrlichia muris with PCR positive for EMLA. A more detailed patient history included a single dose treatment with doxycycline five months prior following a deer tick exposure. Further history revealed the patient lived in a rural area and spent a significant amount of time outdoors. Patient fully recovered following a 14 day course of doxycycline.

Discussion: Our patient originally presented to the trauma surgery service. However, the patient's history and specific CT findings directed attention towards an infectious etiology. Immunosuppressed patients, including organ transplant recipients and patients with diabetes or cancer, are all at increased risk of severe illness and life-threatening complications from Ehrlichia infections. These complications include renal failure, meningitis, ARDS, and DIC with a mortality approaching up to 25%. Transplant patients, particularly lung or kidney recipients, have significantly higher rates of ICU admission. The single dose of doxycycline administered to our patient was insufficient for the treatment of his infection. Given the increasing incidence of Ehrlichia infections, growing geographic distribution, and life-threatening complications with a rising number of immunocompromised patients in the population, it is important to further investigate and develop management recommendations for infectious prophylaxis. Our patient originally presented to the trauma surgery service. However, the patient's history and specific CT findings directed attention towards an infectious etiology. Immunosuppressed patients, including organ transplant recipients and patients with diabetes or cancer, are all at increased risk of severe illness and life-threatening complications from Ehrlichia infections. These complications include renal failure, meningitis, ARDS, and DIC with a mortality approaching up to 25%. Transplant patients, particularly lung or kidney recipients, have significantly higher rates of ICU admission. The single dose of doxycycline administered to our patient was insufficient for the treatment of his infection. Given the increasing incidence of Ehrlichia infections, growing geographic distribution, and life-threatening complications with a rising number of immunocompromised patients in the population, it is important to further investigate and develop management recommendations for infectious prophylaxis.

Conclusion: This case outlines the rare occurrence of ehrlichiosis due to Ehrlichia muris in a immunocompromised patient with prior renal transplant. It is hypothesized that the rising number of cases could be rising secondary to an growing immunocompromised patient population, who are at greater risk for severe illness and mortality. No current guidelines exist for prophylaxis of immunosuppressed patients with an Ehrlichia infection. This case demonstrates the need for increased awareness of severe complications in transplant recipients with Ehrlichia infections.

Ehrlichiosis cases from 2000-2019



— *E. chaffeensis*
 — *E. ewingii*
 ▲ *E. muris eauclairensis*
— Undetermined Ehrlichiosis/ Anaplasma
— Total possible cases

Upfront Surgery versus Neoadjuvant Chemotherapy in Patients with Clinical T1c N0 Triple Negative and Human Epidermal Growth Factor Receptor 2 Positive Breast Cancers

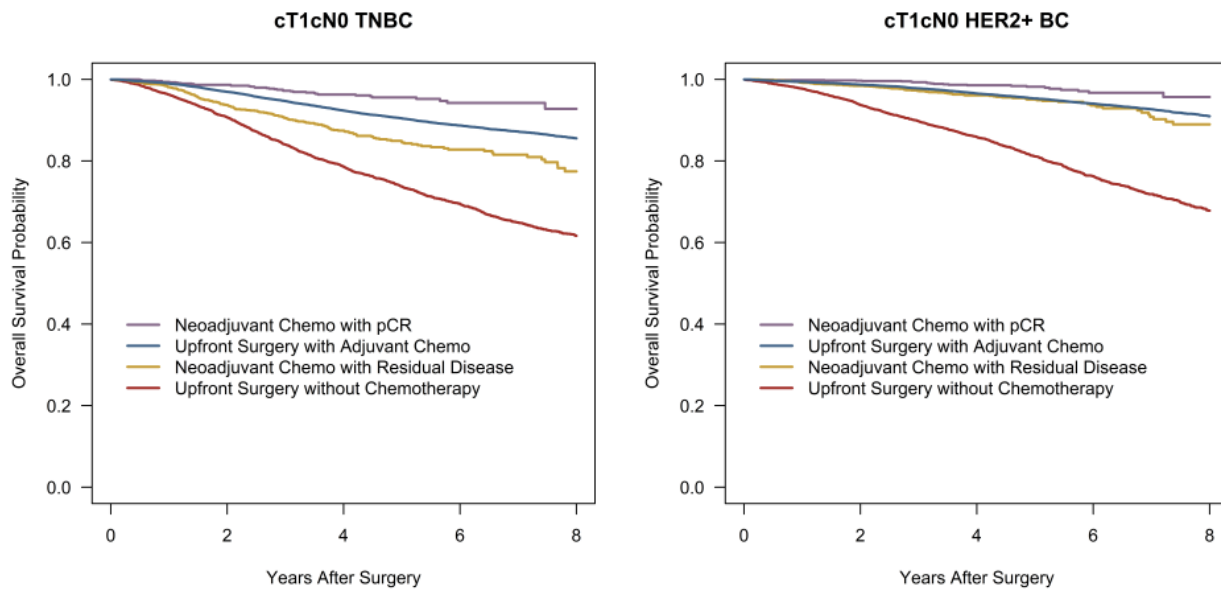
Jennifer F. Carroll, MD, Tanya L. Hoskin, MS, Courtney N. Day, MS, Roberto Leon-Ferre, MD, and Judy C. Boughey, MD

Background: The standard treatment of triple negative (TNBC) and HER2-positive breast carcinoma is neoadjuvant chemotherapy (NAC) followed by surgery. However, controversy persists in management of stage I disease. This study evaluates the overall survival of cT1cN0 TNBC and HER2+ patients treated with upfront surgery versus NAC.

Objective: To evaluate overall survival of cT1cN0 and HER2+ patients treated with upfront surgery versus NAC.

Methods: Patients with cT1cN0 TNBC and HER2+ disease were identified in the National Cancer Database from 2010-2018. Overall survival (OS) was compared between upfront surgery and NAC, and further by upfront surgery with adjuvant chemotherapy (AC) versus no chemotherapy, and NAC by pathologic complete response (pCR) versus residual disease.

Conclusion: The majority of cT1cN0 TNBC and HER2+ disease is treated with upfront surgery, however use of NAC is increasing. Patients with omission of chemotherapy had the poorest survival. These data support that chemotherapy is recommended for cT1cN0 TNBC and HER2+ disease. Given that pCR to NAC has the best outcome and that recent advances demonstrate that adjuvant capecitabine/TDM1 for patients with residual disease leads to improved survival - NAC should be recommended for cT1cN0 disease.



Comparative Analysis of Clinical Outcomes for Fascicular vs. Segmental Sural Nerve Biopsy

J Steblay, A Jadhav, B Palzer, M Pascu, L Johnson, S Navarro, J Harmon

Background: Sural nerve biopsies (SNBs) are frequently indicated for patients with suspected demyelinating or inflammatory causes of neuropathy; however, the technical details of this procedure are often overlooked. For many years, a segmental biopsy has been recommended in which the sural nerve is transected at two sites, leaving discontinuous proximal and distal nerve segments in situ. An alternative approach is the fascicular nerve biopsy, in which a bundle of nerve fascicles is removed, preserving the length of the nerve and leaving it approximately half its original width.

Objective: Our objective was to compare reported sensory deficits in patients following segmental and fascicular sural nerve biopsies in order to determine the superior surgical technique.

Methods: METHODS: We performed a literature review and extracted data regarding sensory deficits following segmental SNB and fascicular SNB for all patients that completed follow up in two separate studies. In one study (Flachenecker et al), a total of 54 patients who underwent segmental SNBs were assessed in clinic follow-up visits for sensory deficits. In a separate study (Solders et al), 54 patients underwent fascicular SNBs and were surveyed for post-op complications. For both studies, all participants had no preceding neuropathy in areas distal to the biopsy site innervated by the sural nerve, allowing for assessment of resulting sensory deficits at the lateral aspect of the foot, near and below the biopsy site. Patients were assessed for self-reported hypesthesia, dysesthesia, and persistent pain. Statistical analysis, including Chi-squared analysis was performed. Data analysis was conducted using BlueSky Statistics (Chicago, IL).

RESULTS: A Chi-squared Test of Independence was performed to determine whether the proportions of patients undergoing fascicular vs segmental SNB differed based on selected reported outcomes. We found that proportions varied significantly between the two groups for reported hypesthesia ($p = 1.85E-5$), but not for reported dysesthesia ($p = 0.633$) or pain ($p = 0.348$).

Conclusion: Analysis of patient reported outcomes following fascicular vs segmental biopsies revealed that patients who underwent fascicular SNB experienced a significantly decreased incidence of reported hypesthesia compared to patients who underwent segmental SNB. However, there were no significant differences in reported dysesthesia or persistent pain in either treatment group. While comparison of these two studies shows a slightly more favorable postoperative symptom profile for fascicular SNB over segmental SNB, a formal comparative trial including randomized selection of biopsy method and standardized follow-up intervals is necessary to establish superiority of one technique over the other.






	Fascicular SNB	Segmental SNB
 Lesser saphenous vein		
 Sural nerve		
 Transections		
Hypesthesia	44% (n=12)	93% (n=54)
Dysesthesia	22% (n=54)	19% (n=54)
Persistent pain	23% (n=26)	33% (n=54)

Fig 1. Reported postoperative neurologic deficits following sural nerve biopsy. For patients who underwent fascicular nerve biopsy (Solders et al), 26 patients completed a survey between 1 week and 1 month after their procedure, with 6 of those patients reporting persistent pain. All 54 patients completed a survey within 6 months of the study with 12 patients reporting dysesthesia, and only 12 of the study's participants reported back after 6 months post-op, with 5 patients experiencing hypesthesia. For patients who underwent segmental nerve biopsy (Flachenecker et al), all 54 were assessed at a follow up clinic visit for sensory deficits between 3 and 32 months postoperatively.

Surgical Potpourri III | Clinical Science | Surgical Education

EFFECT OF MINDFULNESS-BASED PROGRAM ON RESIDENT SURGEON BURNOUT, QUALITY OF LIFE AND COMPASSION

Irena Cich, Rachel Nygaard, Emily Colonna, Richard Zera

Background: Mindfulness-based Stress Reduction (MBSR) is a program that may help combat physician-reported burnout and improve empathy for patients. Standard MBSR programming involves an extensive time commitment that is not compatible with residency work schedule. We developed an MBSR based program that was incorporated into protected education time in the hope to provide our residents with accessible tools to strengthen resilience and compassion.

Objective: Establish a baseline of resident wellness within our residency and create a program to give residents tools to build resiliency that is easily accessible and impact these measures.

Methods: An 8-session mindfulness program, beginning in 7/2021 and ending 8/2022, was offered to 25 general surgery residents at Hennepin Healthcare. A pre and post survey was created with measures for burnout, depression, anxiety, and compassion. Additionally, short check-in surveys were created after each session.

Conclusion: Attendance for each session averaged 12 residents. Fifteen of 25 and 16 of 25 residents, respectively, completed both entrance and exit surveys. A high percentage of residents had above average scores for depression, anxiety, burnout and low self compassion both before and after mindfulness program. (PHQ8 score > 5 40% vs 42%, GAD7 > 5 35% vs 14%, self report burnout mod-severe 30% vs 12%, Self Compassion below average 35% vs 35%). Very few residents demonstrated low compassion (5% vs 5%). There was no statistically significant change in these scores before or after program.

In summary, most surgery residents were able to attend these sessions. There was no change in our wellbeing measures from the intervention; however, of note these measures did show a concerning amount of residents reporting depression, anxiety and burnout that will require continued research and intervention to address.

Incorporating the History of Surgery into Surgical Skills Workshops and Flipped Classroom Conferences

J Brierton, P Dodhiawala, M Roof, P Kernahan, and J Harmon Jr

Background: Exposure to the history of surgery will promote medical student appreciation of professionalism and the historical advances in the art and science of surgical practice. The University of Minnesota Surgery Interest Group's (SIG) surgical skills workshops and weekly teaching conferences provide early exposure to surgery as a career. We report a fifteen-year experience of incorporating these hands-on workshops and weekly conferences using the resources of the Owen H. Wangensteen Historical Library of Biology and Medicine. Case-based surgical topics are discussed during the weekly conferences which permit the opportunity to review historical background regarding the development of surgical practice and techniques. Medical students learn surgical skills, present both surgical case presentations and historical vignettes, and receive faculty guidance and feedback. The flipped classroom format, as an alternative to didactic lectures, requires students to research the topic and present the historic findings to their medical student colleagues.

Objective: Our objective is to encourage student appreciation of the history of surgery heritage, increase professionalism, and promote interest in surgery as a career through our workshops and weekly conference meetings.

Methods: "Various historical surgical techniques, instruments, and biographies have been presented to medical students in surgical skill workshops and weekly, flipped-classroom teaching conferences (Table 1). An email survey was administered to medical students who have attended the teaching conferences to assess the impact of incorporating the history of surgery into the workshops and weekly conferences. The two questions utilized multiple-choice response options based on Likert Scales.

Results: Thirty history of surgery topics were presented to medical students. Of these, 60% were presented during weekly teaching conferences. 40% of the history of surgery topics focused on historical surgical techniques, 37% focused on historical surgical instruments, and 23% illustrated a surgeon's individual contributions to surgery in a historical context (see Table 1). Thirteen students completed a survey regarding the incorporation of the history of surgery. 100% indicated that learning the history of surgery for future surgeons is "highly essential" or "essential." 85% "strongly agree" or "somewhat agree," that learning the history of surgery further stimulated their interest in Surgery as a career.

Conclusion: Thirty different historical surgery topics from various eras have been incorporated into the student-led, flipped classroom presentations and workshops organized by the University of Minnesota SIG. Survey responses confirm a high level of medical student interest and satisfaction with the inclusion of the history of surgery within the curriculum.

Missing, not Forgotten: Missing Data by Cancer Center Accreditation in Surveillance Epidemiology and End Results

MJ White, S Prathibha, D Brauer, J Ankeny, C LaRocca, JYC Hui, P Goffredo, M Rao, T Tuttle, EH Jensen, S Marmor

Background: Missing data is common in database research. Patients with missing data are often excluded from database analyses. However, this practice may result in selection bias, particularly related to when stratifying missing variables by the accreditation type of the treating facility.

Objective: We aimed to assess the degree of bias related to missing data in oncology research, based on the accreditation status of the patients treating facility.

Methods: We evaluated 2018-2019 missing Surveillance, Epidemiology, and End Reports (SEER) data prevalence for patients with Breast, pancreas, colon, or non-small cell lung cancer (NSCLC) patients by Commission on Cancer (CoC) accreditation of the treating center and 2-year overall survival (OS) by missing data and treatment center.

Across disease sites, patients were predominately treated at CoC centers (breast 81%, pancreas 81%, colon 76%, NSCLC 79%), with missing data more prevalent from non-CoC centers than CoC centers (breast 24% vs 11%, pancreas 40% vs 18%, colon 32% vs 18%, NSCLC 37% vs 15%). The odds of missing data were significantly higher at non-CoC centers than at CoC centers. Patients with missing data had significantly lower 2-year OS rates than patients with known data (breast 88% vs 96%, pancreas 21% vs 34%, colon 58% vs 83%, NSCLC 35% vs 59%, p

Conclusion: Disproportionately more missing data was observed in non-CoC centers than from CoC centers. Patients with missing data had lower OS than those with known data, with the lowest survival reported for patients missing data treated at non-CoC centers. SEER studies which exclude patients with missing data will predominately exclude patients from non-CoC centers, report erroneously superior outcomes, and approximating registry-based, rather than population-based finding.