

Thursday, April 2nd

Scientific Session VIII – Lower Extremity II

Presentation Number: MP35

Publishing Title: Bovine Carotid Artery Biological Graft Out Performs ePTFE for Hemodialysis Access

Author Block: **Thomas Reifsnyder, MD**, Isibor J. Arhuidese, MD MPH, Tasnim Islam, BA, Joshua Grimm, MD, Umair Qazi, MD MPH, Tammam Obeid, MD, Mahmoud B. Malas, MD MHS
Johns Hopkins Medical Institutions, Baltimore, MD

OBJECTIVES: Autogenous arteriovenous fistula remains the gold standard for hemodialysis access. Non-autogenous conduit provides an alternative access in the setting of inadequate veins. In this study, long-term functional patency between two non-autogenous conduits, bovine biograft and polytetrafluoroethylene (ePTFE) is compared.

METHODS: This single institution retrospective review of 120 consecutive grafts placed in 98 patients between January 2011 and June 2014. Univariate methods (Chi Square, ANOVA) were employed to compare demographic and medical characteristics of patients that received each graft type. Kaplan-Meier and Cox regression analyses were used to evaluate time to loss of patency and identify its predictors. Log rank tests were carried out to compute differences in functional survival of the grafts between both groups. Outcomes were defined and analyzed per standards published by the Society for Vascular Surgery. Follow-up commenced at the time the graft was first used for “functional” outcomes or at graft placement and ended with the occurrence of an event, death or study closure.

RESULTS: There was no difference in the functional primary and assisted primary patency comparing ePTFE to biograft (Table 1). Functional secondary patency at 6months, 1 year and 18 months for biograft and PTFE are 76%, 72%, 72% and 52%, 46%, 46% respectively. There was a six fold increase in the hazard of loss of functional secondary patency in ePTFE compared to biograft (HR: 6.8 95%CI: 1.7-26.3, P=0.006). Graft infection rates were higher for ePTFE compared to biografts (21% Vs 15%). The significant predictors of patency loss were high-BMI and hyperlipidemia.

CONCLUSIONS: In this cohort, primary and primary assisted patency are similar between biografts and ePTFE conduits. However, bovine biografts confer a significant advantage compared to ePTFE with regards to functional secondary patency.

Abstract Body:

	Hazards of loss of outcome			
Outcome	Bovine biograft	PTFE	95% CI	P-value
Primary patency	1	0.96	0.56-1.63	0.88
Functional primary patency	1	0.88	0.39-1.99	0.76
Primary assisted patency	1	1.15	0.66-2.02	0.62
Functional primary assisted patency	1	1.11	0.48-2.59	0.80
Secondary patency	1	2.56	1.27-5.19	0.009
Functional secondary patency	1	6.76	1.73-26.34	0.006

Table1. Hazards of graft failure comparing PTFE to bovine biograft

Presentation 24

Number:

Publishing

Title:

Clinical Results of Single versus Multiple-Vessel Infrapopliteal Intervention

Author

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Block:

Beth Israel Deaconess Medical Center, Boston, MA, USA.

OBJECTIVES: The effects of concomitant endovascular interventions on multiple infrapopliteal vessels are not well known and the long-term sequelae of such procedures have not been reported.

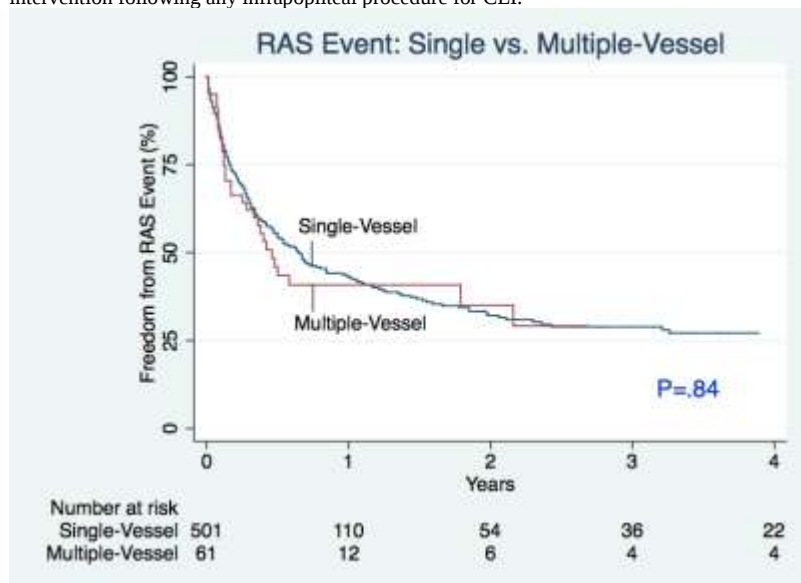
METHODS: From 2004 to 2014, 673 patients underwent an infrapopliteal endovascular intervention for tissue loss (77%), rest pain (13%), stenosis of a previously treated vessel (5%), acute limb ischemia (3%), or claudication (2%). Data collected included RAS events (revascularization, major amputation, or stenosis [$>3.5\times$ step-up by duplex]) and wound healing. Patients without an initial indication of Critical Limb Ischemia (CLI) were excluded. Patients were characterized by single-vessel infrapopliteal interventions and multiple-vessel infrapopliteal interventions. Worsened Rutherford class between index procedure and failure was also noted.

RESULTS: Of the 673 patients, 596 underwent an infrapopliteal endovascular intervention for CLI: 85% for tissue loss and 15% for rest pain. During a single procedure, 533 (89%) patients underwent a single-vessel intervention while 63 (11%) patients underwent a multiple-vessel intervention. Patients undergoing a single-vessel intervention had more commonly experienced a prior ipsilateral endovascular procedure (17% vs. 10%, $P=.04$) while patients undergoing a multiple-vessel intervention more often suffered from diabetes (78% vs. 89%, $P=.03$) and were more often discharged to a rehab facility (33% vs. 41%, $P=.04$). Survival analysis revealed no difference in the proportion of patients experiencing a restenosis ($P=.11$). A Cox regression model illustrated that long-term outcomes do not differ between patients undergoing a multiple-vessel intervention versus those undergoing a single-vessel intervention. Among the 596 patients, a RAS event occurred in 284 limbs (48%) and there was no significant difference in the rate of RAS events between single and multiple-vessel infrapopliteal interventions (48% vs. 49%, $p=.84$). Amputation rate also did not significantly differ between the two groups (14% vs. 16%, $P=.71$). In both groups, 8% of RAS patients presented with a worse ischemia class as compared to their initial symptoms.

CONCLUSIONS: Our data suggest that multiple-vessel intervention does not improve outcomes as compared to single-vessel intervention following any infrapopliteal procedure for CLI.

Abstract

Body:



**Presentation
Number:** 25

**Publishing
Title:**

**Author
Block:**

Different Patterns of Arterial Occlusive Disease in Chronic Critical Limb Ischemia between Blacks, Hispanics and Caucasians

Jayer Chung, MD, J Gregory Modrall, MD, Martyn Knowles, MD, Lawrence A. Lavery, DPM, MPH, Carlos H. Timaran, MD, R James Valentine, MD.

University of Texas Southwestern Medical Center, Dallas, TX

OBJECTIVES: Quantify associations between ethnicity and anatomic patterns of arterial occlusive disease in chronic critical limb ischemia (CLI), adjusting for known co-variables.

METHODS: Retrospective review of a prospective database of consecutive CLI patients presenting to the vascular surgery service. Computed tomographic angiograms (CTAs) and digital subtraction angiograms (DSAs) were reviewed. Arterial lesions were defined by location (Aortoiliac=aorta and iliac arteries; Femoral=common, profunda, and superficial femoral arteries; and Popliteal-tibial=infrapopliteal and tibial arteries). Stenoses > 50% were deemed hemodynamically significant. Associations between the arteriographic patterns of disease, baseline demographics and medical co-morbidities were quantified using Kruskal-Wallis, χ^2 , and Maentel-Haenszel χ^2 tests.

RESULTS: Between August 2010 and January 2014, 286 patients (N=172 male, N=143 with tissue loss) presented. 270 subjects had arteriograms (Black N=134, 50%; Hispanic N=78, 29%; Caucasian N=58, 21%; Table 1.) Hispanics (N=23, 30%) presented with the highest incidence of isolated infra-popliteal disease (IPD; $p=0.02$, χ^2). Caucasians (N=8, 14%) presented more frequently with aorto-iliac occlusive disease than either Hispanics or Blacks ($p < 0.01$, χ^2). Diabetes mellitus was more prevalent in Hispanics (N=72, 85%) relative to Blacks (N=77, 55%) and Caucasians (N=32, 52%; $p < 0.001$, χ^2). Median Hemoglobin A1c (HbA1c) was also higher among Hispanics (7.3%, IQR 6.2, 9.9) versus Blacks (6.6%, IQR 5.8, 8.2) and Caucasians (6.0%, IQR 5.6, 7.6; $p=0.002$, Kruskal-Wallis). More Caucasians (N=53, 87%) and Blacks (N=113, 81%) abused tobacco compared to Hispanics (N=48, 57%; $p=0.001$, χ^2). When stratified by baseline HbA1c, there was no relationship between ethnicity and IPD with HbA1c 8.9% had a significantly higher probability of having IPD ($p=0.005$, Maentel-Haenszel χ^2). Smoking was not associated with any anatomic pattern of disease ($p = \text{NS}$, Maentel-Haenszel χ^2). Use of statin, anti-platelet, beta-blocker, angiotensin-converting enzyme inhibitor/angiotensin-receptor blocking medications was similar across all ethnicities ($p=\text{NS}$, χ^2). **CONCLUSIONS:** Hispanic patients present more frequently with IPD, which may contribute to previously reported outcome disparities. IPD may be modifiable, as the most severely afflicted diabetics are at the highest risk. Future interventions to improve outcomes should aim to understand mechanisms of diabetic arteriopathy and barriers to proper glycemic control, especially among Hispanics.

**Abstract
Body:**

Table 1. Distribution of $\geq 50\%$ hemodynamically significant stenoses among 270 consecutive patients with CLI stratified by ethnicity.

Anatomic level of $\geq 50\%$ stenosis	Black (N=134)	Hispanic (N=78)	Caucasian (N=58)	P-value
All levels	23 (17%)	10 (13%)	10 (17%)	0.64
Aorto-iliac only	2 (2%)	0 (0%)	8 (14%)	<0.01
Aorto-iliac and femoral only	12 (9%)	3 (4%)	3 (5%)	0.29
Aorto-iliac and infra-popliteal only	7 (5%)	0 (0%)	6 (10%)	0.02
All infra-inguinal levels	64 (48%)	40 (51%)	20 (35%)	0.15
Femoral only	11 (8%)	2 (3%)	6 (10%)	0.15
Infra-popliteal only	15 (11%)	23 (29%)	5 (9%)	<0.01

Presentation
Number: 26

Publishing
Title: Tibial Bypass Fails to Improve Healing Time of Wounds Compared to Serial Endovascular Tibial Intervention

Author
Block: Andrew M. Reittinger, Samuel N. Steerman, M.D..
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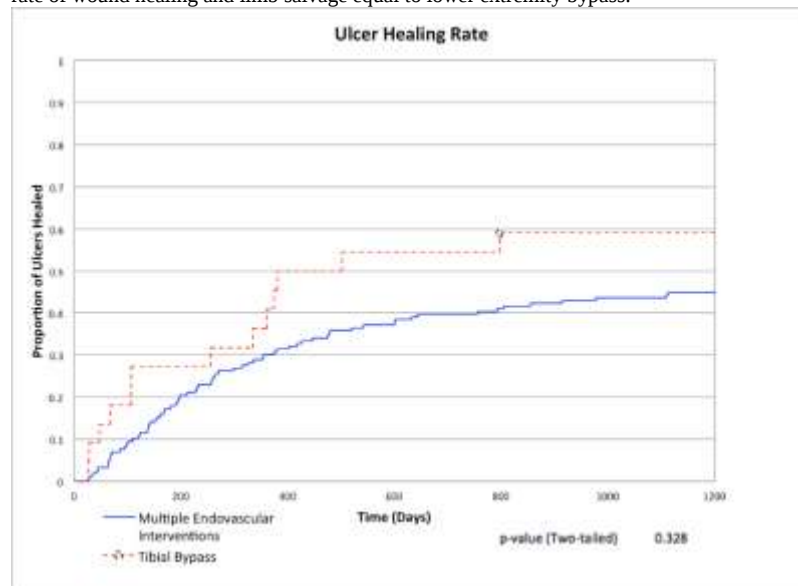
OBJECTIVES: Critical limb ischemia (CLI) has been traditionally treated with bypass surgery, but studies indicate that endovascular techniques can be a safe, effective method of revascularization. Subsequent intervention is often required in CLI patients that had previously undergone initial percutaneous treatment and the superiority of repeat endovascular interventions or tibial bypass is not clear in these patients.

METHODS: A retrospective study was performed of all patients who underwent multiple tibial revascularizations for CLI from 1/1/2000 to 9/24/2013. All patients underwent endovascular tibial interventions as the initial procedure. The Tibial Bypass (TB) group included patients that had a tibial bypass as the second procedure. The Multiple Endovascular Interventions (MEI) group included patients treated with repeat endovascular tibial intervention. Group demographics, procedural data and outcomes were compared using t-test and Kaplan-Meier survival analysis.

RESULTS: The TB group and MEI group included 32 and 181 patients, respectively. The groups were similar in demographics, medications, and risk factors. The MEI group had an average of 1.35 percutaneous revascularizations, with 5 being the maximum. Pre-operative indications for intervention were rest pain (TB 25.00% vs MEI 19.34%, $p=0.464$), ulceration (37.51% vs 47.50%, $p=0.297$), and gangrene (21.88% vs 20.99%, $p=0.911$). Average pre-operative Rutherford scores for the TB group and MEI group were comparable (4.774 vs 4.879, $p=0.440$). Tibial disease within the TB and MEI Groups was classified as TASC A (6.25% vs 7.73%, $p=0.629$), TASC B (34.38% vs 38.67%, $p=0.646$), TASC C (3.13% vs 14.36%, $p=0.079$), and TASC D (53.13% vs 19.89%, $p<0.0001$) after initial angiogram. The TB and MEI groups were followed for an average of 568.47 days and 453.84 days ($p=0.161$) after the final intervention, respectively. There were no significant differences between TB and MEI in mortality (18.8% vs 24.9%, $p=0.458$), post-operative complications (21.9% vs 15.5%, $p=0.370$), major amputation (28.1% vs 30.4%, $p=0.802$), minor amputation (32.3% vs 34.6%, $p=0.802$), ulcer healing rate (TB: 260.54 days vs MEI: 355.86 days, $p=0.328$, Figure) or ulcers healed (TB: 59.10% vs MEI: 46.15%, $p=0.258$).

CONCLUSIONS: After initial endovascular tibial intervention, performing multiple endovascular tibial interventions produces a rate of wound healing and limb salvage equal to lower extremity bypass.

Abstract
Body:



**Presentation
Number:** 27

**Publishing
Title:** Independent Predictors of Readmission after Femoral to Popliteal Artery Bypass Grafting in Diabetics

Author Block: **Khanjan H. Nagarsheth, MD**, Jonathan Schor, MD, Matthew D'Alessandro, MD, Kuldeep Singh, MD, Saqib Zia, MBBS,
Jonathan Deitch, MD.

Staten Island University Hospital, Staten Island, NY

OBJECTIVES: To determine which factors contribute to hospital readmission for diabetic patients within 30-days of femoral to popliteal artery bypass (FPB) surgery, we performed a database review.

METHODS: The National Surgical Quality Improvement Program (NSQIP) database was queried from the years 2005 to 2011, to identify diabetic patients who underwent FPB. Patients were divided into two groups, those who were readmitted within 30-days of operation (RA) and those who were not readmitted (NRA). Patient demographics, comorbidities, perioperative data, and outcomes were compared.

RESULTS: Of the 5523 patients identified, 334 were in the RA group and 5189 were in the NRA group. There were 208 vein bypasses in the RA group and 2949 vein bypasses in the NRA group. The remainder were prosthetic conduit. Difference in bypass conduit approached but did not achieve statistical significance ($p=0.051$).

**Abstract
Body:**

The RA group had a higher proportion of patients with medical comorbidities including: ventilator dependence (2.1% v. 0.1%, $p<0.01$), CHF (8.7% v. 3.1%, $p<0.01$), recent MI (4.5% v. 2%, $p<0.01$), and insulin dependence (59.6% v. 53.6%, $p=0.03$) compared to the NRA group. Pre operative vascular disease was more severe in the RA group as well with rest pain/gangrene (50.9% v. 39.1%, $p<0.01$) and history of prior amputation (73.1% v. 49.8%, $p<0.01$) both higher in the RA group. The RA group also had a higher proportion of emergency procedures (11.4% v. 4.4%, $p<0.01$), longer operative time (226 ± 11.5 min v. 208.4 ± 2.6 min, $p<0.01$) and longer prior hospital LOS (16.5 ± 1.8 days v. 8 ± 0.3 days, $p<0.01$). The RA group also was taken back to the OR more frequently during the index admission (36.2% v. 15.3%, $p<0.01$) than the NRA group. Pre-operative HTN (odds ratio [OR] 46.7, confidence interval [CI] 34.6 to 62.9) and rest pain/gangrene (OR 50.1, CI 36.4 to 69.1) were found to be the only independent predictors of readmission on multivariate analysis.

CONCLUSIONS: Insulin dependence and preoperative cardiac comorbidities are not predictive of readmission rates after FPB in diabetic patients. The presence of critical limb ischemia is the most predictive factor for 30-day readmission after FPB in diabetic patients.

Presentation Number: MP36

Publishing Title: Initial Experience with Infrageniculate Access for Retrograde Endovascular Interventions (REI) for Chronic Lower Extremity Ischemia

Author Block: Ashraf Taha, MD, Luke Marone, MD, Efthymios D. Avgerinos, MD, Timothy Wu, MD, George AlKhoury, MD, Michael Singh, MD, Geetha Jeyabalan, MD, Michel Makaroun, MD, Rabih A. Chaer, MD.

University of Pittsburgh, Pittsburgh, PA

OBJECTIVES: Retrograde infrageniculate access is an alternative treatment strategy for patients that failed antegrade endovascular intervention. This study examines the modes of failure and outcomes of REI for lower extremity ischemia.

METHODS: This was a retrospective single center review of REI from 2012-2014. Indications for intervention, comorbidities, complications, procedural success, limb outcomes, and mortality were analyzed. Technical failure was defined as the inability to complete the procedure due to failed access or unsuccessful recanalization. Infrageniculate access was obtained with ultrasound or angiographic roadmap guidance. Patency rates were calculated for technically successful interventions.

RESULTS: 37 patients presenting with critical limb ischemia (81%) or disabling claudication (19%) underwent sheathless REI after failed antegrade recanalization of TASC D infrainguinal lesions. Mean follow up was 8 months (range 1-27). There were 14(38%) femoropopliteal, 5 (14%) tibial, and 10(27%) multilevel interventions. Access sites included the dorsalis pedis (27%), mid-calf peroneal (27%), anterior tibial (19%), posterior tibial (24%) and popliteal arteries (3%). Overall technical success was achieved in 22 (59%) patients: technical failure rate (41%) included failed access (11%) and failed recanalization (30%). Of the 15 technical failures, 4 underwent successful antegrade endovascular interventions, 8 bypasses, 2 major amputations, and one patient was managed conservatively. The 1-year primary, assisted primary, and secondary patency rates were 77%, 77%, and 97%, respectively. The rate of reintervention was 23%, the majority consisting of antegrade endovascular interventions for symptomatic restenosis. At one year, limb salvage and survival rates were 85% and 77% by KM analysis, comparable to published reports of antegrade interventions for CLI. There were no access site complications or periprocedural deaths.

CONCLUSIONS: Infrageniculate access for REI can result in similar limb salvage and patency rates as antegrade interventions, and does not compromise the access site. Technical failure is high in this initial experience and is mostly due to failed recanalization. Limb salvage may be achieved after technical failure with either repeat antegrade intervention or surgical bypass.

Abstract Body:

Patient Characteristics		
	N (37)	%
Mean age (yrs+/-SD)	70.5±12.17	46
Male	17	76
Smoker	28	
Co-morbidities		
CAD	24	65
CHF	12	32
Hypertension	30	81
Renal Insufficiency	12	32
Dialysis	4	11
Stroke	5	14
Cancer	7	19
Dyslipidemia	26	70
DM	21	57
COPD	15	41

Presentation Number: MP37

Publishing Title: Initial Hemodynamic Changes after Bypass versus Endovascular Intervention for CLI in the ACS-NSQIP Targeted Vascular Module

Author Block: John C. McCallum, MD, Jeremy D. Darling, BA, Dominique B. Buck, MD, Peter A. Soden, MD, Sara L. Zettervall, MD, Marc L. Schermerhorn, MD, Raul J. Guzman, MD.
Beth Israel Deaconess Medical Center, Boston, MA

OBJECTIVE: It has been suggested that endovascular and open interventions achieve equivalent hemodynamic results in the treatment of lower extremity vascular occlusive disease. We sought to compare the change in hemodynamic status after open versus percutaneous interventions for patients undergoing revascularization attempts for critical limb ischemia (CLI).

METHODS: We queried the ACS-NSQIP from 2011 to 2012, the years for which targeted vascular data were available. Patients were included if they had undergone infrainguinal bypass or endovascular intervention for CLI. Non-bypass open procedures (e.g. endarterectomy) were excluded. Patients were stratified by the pre-operative ankle-brachial index (ABI). The proportion of patients in the open and endovascular groups who achieved a normal ABI or palpable pulse were compared using chi-squared and Fisher's exact tests where appropriate.

RESULTS: A total of 4,384 patients underwent open or endovascular infrainguinal intervention in the targeted vascular module. Among patients with CLI, bypass was performed in 1,880 (69%) and endovascular intervention in 838 (31%). In CLI patients who had a pre-operative ABI of < 0.39, there were no differences in the proportion achieving normal ABI or palpable pulse (33% vs 28%, p= .30). However, among patients with CLI who had a pre-operative ABI between 0.4 and 0.89, those undergoing open bypass surgery were significantly more likely to achieve a normal post-op ABI or palpable pulse than those undergoing a percutaneous intervention (42% vs 30%, OR 1.7, 95% CI 1.2-2.3).

CONCLUSIONS: In this multi-institutional report of hemodynamic changes after vascular interventions for CLI, stratified analysis suggests that improvements in ABI are more likely after open bypass surgery than endovascular procedures. Further studies aimed at determining whether these differences are associated with improved wound healing and reduced adverse limb events are needed.

Abstract Body:

Post-revascularization ankle-brachial index in patients with CLI		
		Post-op Normal ABI (0.9-1.3) or Palpable pulse
Pre-op ABI <0.39	Endo (n=117)	28.2%
	Open (n=372)	33.3%
	P-value	.30
Pre-op ABI 0.4-0.89	Endo (n=254)	29.9%
	Open (n=459)	41.8%
	P-value	<.001

Thursday, April 2nd Scientific Session IX – Aortic

**Presentation
Number:** 28

**Publishing
Title:** The da Vinci Robot in the Field of Vascular Surgery.

Author Petr Stadler, Assoc. Prof., MD, PhD., Libor Dvoracek, MD, Petr Vitasek, MD, Pavel Matous, MD.
Block: Na Homolce Hospital, Praha 5, Czech Republic.

OBJECTIVES: The da Vinci system has been used by a variety of disciplines for laparoscopic procedures but the use of robots in vascular surgery is still relatively unknown. The feasibility of laparoscopic aortic surgery with robotic assistance has been sufficiently demonstrated. Our clinical experience with robot-assisted vascular surgery performed using the da Vinci system is herein described.

METHODS: Between November 2005 and May 2014, we performed 310 robot-assisted vascular procedures. 224 patients were prospectively evaluated for occlusive diseases, 61 patients for abdominal aortic aneurysm, four for a common iliac artery aneurysm, four for a splenic artery aneurysm, one for a internal mammary artery aneurysm five for hybrid procedures, two for median arcuate ligament release and nine for endoleak II treatment post EVAR.

RESULTS: 299 cases (96,5%) were successfully completed robotically, one patient's surgery (0,3%) was discontinued during laparoscopy due to heavy aortic calcification. In ten patients (3,2%) conversion was necessary. The thirty-day mortality rate was 0,3%, and early non-lethal postoperative complications were observed in six patients (1,9%).

CONCLUSIONS: Our experience with robot-assisted laparoscopic surgery has demonstrated the feasibility of this technique for occlusive diseases, aneurysms, endoleak II treatment post EVAR, for median arcuate ligament release and hybrid procedures.

**Abstract
Body:**



Presentation 29

Number:

Publishing Title: Type I Endoleak at Completion of Endovascular Abdominal Aneurysm Repair is Associated with Increased Perioperative Mortality

Author: Tze-Woei Tan, MD¹, Mohammad Eslami, MD², Wayne W. Zhang, MD¹, Denis Rybin², Doros Gheorghe², Alik Farber, MD².

Block: ¹Louisiana State University Health Sciences Center Shreveport, Shreveport, LA ²Boston University Medical Center, Boston, MA

OBJECTIVES: Type I endoleak (TIE) during endovascular abdominal aortic aneurysm repair (EVAR) is usually identified and treated intraoperatively. We evaluated the outcomes of patients who, despite possible treatment, had TIE at completion of EVAR.

METHODS: We examined consecutive EVAR within the Vascular Study Group of New England database (2003-2012) and compared the outcomes of patients who had TIE at completion with those who did not. Ruptured abdominal aortic aneurysms were excluded. Outcomes included perioperative death, cardiac complication, reoperation, and one-year mortality. Multivariable logistic regression was used to determine factors associated with perioperative mortality, as well as factors associated with TIE.

RESULTS: Among the 2,402 EVARs in the study cohort, 93% (2235) were performed electively; 7% had (167) symptomatic AAA. Eighty patients (3.3%) had TIE at completion of surgery; these patients were older, more likely to be female, have a larger endograft main body diameter and have unplanned graft extension (Table). TIE was associated with increased postoperative mortality(5% vs. 0.6%, p=.002) and cardiac dysrhythmia (8.8% vs. 3.2%, p=.02). Four patients underwent intraoperative conversion to open repair and none died before hospital discharge. In multivariable analysis, TIE was associated with increased perioperative mortality (Odds ratio (OR) 4.6, 95%Confidence Interval (CI) 1.3-16.7, p=.02). Other factors associated with perioperative death included female gender (OR 4.6, 95% CI 1.7-12.8, p=.003) and cardiac dysrhythmia (OR 17.5, 95% CI 6.0-50.6, p30mm (OR 2.5,95% CI 1.6-4.4, p<.001) and unplanned graft extension(OR 4.2,95% CI 2.5-7.3, p<.001).

CONCLUSIONS: Type I endoleak at EVAR completion occurs in up to 3% of patients, and is associated with increasing age, female gender, larger endograft diameter and unplanned graft extension; TIE is associated with increased risk of perioperative mortality. Further study is needed to further define and improve perioperative outcomes of these at-risk patients.

Abstract

Body:

Characteristics/ Outcomes	Overall (N=2402)	Type I Endoleak (N=80)	None (N=2322)	P Value
Age, mean $\pm$ SD	73.8 $\pm$ 8.4	77.9 $\pm$ 8.4	73.6 $\pm$ 8.5	<.001
Female gender	20.4%	33.8%	20.0%	.004
Maximum diameter, mean $\pm$ SD	57.7 $\pm$ 22.6	61.4 $\pm$ 11.9	57.6 $\pm$ 22.9	.14
Graft body diameter, mean $\pm$ SD	27.2 $\pm$ 3.9	28.8 $\pm$ 3.9	27.2 $\pm$ 3.6	<.001
Unplanned graft extension	10.4%	32.1%	9.6%	<.001
Hospital Death	0.7%	5.0%	0.6%	.002
Dysrhythmia	3.4%	8.8%	3.2%	.018
Reoperation	2.0%	5.0%	1.9%	.08
One-year mortality	5.7%	8.8%	5.6%	.22

**Presentation
Number:** 30

**Publishing
Title:** **Patients with Familial Abdominal Aortic Aneurysms are at Increased Risk for Type 1 Endoleak Following Elective Endovascular Aneurysm Repair**

Author Block: **Biju K. Thomas, M.D.**, Evan J. Ryer, M.D., Robert P. Garvin, M.D., Helena Kuivaniemi, M.D., Ph.D., David P. Franklin, M.D., James R. Elmore, M.D.,

Geisinger Medical Center, Danville, PA

OBJECTIVES: A recent investigation has documented increased aneurysm related complications after endovascular aneurysm repair (EVAR) of familial abdominal aortic aneurysms (fAAA). We hypothesized that fAAA patients are not at increased risk following EVAR, when compared to EVAR for sporadic abdominal aortic aneurysms (spAAA). To this end, we performed a retrospective review of our single institution series.

METHODS: Epidemiologic data was collected through the electronic medical record. Major adverse events were defined as myocardial infarction, cardiac arrest, respiratory failure requiring tracheostomy, renal failure requiring dialysis, colonic ischemia requiring resection, limb ischemia requiring amputation, multi-system organ failure or death. Endoleaks were classified in accordance with the standardized reporting practices of the Society for Vascular Surgery.

**Abstract
Body:**

RESULTS: Three hundred ninety one patients with complete family history and clinical data underwent elective AAA repair from 2004 to 2014. Demographics were consistent with a standard AAA population and did not differ between fAAA and spAAA patients. Sixty two percent (n=56) of fAAA patients and 68% (n=203) of spAAA patients underwent EVAR (p=0.31). fAAA patients did not incur any greater risk of major adverse events following EVAR (fAAA: 11% vs. spAAA: 9%, p=0.8) or open AAA repair (fAAA: 11% vs. 15%, p=0.78). Despite no difference in major morbidity, fAAA patients did have an increased rate of all type endoleaks (fAAA: 23% vs. spAAA: 12%, p=0.05). Furthermore, the rate of type 1 endoleak and subsequent re-intervention for type 1 endoleak did differ between the groups (fAAA: 7% vs. spAAA: 1%, p=0.02). In contrast, re-intervention for all types of endoleak following EVAR (fAAA: 13% vs. spAAA: 8%, p=0.16) did not differ between fAAA and spAAA patients.

CONCLUSIONS: The current study demonstrates that patients with a familial form of AAA do not have increased morbidity following AAA repair but are more prone to endoleak following EVAR. We believe our results, combined with those of others, suggest EVAR for fAAA is safe and effective but represents a subpopulation that would benefit from close post-procedure surveillance.

**Presentation
Number:** 31

**Publishing
Title:** External Validation of Vascular Group of New England (VSGNE) Risk Predictive Model of Mortality after Elective Abdominal Aorta Aneurysm Repair (EAR) and Comparison against Established Models.

**Author
Block:** **Mohammad H. Eslami, MD¹**, Denis Rybin, MS², Gheorghe Doros, PhD², Alik Farber, MD¹.

¹Division of Vascular and Endovascular Surgery, Boston University School of Medicine, Boston, MA, USA, ²Department of Biostatistics, Boston University School of Public Health, Boston, MA

OBJECTIVES: Previously, we developed a VSGNE risk predictive model (RPM) to predict in-hospital mortality (IHM) after EAR. The purpose of this study is to externally validate this model using American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) database and evaluates its ability to predict mortality compared to established RPMs.

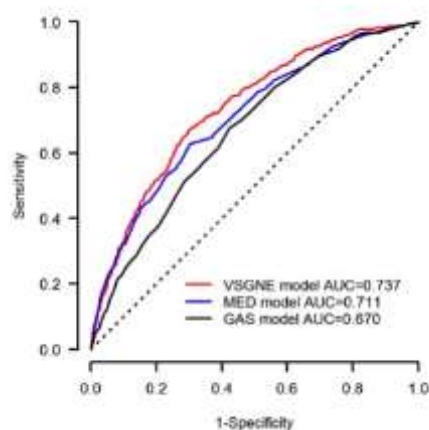
METHODS: VSGNE AAA database was queried for patients who underwent EAR. Only pre-operative variables, Anesthesia Society Association (ASA) classification and type of procedure were entered into a logistic regression model as predictors of IHM. Backward elimination procedure with alpha level of 0.2 was used to select a more parsimonious model. Calibration was performed to measure how closely predicted outcomes agree with observed outcomes. The predictive value of the model was assessed via C-statistic. Hosmer-Lemeshow (HL) method was used to assess calibration. The external validation of this model was performed using the NSQIP EAR sample. This model was then compared to Medicare (MED) and Glasgow Aneurysm Score (GAS) for predicting IHM in NSQIP sample. Vuong test was performed to compare model fit. Model discrimination was assessed in equally-sized risk-group NSQIP terciles.

RESULTS: Data from 2,681 patients from the VSGNE sample with overall 1.3% IHM rate were used to develop a parsimonious AAA mortality model (Table). Internally validated model showed a very high discriminating ability (Corrected C= 0.805) and good model fit (HL p=0.699). External validation on 18,766 NSQIP patients with an overall 1.9% IHM rate showed very good predictive ability (AUC=0.737, Fig). Vuong tests yielded a significant fit difference favoring MED and VSGNE to GAS model while MED and VSGNE compared similarly (Fig). Across three risk terciles, VSGNE model predicted observed mortality reasonably well.

CONCLUSIONS: The VSGNE AAA RPM was externally validated on NSQIP AAA patients and shows a high fidelity for predicting EAR mortality performed by a diverse array of physicians. A risk score based on this model can reliably stratify patients according to their risk of mortality after EAR.

**Abstract
Body:**

AAA Final Risk Predictive Model of Mortality			
Variable	Beta	Standard Error	p Value
Intercept	-12.54	2.17	<0.001
Open Procedure	1.35	0.37	<0.001
Age	0.09	0.03	0.001
Female Gender	0.88	0.36	0.014
Myocardial Disease	0.62	0.36	0.088
Vascular Disease	0.80	0.42	0.060
Congestive Heart Failure	0.88	0.41	0.032
Chronic Obstructive Pulmonary Disease	0.55	0.36	0.126
ASA: Life Threat/Moribund	0.90	0.80	0.260



Presentation Number: MP38

Publishing Title: Comparative Analysis of Open and Endovascular Abdominal Aortic Aneurysm Repair by Chronic Kidney Disease Severity

Author: **Nathan J. Aranson, MD¹**, Robert T. Lancaster, MD¹, Emel Ergul, M.A.¹, Shermerhorn L. Marc, MD², Daniel J. Bertges, MD³, Mark F. Conrad, MD¹, Richard P. Cambria, MD¹, Patel I. Virendra, MD¹

Block: ¹Massachusetts General Hospital, Boston, MA, ²Beth Israel Deaconess Medical Center, Boston, MA, ³Fletcher Allen, Burlington, VT

INTRODUCTION: Chronic kidney disease (CKD) has been shown to increase post-operative mortality, complications, and length of stay following abdominal aortic aneurysm (AAA) repair, however impact of repair type in patients with CKD is unknown. This study evaluated the outcomes of endovascular AAA (EVAR) and open AAA repair (OAR) in patients of varying CKD severity. **METHODS:** Patients in the Vascular Study Group of New England (VSGNE) registry who underwent EVAR or OAR for non-ruptured AAA from 2003 to 2013 were stratified by National Kidney Foundation CKD staging as having MILD (CKD class 0-1), MODERATE (CKD class 2-4), or SEVERE (CKD class 5-6) CKD. Comparative analysis was conducted with mortality as a primary endpoint as well as pre-operative factors and postoperative clinical outcomes as secondary endpoints.

RESULTS: We identified 5101 patients who were treated with EVAR (n=3760; 74%) and OAR (n=1341; 26%). Distribution of MILD, MODERATE, and SEVERE CKD across the cohort was 70%, 26%, and 2% respectively; similar in both repair types (P=0.72). Variables associated with increasing CKD severity included age, ASA class 4/5, hypertension, diabetes, CAD, CHF, COPD, PVD, larger AAA, and urgent cases (P≤0.01; all variables). Post-operative death, renal failure, and 5-year survival rates are presented. (Table 1) Univariate outcomes were worse in patients with MILD or SEVERE CKD undergoing OAR, whereas outcomes were comparable for EVAR and OAR in patients with MODERATE CKD. Multivariable modeling however found that MODERATE (OR1.9[95%CI:1.04-3.6]; P=0.02), SEVERE (OR4.9[95%CI:1.6-15.5]; P=0.02), and OAR (OR2.3[95%CI:1.2-4.5]; P<0.01) independently predicted operative mortality. Independent risk of renal failure was associated with MODERATE (OR3.0[95%CI:2.1-4.4]; P<0.01), SEVERE (OR13.4[95%CI:6.8-26]; P<0.01), and OAR (OR3.4[95%CI:2.3-4.9]; P<0.01). Other independent predictors of operative mortality and acute renal failure included ASA class 4/5, CAD, and CHF. Cox proportional hazards modeling showed that MODERATE (HR1.2[95%CI:1.05-1.4]; P<0.01) and SEVERE (HR2.6[95%CI:1.9-3.6]; P<0.01) CKD increased risk of late death whereas procedure type did not affect survival (HR0.9[95%CI:0.7-1.3]; P=0.8). Other independent predictors of late death included age, CAD, CHF, and COPD.

CONCLUSION: MODERATE and SEVERE CKD adversely impact early and late mortality following AAA repair therefore should be prominently considered in surgical decision making. In patients with CKD and AAA, EVAR is associated with lower morbidity and comparable late survival and should be the treatment of choice if anatomically feasible.

Abstract Body:

Post-operative Outcomes				
		EVAR	OAR	P-value
MILD	30-Day Mortality (%)	0.7	1.5	<0.05
	Acute Renal Failure (%)	0.2	0.6	<0.05
	5-year Survival (%; SE)	78 (1.2)	81 (1.5)	0.5
MODERATE	30-Day Mortality (%)	1.8	2.4	0.5
	Acute Renal Failure (%)	0.8	1.2	0.1
	5-year Survival (%; SE)	65 (2.4)	75 (2.6)	<0.05
SEVERE	30-Day Mortality (%)	4.3	9.1	0.4
	Acute Renal Failure (%)	1.4	25	<0.05
	5-year Survival (%; SE)	44 (1.1)	42 (1.3)	0.7

**Presentation
Number:** MP39

**Publishing
Title:** Ultra Low-Concentration Catheter Directed Computed Tomography Angiography (Cd-CTA) for Planning Fenestrated Endovascular Aortic Repair (FEVAR) in Patients with Chronic Kidney Disease (CKD)

Author Block: **Raghuveer Vallabhaneni, MD**, Mark A. Farber, MD
University of North Carolina-Chapel Hill, Chapel Hill, NC

**Abstract
Body:**

OBJECTIVES: FEVAR of complex aortic aneurysms requires high quality CT angiography for custom device planning and possible intra-operative guidance using image fusion technology. At our institution, patients with stage 3-4 (CKD) have undergone cd-CTA with 40 ml of intra-aortic contrast for FEVAR planning. Recently, we have changed our protocol to utilize only 20 ml of contrast with the goal of decreasing the risk of acute kidney injury (AKI) while maintaining adequate imaging quality. The purpose of this study is to evaluate the applicability of low dose cd-CTA in performing complex aortic repairs as well as the incidence of AKI.

METHODS: Six patients of mean age 72 (58-80) undergoing pre-operative planning for FEVAR with stage 3-4 CKD underwent cd-CTA. The protocol for cd-CTA included placement of a catheter in the descending thoracic aorta under fluoroscopy. CT images were obtained after intra-aortic injection of 20 ml of Omnipaque 350 (GE Healthcare, Princeton, NJ) diluted with 60 ml of normal saline at a rate of 6 ml/s. All patients received pre- and post-scan hydration. Serum creatinine/eGFR levels were obtained before the scan and 3-9 days afterward. Two vascular surgeons with 8 and 3 years experience performing FEVAR evaluated the images independently using Aquarius iNtuition software (TeraRecon, Foster City, CA) to determine if measurements could be accurately obtained for custom device fabrication.

RESULTS: The mean serum creatinine level at baseline was 2.3 mg/dl (1.7-2.5) and the mean estimated GFR was 28.8 ml/min/1.73 m² (19-39). The mean follow-up was 5.8 days (3-9) and the mean change in creatinine was -0.3 mg/dl. Four of the patients were discharged the same day as the scan. All of the cd-CTAs were deemed adequate for pre-operative planning by both surgeons. Five patients have undergone aortic repair with 100% technical success, target vessel patency and exclusion of their aneurysm. The remaining patient has elected to undergo surveillance of their aneurysm.

CONCLUSIONS: cd-CTA of the abdomen utilizing only 20 ml of contrast with same day discharge is feasible for FEVAR pre-operative planning. Target vessel patency as well as success of FEVAR does not appear to be impacted with this technique. Although no acute deterioration in kidney function was observed, larger series are required for validation.

Thursday, April 2nd

Scientific Session X – Visceral

Presentation Number: 32

Publishing Title: Celiac Artery Decompression for Median Arcuate Ligament Syndrome: A US National Inpatient Sample Study

Author: **Alec B. Rezigh, BS¹**, Sapan S. Desai, MD², Rana O. Afifi, MD¹, Kristofer M. Charlton-Ouw, MD¹, Charles C. Miller, PhD¹, Anthony L. Estrera, MD¹, Hazim J. Safi, MD¹, Ali Azizzadeh, MD¹.

Block: ¹The University of Texas at Houston Medical School, Houston, TX ²Southern Illinois University School of Medicine, Springfield, IL

OBJECTIVES: Median Arcuate Ligament Syndrome (MALS) results from celiac artery compression by the median arcuate ligament and is most often associated with chronic abdominal pain. The objective of this study was to evaluate the outcomes of MALS after celiac artery decompression (CAD).

METHODS: A retrospective analysis was completed using the Nationwide Inpatient Sample based on ICD-9-CM codes for MALS (447.4) and CAD (39.91) for patient admissions between 1999 and 2011 in the US. Demographic covariates included age and gender. Clinical covariates included Diagnosis-Related Group (DRG) severity of illness scores, mortality scores, comorbidities, and hospital covariates. Outcomes included inpatient mortality, median length of stay (LOS) in days, and adjusted median hospital costs. Data analysis was completed using the IBM SPSS software package (SPSS version 22.0, SPSS Inc., Chicago, IL, USA).

RESULTS: We identified 33,951 patients who were diagnosed with MALS and 1029 patients who underwent CAD. Demographics, comorbidities, hospital covariates, and outcomes are shown in Table 1. Although the results indicate increased mortality in patients who do not undergo surgery (MALS 2.6% vs. CAD 0%; p<0.001), this is more likely due to higher DRG severity of illness (MALS 2.7; CAD 1.7; p<0.001) and risk of mortality (MALS 2.3; CAD 1.2; p<0.001). The incidence of MALS has increased steadily since the year 2000, yet only 2.44% of patients, on average, identified with MALS undergo CAD.

CONCLUSIONS: The outcomes of CAD for MALS are excellent. While the incidence of MALS has increased, very few patients undergo CAD. This may represent an opportunity to educate physicians regarding the diagnosis and treatment of MALS. Table. Demographics, comorbidities, hospital covariates, and outcomes in patients with MALS and in those who undergo CAD.

Abstract Body:

Variable	MALS	CAD	Significance
<u>Demographics</u>			
Age	67.9 +/- 15.7	40.9 +/- 17.4	P<0.001
Female	66.9%	73.9%	P<0.001
Number of chronic conditions	7.3 +/- 3.1	3.5 +/- 2.3	P<0.001
Number of diagnoses on record	11.3 +/- 5.3	6.3 +/- 4.6	P<0.001
DRG severity of illness	2.7 +/- 0.7	1.7 +/- 0.8	P<0.001
DRG risk of mortality	2.3 +/- 0.9	1.2 +/- 0.5	P<0.001
<u>Comorbidities</u>			
Iron deficiency anemia	19.8%	4.7%	P<0.001
Congestive heart failure	11.2%	0.0%	P<0.001
COPD	25.1%	12.2%	P<0.001
Depression	12.8%	9.3%	P<0.01
Diabetes	17.1%	3.1%	P<0.001
Hypertension	61.1%	22.4%	P<0.001
Fluid and electrolyte disorders	28.1%	9.5%	P<0.001
Peripheral vascular disorder	49.5%	14.3%	P<0.001
Renal failure	15.5%	0.8%	P<0.001
Weight loss	12.4%	10.0%	N.S.
<u>Hospital Covariates</u>			
Urban hospital location	92.2%	97.3%	P<0.001
Teaching hospital	51.5%	82.2%	P<0.001
<u>Outcomes</u>			
Length of stay (days)	5 (3-8)	4 (3-7)	N.S.
Total costs (2014 USD)	\$13,129 (7,716-22,628)	\$16,107 (11,466-23,610)	P<0.01

Inpatient mortality	2.6%	0.0%	P<0.001
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Presentation Number: 33

Publishing Title: A Comparison of Open and Endovascular Treatment Strategies for the Management of Splenic Artery Aneurysms

Andrew Sticco, M.D., **Michael S. Shapiro**, Alok Aggarwal, M.D., Abimbola Pratt, M.D., Donald Risucci, M.D., Marcus

Author Block: D'Ayala, M.D..

New York Methodist Hospital, Brooklyn, NY

OBJECTIVES: Splenic artery aneurysms (SAA) are rare with an overall estimated incidence of less than 0.01%. Open surgical techniques have traditionally been used to treat or exclude SAAs. More recently endovascular procedures have emerged as a preferred treatment. However, evidence to support an endovascular management strategy for SAA is limited to few case series and mostly individual case reports.

METHODS: We used the Nationwide Inpatient Sample (NIS) and gathered data from 2008 to 2011 to compare open to endovascular SAA repair by assessing postoperative outcomes, length of hospital stay, and mortality.

Abstract Body:

RESULTS: There were 2316 admissions during the study period with a diagnosis code for SAA. Among these admissions, 347 (14.9%) patients underwent endovascular repair and 112 (4.8%) patients underwent open surgery. There was a statistically significantly lower rate of cardiac (2.3% vs 6.9%, P=0.05) and pulmonary (8.9% vs 16.1%, P=0.05) complications in patients undergoing endovascular repair compared with those undergoing open surgery. In addition, the risk of surgical site infection in endovascularly treated SAA was also lower (0.6% vs 5.1%, P=0.01). In-hospital LOS was significantly greater for open repairs than endovascular repairs (6 vs. 4 days respectively, P=0.01). There were no statistically significant differences across procedures for renal complications (8.9% in both groups, P=0.88) or in-hospital mortality (3% in both groups, P=0.99).

CONCLUSIONS: In this observational study, endovascular repair of SAA is associated with a lower complication rate and less resource utilization but no difference in mortality peri-operatively when compared to open surgery. This may justify an endovascular first treatment strategy in the management of SAA.

**Presentation
Number:** MP40

**Publishing
Title:** Vascular Reconstruction for Middle Aortic Syndrome

Author Block: **Allan W. Tulloch, MD**, William Quinones-Baldrich, MD
UCLA, Los Angeles, CA

**Abstract
Body:**

OBJECTIVES: The Middle Aortic Syndrome (MAS) is a rare pathology typified by segmental narrowing of the abdominal or distal descending thoracic aorta with branch involvement. Patients often present as children with severe hypertension, claudication, and or postprandial abdominal pain. We present our experience with surgical treatment for MAS.

METHODS: Patients with MAS who had surgical reconstruction at our institution were identified. Symptomatology, timing of operation, comorbid conditions, type of reconstruction, resolution or improvement of hypertension, and secondary interventions were all assessed.

RESULTS: There were eight patient with MAS who had surgical reconstruction with followup ranging from 9 months to 10 years. All patients presented with hypertension; two patients having claudication, two postprandial pain, and one who presented with stroke. The mean age at diagnosis was 6 with a mean age at repair of 10. Comorbid conditions included neurofibromatosis (3), Moya Moya (2), and Takayasu's arteritis (1). Reconstructions included renal patch angioplasty (2), renal reimplantation (1), renal artery bypass (5) with aortic reconstruction (3) and mesenteric revascularization (2). There were no deaths and no patient required dialysis. All patients were on antihypertensive medications preoperatively (mean 3) with better control postoperatively (mean 1.8) with one patient remaining off all medications. Mesenteric and aortic reconstruction were undertaken only when patients were symptomatic with resolution postoperatively. No asymptomatic patient with mesenteric involvement has developed symptoms during follow-up. Two patients required secondary interventions (renal artery angioplasty).

CONCLUSIONS: Surgical reconstruction for patients with MAS is safe and durable. Despite renal revascularization, most patients continue to require antihypertensive medications postoperatively, but fewer medications overall. Mesenteric revascularization can be reserved for symptomatic patients at presentation. Asymptomatic mesenteric involvement in MAS can be safely treated conservatively.

**Presentation
Number:** MP41

**Publishing
Title:** A Comparison of Open And Endovascular Treatment Strategies for the Management of Splenic Artery Aneurysms.

Author Block: Andrew Sticco, MD, **Michael S. Shapiro, MD**, Alok Aggarwal, MD, Abimbola Pratt, MD, Donald Risucci, MD, Marcus D'Ayala, MD.

New York Methodist Hospital, Brooklyn, NY

OBJECTIVES: Splenic artery aneurysms (SAA) are rare with an overall estimated incidence of less than 0.01%. Open surgical techniques have traditionally been used to treat or exclude SAAs. More recently endovascular procedures have emerged as a preferred treatment. However, evidence to support an endovascular management strategy for SAA is limited to few case series and mostly individual case reports.

METHODS: We used the Nationwide Inpatient Sample (NIS) and gathered data from 2008 to 2011 to compare open to endovascular SAA repair by assessing postoperative outcomes, length of hospital stay, and mortality. Multivariate logistic regression analysis was done to determine predictors of postoperative complications.

**Abstract
Body:**

RESULTS: There were 2316 admissions during the study period with a diagnosis code for SAA. Among these admissions, 347 (14.9%) patients underwent endovascular repair and 112 (4.8%) patients underwent open surgery. There was a statistically significantly lower rate of cardiac (2.3% vs 6.9%, $P=0.05$) and pulmonary (8.9% vs 16.1%, $P=0.05$) complications in patients undergoing endovascular repair compared with those undergoing open surgery. In addition, the risk of surgical site infection in endovascularly treated SAA was lower (0.6% vs 5.1%, $P=0.01$). Median in-hospital LOS was significantly greater for open repairs than endovascular repairs (6 vs. 4 days respectively, $P=0.01$). There were no statistically significant differences across procedures for renal complications (8.9% in both groups, $P=0.88$) or in-hospital mortality (3% in both groups, $P=0.99$). Regression analysis established age, CHF, renal failure, and procedure type to be independent predictors of postoperative complications.

CONCLUSION: In this observational study, endovascular repair of SAA is associated with a lower complication rate and less resource utilization but no difference in mortality peri-operatively when compared to open surgery. This may justify an endovascular first treatment strategy in the management of SAA.