Abstracts

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Effect of Physician and Hospital Experience on Patient Outcomes for Endovascular Treatment of Aortoiliac Occlusive Disease

Indes JE, Tuggle CT, Madawat A, et al. Arch Surg 2011;146:966-71.

Conclusion: Hospital and physician volume are predictors of patient outcome after endovascular treatment of aortoiliac occlusive disease (AIOD).

Summary: Patients undergoing some vascular and cancer procedures have a decreased risk of operative death when the procedures are performed in high-volume hospitals. For many procedures, associations between mortality and hospital volume are mediated through surgeon volume (Birkmeyer JD et al, N Engl J Med 2002;346:1128-37). Little information is available on the relationship between physician volume, hospital volume, and the outcomes of endovascular procedures for AOID. In the study reported here, the authors evaluated the effects of physician volume, and especially in-hospital volume, on outcomes of endovascular repair in patients with AIOD. This was a retrospective, cross-sectional analysis, of in-patients undergoing endovascular repair of AIOD. Physicians were considered low volume if they performed <17 procedures per year or high volume if they performed ≥17 procedures per year. Hospital volume was defined as high (≥116 procedures per year) and low (<116 procedures per year). The authors identified 818 in-patients who underwent endovascular repair of AIOD from the Healthcare Cost and Utilization Project Nationwide In-patient Sample from January 2003 through December 2007. The main outcome measures were in-hospital complications and mortality, length of stay, and cost. Of the 818 procedures, 59% were of high-volume physicians who were surgeons, and 65% practiced at high-volume hospitals. Complication rates (unadjusted) were higher for low-volume compared with high-volume physicians (18.7% vs 12.6%: $P = .02$). However, complication rates were not affected by physician's specialty or hospital volume. Length of stay was shorter for patients of high-volume physicians ($P = .001$), hospitals ($P = .001$), and surgeon providers ($P = .03$). Physician specialty was also associated with decreased cost ($P = .004$). With multivariate analysis, high physician volume was associated with lower complications ($P = .04$), high hospital volume with shorter length of stay ($P = .002$), and nonsurgeons with higher costs ($P = .05$).

Comment: There are many problems with this report. First, the study only looked at in-patients; however, the very large majority of patients undergoing endovascular interventions for AIOD are treated as out-patients. In addition, this study did not look at the appropriateness of interventions. High-volume specialists are sometimes associated with a higher volume of marginal or inappropriate procedures. The study likely represents a highly skewed sample of patients undergoing endovascular treatment for AIOD for unclear indications. It is not possible to do a drill down with this data to determine why shorter lengths of stay might be associated with higher-volume physicians or why surgeons were associated with lower hospital costs. It is certainly possible that patients and their risk factors or complexity of procedure might not have been stratified equally among the providers and the hospitals. Overall, this article really provides actually little insight about the relationship between physician and hospital volume for endovascular treatment of patients with AIOD.

Heart Disease May Be a Risk Factor for Pulmonary Embolism Without Peripheral Deep Venous Thrombosis

Sorensen HT, Horvath-Phuo E, Lash TL, et al. Circulation 2011;124:1435-41.

Conclusion: Heart disease increases the risk of pulmonary embolism (PE) not associated with diagnosed deep venous thrombosis (DVT).

Summary: Up to 40% of patients with PE do not have evidence of DVT (Hull RD, et al, Ann Intern Med 1983;98:91-99). A possible explanation is that the emboli were dislodged from the lower extremity and are now in the lungs. An additional explanation is that the emboli may come from another embolic source, including the heart. This may be especially true in the setting of cardiac disease. Left-sided cardiac thrombi predispose to arterial embolization. Autopsy series have shown, however, that right-sided intercardiac thrombosis may be as common as thrombosis on the left (Ögren M, Eur Heart J 2005;26:1108-14). Echocardiographic studies have reported right-sided cardiac thrombi in patients with acute PE (Goldhaber SZ, et al, Mayo Clin Proc 1988;63:1261-4). Recently, it has also been suggested that there is a higher prevalence of heart disease in patients with PE and no detected DVT compared with patients who have PE and DVT (Prandoni P, et al, Eur J Intern Med 2009;20:470-3).

The authors sought to determine if cardiac risk factors that increase the risk of left-sided atrial embolism may also be associated with an increased risk of PE without apparent DVT, thereby implicating the heart itself as a potential source of PE. This was a nationwide, population-based, case-controlled study in Denmark of patients who had a diagnosis of PE or DVT, or both, between 1980 and 2007. Odds ratios were computed to estimate relative risk and associated preceding heart disease with PE, PE and DVT, or DVT alone. There were 45,282 patients with PE alone: 4680 with PE and DVT, and 59,790 with DVT alone. An additional 541,561 patients served as population controls. Data indicated that myocardial infarction and heart failure in the 3 months before PE conferred a higher risk of apparently isolated PE (OR, 43.5 [95% CI, 39.6-47.8] and 32.4 [29.8-35.2], respectively). The risk of combined PE and DVT (OR 19.7 [95% CI, 16.0-24.2] and OR, 22.1 [18.7-26.0] respectively), and DVT alone (OR, 9.6 [8.6-10.7] and 12.7 [11.6-13.9]) were lower. The OR for left-sided valvular disease was 13.5 (95% CI, 11.3-16.1). However, the OR for right-sided valvular disease was 74.6 (95% CI, 28.4-195.8).

Comment: The proportion of apparently isolated PE is much higher in this study than one would expect. The authors did not have data on how often the presence of DVT was assessed in patients with PE. However, multiple studies have indicated not everyone with PE has a diagnosable DVT. The authors' observations on the timing of PE in relationship to cardiac disease, previous studies indicating a significant prevalence of right-sided cardiac thrombi, and the strong ORs in this study implicating right-sided cardiac sources for PE, all combine to suggest the right heart can serve as a source of PE. A similar analysis performed in patients with PE simultaneously assessed for cardiac disease and DVT is needed to determine the proportion of PEs that originate from the right heart.

Intracranial Hemorrhage Is Much More Common After Carotid Stenting Then After Endarterectomy: Evidence From the National Inpatient Sample

McDonald RJ, Cloft HJ, Kallmes DF. Stroke 2011;42:2782-7.

Conclusion: Patients undergoing carotid artery stenting (CAS) are more likely to experience intracranial hemorrhage (ICH), in-hospital death, and unfavorable discharges relative to those undergoing carotid endarterectomy (CEA).

Summary: ICH after carotid revascularization occurs after 0.2% to 0.5% of patients (van Mook WN, et al, Lancet Neurol 2005;4:877-88). Little data, if any, are available to determine if ICH rates vary between specific revascularization procedures. Even large studies, such as CREST, lack sufficient power to study relative rates of infrequent complications such as ICH. The National Inpatient Sample (NIS) is a sufficiently large database to investigate infrequent complications. It provides information with respect to ~20% of nonfederal hospitalizations in the United States. This represents >8 million annual hospitalizations (http://www.HCUP-US.AHRQ.GOV/databases.jsp). The authors used the NIS to determine prevalence of, type of, and risk factors associated with ICH among recipients of CAS and CEA.

Cases of ICH after CEA or CAS were retrieved from the NIS from 2001 to 2008. Clinical presentation (asymptomatic vs symptomatic), discharge status, in-hospital mortality, demographics, and hospital characteristics were extracted from NIS data. ICD-9 and clinical classification software codes were used to determine Charlson indices of comorbidity. Multivariate regression analysis determined the effect of revascularization procedure type and symptom status on ICH, in-hospital mortality, and an unfavorable discharge, defined as those requiring skilled care (short-term hospitalization, skilled nursing facility, home health care).

Among the 57,663,483 NIS hospital admissions were 215,012 CEAs and 13,884 CAS procedures. Only 10,049 CEA cases (5%) were considered symptomatic, and only 1,251 CAS cases (10%) were for symptomatic disease. ICH occurred more frequently after CAS than CEA in both symptomatic (4.4% vs 0.8%; $P > .0001$) and asymptomatic presentations (0.5% vs 0.6%; $P > .0001$). Multivariate regression indicated that symptomatic presentation and CAS procedures were independently predictive of a sixfold to sevenfold increase frequency of postoperative ICH. ICH was in turn independently predictive of a 30-fold increased risk of death before discharge. Among symptomatic patients treated with CAS who developed ICH, the risk for ICH was higher in younger patients.

Comment: The NIS data do not allow independent diagnosis of hyperperfusion among cases of ICH or if hyperperfusion was most predictive of ICH. NIS also contains coding errors, but arguably, such errors occur at random so that the data are not biased for or against one procedure or the other. The overall dramatic relative increase in ICH in CAS vs CEA patients, especially those who are symptomatic, is another bit of data arguing for

preferential use of CEA in the symptomatic patient to minimize the risk of adverse neurologic outcome.

Low Prevalence of Abdominal Aortic Aneurysm Among 65-Year-Old Swedish Men Indicates a Change in the Epidemiology of the Disease

Svensjö S, Björck M, Gürtelschmid M, et al. Circulation 2011;124:1118-23.

Conclusions: There is a lower than expected prevalence of abdominal aortic aneurysm (AAA) in Swedish men, likely explained by a reduction in the prevalence of smoking. Changes in the epidemiology of AAA call into question current abdominal aortic screening algorithms.

Summary: A common recommendation for a screening protocol for AAA is a one-time ultrasound screening of 65-year-old men. In Sweden, there has been a rapid introduction of such screening programs (Wanhainen A, J Vasc Surg 2011;53:1164-5). By 2009, screening programs had been implemented in five contiguous counties of central Sweden. Every 3 months, 65-year-old men in these counties are identified by using a national population registry and are then invited to a one-time ultrasound examination of the abdominal aorta. In 2009, these five counties comprised 15% of Sweden's population (1,404,978 individuals).

In this study, the authors report their results of screening 65-year-old men for AAA in middle Sweden. All 65-year-old men (n = 26,256) in the five-county area of middle Sweden were identified through a national population registry and were invited for an ultrasound examination of the abdominal aorta. An AAA was defined as a maximum infrarenal aortic diameter ≥30 mm. Of the 22,187 invited for the screening, 85% accepted the invitation and 373 AAAs (1.7%, 95% CI, 1.5%-1.9%) were detected. If one included 127 previously known AAAs repaired or under surveillance, the total prevalence of AAA in the population was 2.2% (95% CI, 2.0%-2.4%). Independent associations from a multivariate logistic regression model with AAA were self-reported smoking (OR, 3.4; $P < .001$), coronary artery disease (OR, 2.0; $P < .001$), and hypertension (OR, 1.6; $P = .001$). In the five-county population, 13% of inhabitants were self-reported to be current smokers, one-third the frequency reported in the 1980s.

Comment: The population-based study design and high participation in the screening program (85%) suggests the results of this study are generally applicable at least to the Swedish population. The prevalence of the AAA in this study is one-half to one-third of that reported elsewhere and parallels a dramatic reduction in the prevalence of smoking. The decreased prevalence of smoking combined with the significant increase in life expectancy of the male population at risk for AAA has implications for AAA screening programs. On the basis of what is apparently a decreased prevalence of disease and decreased risk factors, cost-effectiveness and protocols of current screening programs may need to be reevaluated.

Nonoperative Management of Adult Blunt Splenic Injury With and Without Splenic Artery Embolotherapy: A Meta-Analysis

Requarth JA, D'Agostino RB Jr, Miller PR. J Trauma 2011;71:898-903.

Conclusion: Embolization of splenic injury improves the result of nonoperative management of patients with grade 4 and 5 splenic injuries.

Summary: Nonoperative management of blunt splenic injury (BSI) is standard of care in hemodynamically stable children (Davis KA, et al, J Trauma 1998;44:1008-13) and is also frequently used in adults. Nonoperative management of BSI can be observational without splenic embolization or observational with splenic embolization. The relative effectiveness of these two approaches stratified for grade of splenic injury is unknown. Complicating previous studies of the effectiveness of splenic embolization for treatment of BSI is that purely observational nonoperative management of BSI is frequently reported along with embolic therapy for splenic injury, but these are clearly different modes of treatment. The authors point out that important information comparing the effectiveness of these two forms of nonoperative management may be lost when the two forms of nonoperative management are studied together or without respect to the specific grade of splenic injury. This meta-analysis was performed to evaluate the failure rate of adults with BSI treated with observational management only vs splenic embolization in patients with comparable grades of injury to the spleen. The authors reviewed 33 articles on outcomes of BSI published between 1994 and 2009. Nine publications stratified data by splenic injury grade for observational management and splenic embolization. The data from these nine studies were used to analyze failure rates of pure observational management vs splenic embolization using random effects estimates. The study comprised 10,157 patients, of whom 68.4% were managed nonoperatively. The failure rate for nonoperative management was 8.3% (95% CI, 6.7%-10.2%). The failure rate for observational management alone increased from 4.7% to 83.1% in patients with splenic injury grades from 1 to 5. The failure rate of splenic embolization was 15.7% (95% CI, 10.4%-23.2%) and did not vary significantly with splenic injury grades 4 to 5 ($P = .413$). In patients with splenic injury grade injuries 4 and 5, the failure rate of purely observational management without embolization was higher than failure rates with embolization: 43.7% (95% CI, 25.5%-63.8%) vs 17.3% (95% CI, 7.8%-34.1%, $P = .035$) and 83.1% (95% CI, 45.2%-96.7%) vs 25.0% (95% CI, 8.7%-53.8%, $P = .016$), respectively.

Comment: The authors of this study point out that observational management alone and splenic embolization are different methods of nonoperative management of patients with BSI. Comparative information can be lost when failure rates of the two methods are combined in a single analysis. The data here suggest that patients with high-grade splenic injuries (grades 4 and 5) should be treated with embolization if nonoperative management of BSI is chosen.

Secondary Prevention and Mortality in Peripheral Artery Disease: National Health and Nutrition Examination Study, 1999 to 2004

Pande RT, Perlstein TS, Beckman JA, et al. Circulation 2011;124:17-23.

Conclusion: Millions of adults in the U.S. do not receive secondary preventive therapies for peripheral artery disease (PAD). In patients with PAD, treatment with multiple therapies is associated with reduced all-cause mortality.

Summary: Lack of evidence for screening-guided treatment in patients with PAD has led the U.S. Preventative Services Task Force (USPSFT) to recommended against screening for PAD with ankle-brachial index (ABI; Ann Intern Med 2009;151:474-82). This stance has been strengthened by recent studies questioning the efficacy of preventive therapies in patients with PAD (Berger JS, et al, JAMA 2009;301:1909-19; Fowkes FG, et al, JAMA 2010;303:841-8). Guidelines for management of patients with PAD recommend lipid-lowering therapy with a statin, antihypertensive therapy to achieve a systolic blood pressure <140 mm Hg, particularly angiotensin-converting enzyme (ACE) inhibitors, and antiplatelet therapy (Yusuf S, et al, N Engl J Med 2000;342:145-53). Because of inconsistencies for recommendations for secondary prevention in patients with PAD, the authors sought to determine whether treatment with multiple risk factor-modifying therapies was associated with reduced all-cause mortality in adults identified with PAD who otherwise had no established cardiovascular disease. The authors analyzed data from the National Health and Nutrition Examination survey (NHANES) from 1999 to 2004. Mortality follow-up extended through calendar year 2006. PAD was defined as an ABI ≤0.90. In the NHANES study, there were 7458 eligible participants aged >40 years with a weighted PAD preference of 5.9% ± 0.3%. This equates to 7.1 million adults in the U.S. with PAD. In the NHANES patients, statin use prevalence was 30.5% ± 2.5%, ACE inhibitor/angiotensin receptor blocker (ARB) use prevalence was 24.9% ± 1.9 %, and aspirin use prevalence was 35.8% ± 2.9%. This corresponds to 5 million adults in the U.S. with PAD not taking statins, 5.4 million not taking ACE inhibitors/ARBs, and 4.5 million not receiving aspirin. Even adjusting for sex, age, and race/ethnicity, PAD was associated with all-cause mortality (HR, 2.4; 95% CI, 1.9-2.9; $P > .0001$). When individuals with PAD were stratified by excluding those with known cardiovascular disease, PAD patients still had higher mortality rates of 16.1% ± 2.1% vs 4.1% ± 0.3% in subjects without PAD or cardiovascular disease (adjusted HR, 1.9; 95% CI, 1.3-2.8; $P = .001$). Multiple preventative therapies in PAD patients without cardiovascular disease were associated with 65% lower all-cause mortality (HR, 0.35; 95% CI 0.20-0.86; $P = .02$).

Comment: NHANES is a series of surveys conducted by the National Center for Health Statistics. The surveys began in the early 1960s; from 1999 to 2004, ABI measurements were added. Extrapolating to the U.S. population, potentially thousands of deaths could be avoided if secondary prevention therapies were applied and adhered to in patients with PAD. The authors call for a large-scale clinical trial to determine whether implementation of secondary preventative therapies in patients with PAD identified by low ABI can indeed reduce cardiovascular morbidity and mortality. This is very reasonable.

Supervised Exercise Versus Primary Stenting for Claudication Resulting From Aortoiliac Peripheral Artery Disease: Six-Month Outcomes From the Claudication: Exercise Versus Endoluminal Revascularization (CLEVER) Study

Murphy TP, Cutlip DE, Regensteiner JG, et al; and the Clever Study Investigators. Circulation 2012;125:130-9.

Conclusion: In patients with intermittent claudication and aortoiliac disease (AIOD), supervised exercise results in better treadmill walking performance than stent revascularization.

Summary: Although drug therapy, revascularization, and supervised exercise are all documented effective therapies for intermittent claudication, the relative effectiveness of these measures are unknown. No multicenter clinical trials have directly compared strategies of pharmacology alone or supervised exercise vs endovascular intervention. The CLEVER trial was a randomized clinical trial comparing the benefits of optimal medical care, supervised exercise, and stent revascularization on walking outcomes and measures of quality of life in patients with intermittent claudication secondary to AIOD.

The study randomized 111 patients with AIOD to receive optimal medical care, optimal medical care plus stent revascularization, or optimal