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References

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In Reply:—Dr. Edelist's comments relate to the issue of the most-appropriate outcome definition of change in cognitive function over time. One approach is to compare within-patient change on each test as a continuous variable, as described in our article regarding hypotensive epidural anesthesia for total hip replacement (THR).¹ This is an appropriate and sensitive method for the comparison of outcomes between two groups as the result of an intervention.

An alternative approach is to compare the percentage of patients in each group who exceeded a certain threshold of change on each test. Furthermore, a single overall outcome can be derived for each patient by aggregating their changes on all of the tests in the study battery. There is controversy in the postoperative cognitive dysfunction literature regarding how to set the threshold for an important change, and how to aggregate the results on the different tests. Validating the optimal method is a difficult challenge, and there currently is no clear consensus.

In our previous study that compared postoperative cognitive changes in patients undergoing total knee replacement (TKR) who were randomized to receive either epidural or general anesthesia,² we proposed a methodology for arriving at individual patient outcomes, and observed a 5% overall incidence of long-term cognitive deterioration. Applying that same outcome definition, a 2.3% incidence of long-term cognitive deterioration was observed in patients undergoing THR. There was no difference in the rate of long-term cognitive deterioration between the two blood-pressure groups. Analysis of the percentage of patients whose scores declined by a value greater than a clinical important difference on each individual test also revealed no significant differences between the two blood-pressure groups.

Dr. Edelist asks why the rate of long-term cognitive deterioration might be lower in the THR trial than in the TKR trial. This seems paradoxical, particularly because patients undergoing THR were older and had higher rates of comorbid medical disease. We suspect that the answer lies in the outcome definition, which considers both important improvements and declines in performance on the various tests, and determines a "net" impact for each patient. After lower-extremity joint replacement, patients experience major improvements in multiple dimensions of functional status, including physical function, role function, social function, and psychologic well being. In addition, they have markedly reduced pain and use fewer medications.³ These results may, in turn, contribute to improved cognitive function that is consistent with the observed generalized improvement in neuropsychologic

trial of hypotensive epidural anesthesia in older adults. *ANESTHESIOLOGY* 1999; 91:926-35

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performance on the long-term postoperative assessment. Studies using a common methodology to measure changes in functional status have noted a greater magnitude of improvement after THR than after TKR,⁴ which may partially explain the difference in results observed in the two study populations.

Finally, and most importantly, Dr. Edelist notes that "a 5% incidence of this complication is hardly encouraging." This is certainly true if the observed incidence can definitively be attributed to the surgery and to anesthesia. This is not yet clear; the observed incidence of long-term cognitive deterioration may not be a complication, but instead may represent the basal rate to be expected in a population with a mean age of 70 years and comorbid medical disease. We are currently conducting a study that addresses this question by comparing a cohort of patients undergoing THR or TKR with a matched control cohort not undergoing surgery and anesthesia during a 6-month period.

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