

# Abstracts from the 2012 New England Society for Vascular Surgery Annual Meeting

## Shared Quality Data Results in Increased Protamine Use and Reduced Bleeding Complications After Carotid Endarterectomy in the Vascular Study Group of New England

Reshma B. Patel,<sup>1</sup> Peter Beaulieu,<sup>2</sup> Philip P. Goodney,<sup>3</sup> Andrew C. Stanley,<sup>1</sup> Jack L. Cronenwett,<sup>3</sup> David H. Stone,<sup>3</sup> Daniel J Bertges<sup>1</sup>. <sup>1</sup>University of Vermont College of Medicine, Burlington, Vt; <sup>2</sup>University of New England College of Osteopathic Medicine, Biddeford, Me; <sup>3</sup>Dartmouth Hitchcock Medical Center, Lebanon, NH

**Introduction and objectives:** The study goal was to evaluate whether protamine usage after carotid endarterectomy (CEA) increased within the Vascular Study Group of New England (VSGNE) in response to the VSGNE presentation (April 2009), the Society for Vascular Surgery presentation (June 2009), and *Journal of Vascular Surgery* publication (March 2010) "Protamine reduces bleeding complications associated with carotid endarterectomy without increasing the risk of stroke."

**Methods:** We reviewed protamine usage during 9882 CEAs excluding concomitant coronary bypass within the VSGNE from January 2003 to June 2011. Protamine usage was evaluated biannually using statistical process control charting. Trends in surgeon use before (n = 67) and after 2009 (n = 113) were categorized as rare, selective, or routine. End points included postoperative myocardial infarction (POMI), stroke, death, and reoperation for bleeding.

**Results:** Protamine was administered during 54% of procedures, increasing from 46% before 2009 to 61% after 2009 (P < .001). The increase in protamine use surpassed the upper control limit of three standard deviations in 2009 coincident with presentation and publication of the VSGNE study (Fig). Surgeon usage shifted from rare, selective, and routine over time from 45%, 18%, and 37% to 24%, 35% and 42%, respectively. Reoperation for bleeding decreased (0.5% vs 1.4%, P < .001) with similar rates of POMI (1.0% vs 1.2%, P = .52), stroke, or death (1.1% vs 1.1%, P = .796) in protamine treated vs untreated patients, respectively. Reoperation for bleeding decreased significantly from 1.2% before 2009 to 0.6% after 2009 (P = .003).

**Conclusions:** Protamine use increased by VSGNE surgeons coincident with presentation of VSGNE-derived data showing the benefit of protamine. Improvements in the process of care can be achieved in regional quality groups by sharing safety and efficacy data.

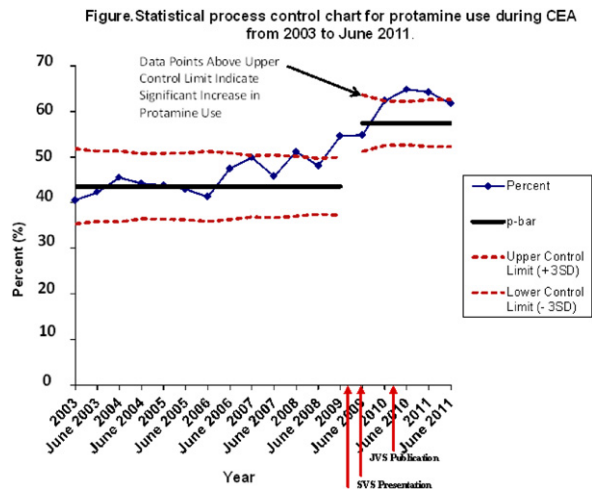


Fig.

## Timing of Perioperative Events Following Carotid Endarterectomy: In-Hospital vs Post-Discharge Adverse Events

Margriet Fokkema,<sup>1</sup> Rodney P. Bensley,<sup>1</sup> Ruby C. Lo,<sup>1</sup> Allan D. Hamdan,<sup>1</sup> Mark C. Wyers,<sup>1</sup> Gert Jan de Borst,<sup>2</sup> Frans L. Moll,<sup>2</sup> Marc L. Schermerhorn<sup>1</sup>. <sup>1</sup>Beth Israel Deaconess Medical Center, Boston, Mass; <sup>2</sup>University Medical Center Utrecht, Utrecht, The Netherlands

**Introduction and objectives:** Most studies based on state and nationwide registries evaluating perioperative outcome after carotid endarterectomy (CEA) rely on hospital discharge data. Therefore, true 30-day complication risk after carotid revascularization may be underestimated.

**Methods:** We used the National Surgical Quality Improvement Program database 2005-2010 to assess the in-hospital and postdischarge rate of

any stroke and stroke/death at 30 days after CEA and identified predictors for the timing of these events. Univariate analysis including demographics and preoperative variables served as a base (threshold P = .2) for multivariable analysis to identify predictors associated with outcome.

**Results:** A total of 35,916 patients (asymptomatic and symptomatic; 59% men, median age, 72 years) underwent CEA during 2005 to 2010. The 30-day stroke rate was 1.6% (n = 591) and the combined stroke/death rate was 2.2% (n = 792), and 31.2% of strokes (0.5%) and 40.9% of combined events (0.9%) took place after hospital discharge (median days to stroke, 8 [interquartile range, 11]). Women were more likely to have postdischarge events than men (stroke, 38.1% vs 29.0%, P = .005; stroke/death, 42.8% vs 40.0%, P = .009). Renal failure was also predictive for postdischarge stroke (odds ratio, 3.16; 95% confidence interval, 1.54-6.47), whereas those undergoing emergency procedures and redo-CEA were more likely to have in-hospital events.

**Conclusions:** One in three perioperative strokes and deaths after CEA are missed when only hospital admission data are analyzed. This emphasizes the need for reporting and comparing 30-day outcomes. Selected subgroups at increased risk for either in-hospital or postdischarge events merit further investigation and may benefit from changes in management. Particularly in women and those with renal failure, we need to be alert to the ongoing risk of adverse events after hospital discharge.

## The Effect of Postoperative Stroke and Myocardial Infarction on Long-Term Survival After Carotid Revascularization

Jessica P. Simons,<sup>1</sup> Philip P. Goodney,<sup>2</sup> Donald T. Baril,<sup>1</sup> Brian W. Nolan,<sup>2</sup> Nathanael D. Hevelone,<sup>3</sup> Jack L. Cronenwett,<sup>2</sup> Louis M. Messina,<sup>1</sup> Andres Schanzer<sup>1</sup>, Vascular Study Group of New England <sup>1</sup>University of Massachusetts Medical School, Worcester, Mass; <sup>2</sup>Dartmouth-Hitchcock Medical Center, Lebanon, NH; <sup>3</sup>Harvard School of Public Health, Boston, Mass

**Introduction and objectives:** The largest randomized controlled trial comparing the efficacy of carotid endarterectomy (CEA) vs carotid artery stenting (CAS) showed equivalent outcomes for the composite end point of postoperative stroke, myocardial infarction (MI), or death. However, CAS had a higher risk of postoperative stroke, and CEA had a higher risk of MI. This analysis of long-term survival after carotid revascularization tested the hypothesis that postoperative stroke reduced long-term survival more than postoperative MI.

**Methods:** The Vascular Study Group of New England was used to identify all CEA and CAS procedures from 2003 to 2011. Patients were stratified according to whether they experienced a minor or major postoperative stroke, MI (troponin elevation, electrocardiographic changes and/or clinical symptoms), or neither. Primary study end points were 1- and 5-year survival. Multivariable Cox proportional hazards models compared the magnitude of effect of stroke and MI on survival.

**Results:** Of 8315 patients, 81 (1.0%) experienced postoperative MI and 63 (0.8%) experienced stroke (37% major, 64% minor). Survival significantly differed at 1 year: MI, 84%; stroke, 77%, neither, 96% (log-rank, P < .0001). After adjusting for confounders, stroke was an independent predictor of death at 1 year (hazard ratio [HR], 6.6; 95% confidence interval [CI], 3.7-12; P < .0001), as was MI (HR, 3.6; 95% CI, 2-6.8; P < .0001). At 5 years, on multivariable modeling, stroke was again an independent predictor of death (HR, 2.7; 95% CI, 1.7-4.3; P < .0001), with a magnitude of effect similar to that of MI (HR, 2.8; 95% CI, 1.8-4.3; P < .0001).

**Conclusions:** Postoperative stroke conferred a sixfold increased hazard of death at 1 year, which was nearly twice that associated with postoperative MI. By 5 years, survival curves converged and the disadvantage conferred by stroke was similar to that by MI. This study demonstrates that stroke portends a significantly worse survival prognosis than MI within the first year after carotid revascularization.

## Race As a Predictor of Morbidity and Mortality After Carotid Endarterectomy

Hilary A. Brown, Michael Sullivan, Richard Gusberg, Alan Dardik, Julie Ann Sosa, Jeffrey Indes. Yale University, New Haven, Conn

**Introduction and objectives:** Racial disparities in the outcomes of patients undergoing carotid endarterectomy (CEA) have been reported. We sought to examine the contemporary relationship between race and outcomes, as well as to report postdischarge events after CEA.

**Methods:** American College of Surgeons-National Surgical Quality Improvement Program data were reviewed to identify all CEAs performed from 2005 to 2010. The influence of race on outcomes was examined. Multivariate analysis was performed using variables found to be significant on bivariate analysis. The primary outcomes were stroke and mortality. Secondary outcomes were other 30-day complications, including postdischarge events.

**Results:** CEA was performed on 29,114 white patients (95.7%) and 1316 black patients (4.3%). The overall stroke and mortality rates were 1.65% and 0.7%, respectively. The stroke rate was 1.6% for whites and 2.5% for blacks (P = .0009). The 30-day mortality rate was 0.7% for white