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Interfacility transfer and mortality for patients with ruptured abdominal aortic aneurysm

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Objective: Patients receiving interfacility transfer to a higher level of medical care for ruptured abdominal aortic aneurysms (rAAAs) are an important minority that are not well characterized and are typically omitted from outcomes and quality indicator studies. Our objective was to compare patients transferred for treatment of rAAAs with those treated without transfer, with particular emphasis on mortality and resource utilization.

Methods: We linked longitudinal data from 2005 to 2010 Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases and Emergency Department Databases from California, Florida, and New York. Patients were identified using International Classification of Diseases-Ninth Revision-Clinical Modification codes. Our main outcome variables were mortality, length of stay, and cost. Data included discharge information on the transfer-out and transfer-in hospital. We used univariate and multivariate analysis to identify variables independently associated with transfer and in-hospital mortality.

Results: Of 4439 rAAA patients identified with intent to treat, 847 (19.1%) were transferred before receiving operative repair. Of those transferred, 141 (17%) died without undergoing AAA repair. By multivariate analysis, increasing age in years (odds ratio [OR] 0.98; 95% confidence interval [CI], 0.97-0.99; $P < .001$), private insurance vs Medicare (OR, 0.62; 95% CI, 0.47-0.80; $P < .001$), and increasing comorbidities as measured by the Elixhauser Comorbidity Index (OR, 0.90; 95% CI, 0.86-0.95; $P < .001$) were negatively associated with transfer. Weekend presentation (OR, 1.23; 95% CI, 1.02-1.47; $P = .03$) was positively associated with transfer. Transfer was associated with a lower operative mortality (adjusted OR, 0.81; 95% CI, 0.68-0.97; $P < .02$) but an increased overall mortality when including transferred patients who died without surgery (OR, 1.30; 95% CI, 1.05-1.60; $P = .01$). Among the transferred patients, there was no significant difference in travel distance between those who survived and those who died (median, 28.7 vs 25.8 miles; $P = .07$). Length of stay (median, 10 vs 9 days; $P = .008$), and hospital costs ($161,000 vs $146,000; $P = .02$) were higher for those transferred.

Conclusions: The survival advantage for patients transferred who received treatment was eclipsed by increased mortality of the transfer process. Including 17% of transferred patients who died without receiving definitive repair, mortality was increased for patients transferred for rAAA repair compared with those not transferred after adjusting for demographic, clinical, and hospital factors. Transferred patients used significantly more hospital resources. Improving systems and guidelines for interfacility transfer may further improve the outcomes for these patients and decrease associated hospital resource utilization.

Renal function changes after snorkel/chimney repair of juxtarenal aneurysms

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Objective: The snorkel approach for endovascular aneurysm repair (EVAR) has been found to be a safe and viable alternative to open repair for juxtarenal abdominal aortic aneurysms with good short-term outcomes. Concerns about long-term durability and renal branch patency with this technique have been raised with the increasing availability of fenestrated devices. We sought to evaluate renal function changes in patients undergoing "snorkel" EVAR (sn-EVAR).

Methods: Patients who underwent sn-EVAR from 2009 to 2012 were included in this analysis. Creatinine values were obtained throughout the patient's preoperative, perioperative, and postoperative course. Glomerular filtration rate (GFR) was estimated by the simplified Modification of Diet in Renal Disease formula. Acute renal dysfunction was analyzed according to the RIFLE (Risk, Injury, Failure, Loss, End stage) criteria, whereas chronic renal dysfunction was stratified by the chronic kidney disease staging system.

Results: Forty-three consecutive patients underwent sn-EVAR (31 double renal, 12 single renal) for juxtarenal aortic aneurysms. Mean follow-up time was 21 months. Mean aneurysm size was 6.6 cm (range, 5.1-10.5 cm) with anatomy not suitable for treatment with standard EVAR (mean neck length, 1.6 mm); 74 renal snorkel stents were placed in these patients with a 2-year primary patency of 95%. On average, the cohort at baseline was stratified as having moderate renal dysfunction. Mean baseline, maximum postoperative, and latest follow-up creatinine concentrations were 1.20, 1.49, and 1.43, respectively ($P = .004$). Mean baseline, maximum postoperative, and latest follow-up GFRs were 57.4, 47.8, and 49.2, respectively ($P = .014$). With use of RIFLE criteria, 14 patients (32.6%) experienced some form of acute kidney injury, although 10 of these patients (23.3%) were classified as mild (25%-50% decline in

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GFR). On analysis without the RIFLE criteria, 21.4% of patients had postoperative creatinine concentration >1.5 mg/dL, 28.6% had postoperative creatinine concentration increase >30%, and 28.6% had postoperative GFR decline >30%. For the entire study cohort at latest follow-up, 51% experienced no decline of chronic renal dysfunction and 8.1% had improvement in renal function. Renal function declined by one stage in 35.2% of the cohort and by two stages in 5.4%. On analysis without chronic kidney disease staging, 24.3% of patients had latest follow-up creatinine concentration >1.5 mg/dL, 29.7% had latest follow-up creatinine concentration increase >30%, and 24.3% had latest follow-up GFR decline >30%. Mean survival time from significant renal decline was 23.4 months.

Conclusions: sn-EVAR continues to demonstrate a high rate of technical success and results in only mild rates of acute and midterm renal function decline according to a number of established definitions for renal dysfunction. Continued monitoring of renal function, renal stent behavior, and abdominal aortic aneurysm sac changes remains critically important in the long-term management of patients undergoing sn-EVAR, particularly given the high comorbidities associated with juxtarenal aortic aneurysms.

"Off-the-shelf" devices for complex aortic aneurysm repair

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Background: Fenestrated devices currently require a 3- to 4-week manufacturing period before implantation; as such, there have been efforts to develop "off-the-shelf" (OTS) devices to reduce the time before definitive treatment can be accomplished. We examined all patients treated for complex aortic problems at our institution during the past 12 months to evaluate the suitability and early outcomes of the OTS devices vs commercially available endovascular options.

Methods: Between July 2012 and September 2013, patients undergoing aortic aneurysm repair were extracted from a prospectively managed aortic database. Two OTS devices, the Cook (Bloomington, Ind) p-Branch and the Endologix (Irvine, Calif) Ventana device, were being evaluated through clinical trials during this time frame. The custom Cook Zenith fenestrated endovascular (ZFEN) device was also available and approved by the U.S. Food and Drug Administration (FDA) during the study period.

Results: Of 224 aortic aneurysms treated at our institution during this period, there were a total of 85 patients with type IV thoracoabdominal aneurysms including juxtarenal aneurysms. Only 23 patients (27%) met anatomic criteria for OTS devices, with 16 patients having these investigational devices implanted. The major exclusion criterion for the p-Branch device was renal axial or circumferential position; the limiting factor for Ventana was infrasuperior mesenteric artery neck length restriction. Five of the patients who would have fit criteria for an OTS device had an FDA-approved (ZFEN) device implanted instead, and two patients opted for open repair as a result of follow-up requirements. An additional 25 patients received custom-designed (ZFEN) devices (n = 30; 35%), whereas 37 (44%) others did not meet criteria for any available endovascular device and were repaired with alternative management strategies. The mean age and maximal aortic diameter of the two cohorts (OTS and ZFEN) were 71.8 years and 72.7 years (*P* = NS) and 61.3 mm and 58.5 mm (*P* = NS), respectively. Technical success was 100%, with an overall 30-day mortality of 2.1% (n = 1, ZFEN). Major complications occurred in eight patients (17%; two OTS, six ZFEN).

Conclusions: Whereas OTS device strategies will reduce the waiting times for patients with complex aortic aneurysmal disease, a significant number will still require custom-made device repair until additional device designs become available. Early experience with OTS devices does not demonstrate any significant renal risks; however, the treatment numbers are low and should be interpreted with caution until larger confirmatory studies are published. Further studies comparing the outcomes of these techniques are required to establish the best approach to handle endovascular repair of complex aortic aneurysm.

The effect of surgeon specialization on outcomes after ruptured abdominal aortic aneurysm repair

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Objective: Although mortality after elective abdominal aortic aneurysm (AAA) repair has steadily declined, operative mortality for a ruptured AAA (rAAA) remains high. Repair of rAAA at hospitals with a higher elective aneurysm workload has been associated with lower mortality rates irrespective of the mode of treatment. This study sought to determine the association between surgeon specialization and outcomes after rAAA repair.

Methods: The American College of Surgeons National Surgical Quality Improvement Project database from 2005 to 2010 was used to examine the 30-day mortality and morbidity outcomes of patients undergoing rAAA repair by vascular and general surgeons. Multivariable logistic regression analysis was performed for each death and morbidity, adjusting for all independently predictive preoperative risk factors. Survival curves were compared using the log-rank test.

Results: We identified 1893 repairs of rAAAs, of which 1767 (96.1%) were performed by vascular surgeons and 72 (3.9%) were performed by general surgeons. There were no significant differences between patients operated on by general vs vascular surgeons in preoperative risk factors or method of repair. Overall 30-day mortality was 34.3% (649 of 1893). After risk adjustment, mortality was significantly lower in the vascular surgery group compared with the general surgery group (odds ratio [OR], 0.51; 95% confidence interval [CI], 0.30-0.86; *P* = .011). The risk of returning to the operating room (OR, 0.58; 95% CI, 0.35-0.97; *P* = .038), renal failure (OR, 0.54; 95% CI, 0.31-0.95; *P* = .034), and a cardiac complication (OR, 0.53; 95% CI,