Sex Differences in Carotid Endarterectomy Outcomes

To the Editor:

In a recent publication by Kapral and colleagues, it was concluded that the perioperative rates from carotid endarterectomy are similar in male and female patients. Respectively for male and female patients, the perioperative mortality rates were 1.8% and 1.2%, the nonfatal stroke rates were 4.2% and 5.0%, and combined death or stroke rates were 5.9% and 6.2. The data of 6038 patients were obtained from the Ontario Carotid Endarterectomy Registry and represent all carotid endarterectomies performed in this province of Canada during a 4-year period. Thus, the data have been influenced by multiple variables, and a multivariate analysis was used in this study. Two important factors that are known to influence the outcome of carotid endarterectomy, however, were not adequately evaluated. From Table 2 of the article, it appears that a patch was used in <20% of closures. The type of patch used for the arteriotomy closure is unknown, but the patch type may affect the outcome. Therefore, the effect of the type of arteriotomy closure on the outcome of carotid endarterectomy cannot be clearly determined in this study. Another difficulty is the evaluation of the effect of the volume of carotid endarterectomies performed by a surgeon.

Several studies have shown that the type of arteriotomy closure and sex are important outcome factors.4–6 Our perioperative ipsilateral stroke rate was 2.2% after a primary closure and 0.5% after a vein patch closure for all patients. Since the outcome after a primary closure in female patients was much worse than in male patients, we now use a vein-patch for all female patients. In a prospective randomized study, the perioperative stroke rate was 4.4% after primary closure and 0% with the vein patch.3 Another group observed that the primary closure was associated with a higher incidence of neurological complications compared with the patch closure.4 Other vascular surgeons also prefer a patch closure for female patients. The sex effect on the outcome after the saphenous vein-patch angioplasty has been evaluated, and the perioperative mortality rates were 0.5% and 0.4%, the nonfatal stroke rates were 0% and 0.8%, and combined death or stroke rates were 0.5% and 1.2%, respectively for male and female patients.8 Other studies have also observed that the stroke and mortality rates were higher in female patients.6,7 Women who had prior neurological symptoms and those using hormone replacement therapy were also at a higher risk for stroke.8 Studies that have found no differences among women and men have reported that the patch was used more frequently in women.9,10 The perioperative stroke rate of 2228 consecutive carotid endarterectomy was higher with synthetic grafts.7 Unfortunately, the data used in the current study were taken between 1994 and 1997 when primary closure was used for many female patients, and the undifferentiated patch type has clouded the interpretation of the statistical analysis.

Lastly, several studies have shown that vascular surgeons who perform frequent carotid endarterectomies (high volume) have fewer perioperative complications. A recent publication confirms that a surgeon's volume is an independent indicator of the outcomes after carotid endarterectomy.11 They have categorized medium-volume surgeons as those who perform 10 to 29 procedures per year and high-volume surgeons as those performing ≥30 per year. In the current study, high-volume surgeons were defined as those performing ≥12 per year. We do not believe that surgeons who perform only 1 carotid endarterectomy per month are high-volume surgeons.

Despite these problems, we agree that female patients should obtain carotid endarterectomies and that they can obtain a good outcome if they receive a vein patch for the closure of the arteriotomy.

Response

We thank Drs Chang and Stein for their insightful comments on our article. We agree that both surgeon volume and the type of arteriotomy closure may be important predictors of surgical outcomes. However, even after adjustment for these factors in our multivariate analyses, we found no sex difference in perioperative complication rates from carotid endarterectomy.

The designation of surgeons as “high-volume” if they performed >12 procedures per year was based on surgeon entry criteria for the ACAS study,1 as well as pilot analyses from our Ontario data set, which indicated better outcomes for surgeons who performed >12 procedures annually.2 We had information on the type of arteriotomy closure in all patients, and found that women were slightly more likely than men to undergo patch closure (19% versus 16%). If rates of patch closure in women have increased since our study time frame, this would be expected to lead to even lower rates of complications in women.

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