Persistent type 2 endoleak after endovascular repair of abdominal aortic aneurysm is associated with adverse late outcomes


Objective. Type 2 endoleak occurs in up to 20% of patients after endovascular aneurysm repair (EVAR), but its long-term significance is debated. We reviewed our experience to evaluate late outcomes associated with type 2 endoleak.

Methods. During the interval January 1994 to December 2005, 873 patients underwent EVAR. Computed tomography (CT) scan assessment was performed ≤1 month of the operation and at least annually thereafter. Sequential 6-month CT scan follow-up was adopted for those patients with persistent type 2 endoleaks, and reintervention was limited to those with sac enlargement ≥5 mm. Study end points included overall survival, aneurysm sac growth, reintervention rate, conversion to open repair, and abdominal aortic aneurysm (AAA) rupture. Preoperative variables and anatomic factors potentially associated with these endpoints were assessed using multivariate analysis.

Results. We identified 164 (18.9%) patients with early (at the first follow-up CT scan) type 2 endoleaks. Mean follow-up was 32.6 months. In 131 (79.9%) early type 2 endoleaks, complete and permanent leak resolution occurred ≤6 months. Endoleaks persisted in 33 patients (3.8% of total patients; 20.1% of early type 2 endoleaks) for ≥6 months. Transient type 2 endoleak (those that resolved ≤6 months of EVAR) was not associated with adverse late outcomes. In contrast, persistent endoleak was associated with several adverse outcomes. AAA-related death was not significantly different between patients with and without a type 2 endoleak (P = .78). When evaluating patients with no early endoleak vs persistent endoleak, freedom from sac expansion at 1, 3, and 5 years was 99.2%, 97.6%, and 94.9% (no leak) vs 88.1%, 48.0%, and 28.0% (persistent) (P < .001). Patients with persistent endoleak were at increased risk for aneurysm sac growth vs patients without endoleak (odds ratio [OR], 25.8; 95% confidence interval [CI] 31.8 to 57.4; P < .001). Patients with a persistent endoleak also had a significantly increased rate of reintervention (OR, 19.0; 95% CI, 8.0 to 44.7; P < .001). Finally, aneurysm rupture occurred in 4 patients with type 2 endoleaks. Freedom from rupture at 1, 3, and 5 years for patients with a persistent type 2 endoleak was 96.8%, 96.8%, and 91.1% vs 99.8%, 98.5%, and 97.4% for patients without a type 2 endoleak. Multivariate analysis demonstrated persistent type 2 endoleak to be a significant predictor of aneurysm rupture (P = .03).

Conclusions. Persistent type 2 endoleak is associated with an increased incidence of adverse outcomes, including aneurysm sac growth, the need for conversion to open repair, reintervention rate, and rupture. These data suggest that patients with persistent type 2 endoleak (≥6 months) should be considered for more frequent follow-up or a more aggressive approach to reintervention.

Long-term postplacement cost after endovascular aneurysm repair


Background. Previous studies have demonstrated that the initial hospital cost associated with endovascular aneurysm repair (EVAR) is approximately $20,000. However, the cost of long-term surveillance and secondary procedures is poorly characterized.

Methods. Between December 1998 and June 2006, 259 patients underwent EVAR for infrarenal aneurysms at a single institution. Follow-up costs were calculated using a relative value unit based hospital cost accounting system, which incorporates departmental direct and indirect costs. Institutional over-head costs were included using a conversion factor. Costs for professional services were determined by a cost-to-charge ratio, and outpatient visits were calculated with a time-based formula. Year 2006 costs were applied to prior years. To minimize costs associated with the early learning curve, the initial 50 EVAR patients between December 1995 and 1998 were excluded.

Patients with <1 year follow-up were also excluded. Data are expressed as mean ± standard error.

Results. The mean follow-up after EVAR for 136 patients was 34.7 ± 1.8 months. The cumulative 5-year postplacement cost per patient was $11,351. The 27 patients (19.8%) who required secondary procedures had a 5-year cumulative cost of $31,696 compared with $3668 for 109 patients without secondary procedures (8.6-fold increase, P < .05). The 5-year cost for patients with endoleak was $26,739 compared with $5706 for those without endoleak (4.7-fold increase, P < .05). Overall, major cost components were 57.4% for secondary procedures and 32.5% for radiologic studies.

Conclusions. During a 5-year period, the postplacement cost of EVAR increases the global cost by 44%. The subgroups of patients with endoleaks and those requiring secondary procedures generate a disproportionate share of postplacement costs. Efforts at minimizing cost should emphasize technical and device modifications aimed at reducing endoleaks and the need for secondary procedures.

Carotid intraplaque hemorrhage detected by magnetic resonance imaging predicts embolization during carotid endarterectomy


Background. Microembolization detected during the dissection phase of carotid endarterectomy (CEA) is associated with plaque instability and might be associated with perioperative morbidity. Intraplaque hemorrhage is found in unstable plaques and is detectable using magnetic resonance imaging (MRI). We aimed to ascertain whether intraplaque hemorrhage as seen on carotid MRI predicts particulate embolization in the dissection phase of CEA.

Methods. Patients with high-grade symptomatic carotid stenosis undergoing CEA were prospectively enrolled. All underwent preoperative MRI assessment of the carotid arteries for intraplaque hemorrhage and transcranial Doppler scanning during the dissection phase of the CEA to assess the presence of microembolic signals. Associations between intraplaque hemorrhage and intraoperative microembolic signals were studied.

Results. Analysis was undertaken on 60 participants; of these, 36 (60%) showed ipsilateral carotid MRI intraplaque hemorrhage, and 24 (40%) did not. Microembolic signals were detected during the dissection phase in 23 (38.3%) participants, and 19 had MRI-detected intraplaque hemorrhage. The association between carotid intraplaque hemorrhage and the presence of dissection phase microembolic signals was significant (odds ratio [OR], 5.6; 95% confidence interval [CI], 1.6 to 19.7; P = .007), even after controlling for age, sex, individual surgeon, degree of stenosis, and delay from symptom to CEA (adjusted OR, 5.8; 95% CI, 1.1 to 30.4; P = .037).

Conclusion. Intraplaque hemorrhage as detected by carotid MRI predicts particulate embolization during the dissection phase of CEA. This imaging technique can be used to identify patients with increased intraoperative thromboembolic risk, and this could influence preventive strategies.

Frequency of transient ipsilateral vocal cord paralysis in patients undergoing carotid endarterectomy under local anesthesia

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Background. Especially because of improvements in clinical neurologic monitoring, carotid endarterectomy done under local anesthesia has become the technique of choice in several centers. Temporary ipsilateral vocal nerve palsies due to local anesthetics have been described, however. Such complications are most important in situations where there is a pre-existing contralateral palsy. We therefore examined the effect of local anesthesia on vocal cord function in patients undergoing carotid endarterectomy.

Methods. This prospective study included 28 patients undergoing carotid endarterectomy under local anesthesia. Vocal cord function was evaluated before, during, and after surgery (postoperative day 1) using flexible
Atheroembolism during percutaneous renal artery revascularization

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Introduction. Atheroembolization during renal artery angioplasty and stenting (RA-PTAS) has been postulated as a cause for the inferior renal function results observed when compared with those with surgical revascularization. To further characterize procedure-associated atheroembolism, we analyzed recovered atheroembolic debris and clinical data from patients undergoing RA-PTAS with distal embolic protection (DEP).

Methods. RA-PTAS procedures were performed with DEP using a commercially available temporary balloon occlusion and aspiration catheter system between July 2005 and December 2006. Following RA-PTAS but prior to deflation of the distal occlusion balloon, the static column of blood proximal to the balloon was aspirated and submitted for embolic particle analysis. Angiograms, demographics, and laboratory data were reviewed. Glomerular filtration rate (eGFR) was estimated before RA-PTAS and at 4 to 8 weeks postintervention using the abbreviated Modification of Diet in Renal Disease formula. Associations between clinical factors, captured particle counts, and changes in renal function were examined using univariate techniques and multiple linear regression.

Results. Twenty-eight RA-PTAS procedures were performed with DEP. Mean total number of embolic particles counted per procedure was 2033 ± 1553 for particles ≥60 μm and 263 ± 132 for particles >60 μm. Significant positive associations with quantity of captured particles ≥60 to 60 μm were observed for African American race (P < .001), predilation (P = .005), and stent diameter (P < .001); a significant negative association was observed for preoperative aspirin use (P = .016). Quantity of captured particles ≥60 μm was positively associated with ratio of stent to renal artery diameter (P = .009). Change in eGFR was positively associated with preoperative aspirin use (P = .006) and preoperative eGFR (P < .001), while a negative association was observed for captured particle counts >60 μm (P = .015).

Conclusion. These results demonstrate the liberation of thousands of atheroembolic particles during RA-PTAS. Clinical, anatomic, and device-related factors may be predictive of procedural embolization, and increasing captured particle counts >60 μm were associated with inferior renal function results. Further investigation is warranted to establish relationships between atheroembolism, end organ functional impairment, and clinical responses.

Evaluation of the efficacy of the transposed upper arm arteriovenous fistula: A single institutional review of 190 basilic and cephalic vein transposition procedures

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Introduction. Although autogenous brachial-basilic upper arm transpositions (BVT) have been extensively utilized, there has been significant disparity in published patent rates. Very little is known about the efficacy of autogenous brachial-cephalic upper arm transpositions (CVT). We evaluated our experience with transposed upper arm arteriovenous fistulas (tAVF) in order to...
assess patency and identify factors that affect efficacy. We then compared our tAVF patients with a cohort of upper arm arteriovenous grafts (AVG).

Methods. A retrospective review was conducted of tAVF performed at our institution from 1998 to 2004. The tAVF group consisted of 119 BVT and 71 CVT procedures. We compared these with 164 AVG. tAVF were placed only for veins ≥2.5 mm in diameter by duplex ultrasonography.

Results. Mean follow-up was 28 months. With the exception of mean vein diameter, the patients in the BVT and CVT groups had similar demographic parameters and complication rates. Primary and secondary patency rates were 52% and 62% at 5 years for BVT and 40% and 46% at 5 years for CVT, respectively (P = NS). Multivariate analysis revealed that hemodialysis dependence at the time of fistula placement and history of previous upper arm access independently affected primary patency. History of upper torso dialysis catheters independently affected secondary patency. Comparison of the tAVF and AVG groups revealed that tAVF patients were significantly younger, more likely to be male, less likely to be African American (AA) and less likely to have a history of previous AV access. The primary patency rate for tAVF was significantly higher than for AVG: 48% vs 14% at 5 years (P < .001). The secondary patency rate for tAVF was also significantly higher than for AVG: 57% vs 17% at 5 years (P < .001). Among the tAVF procedures, 9% required one or more revisions to maintain secondary patency, compared to 51% with the AVG group (P < .001). Multivariate analysis revealed that presence of AVG and a history of previous upper arm access negatively affected primary and secondary patency.

Conclusions. Autogenous BVT and CVT have similar, high patency rates. Transposed upper arm arteriovenous fistulas have higher patency rates than upper arm AVG and require significantly fewer revisions. Our data strongly support the contention that as long as the patient is a candidate for an upper arm tAVF, based on anatomical criteria, a tAVF should always be considered before an AVG.