Preoperative Cognitive Assessment of the Elderly Surgical Patient

A Call for Action

Being sick is not good for the brain. Surgery and all that goes with it (e.g., stress, inflammation, pain, medications, anesthetics) makes people sick temporarily. It should come as no surprise, then, that brain dysfunction is common perioperatively. This is a particular problem in elderly patients, with 30–80% becoming delirious after major surgery and 30–40% and 10–15% developing early and late postoperative cognitive dysfunction (POCD), respectively.1,2 This cognitive morbidity is also important; delirium and POCD are associated with longer hospital stay and cost, premature withdrawal from the workforce, and greater 1-yr mortality.1,3 Therefore, both in terms of incidence and associated adverse outcomes, perioperative brain dysfunction is every bit as serious as the other varieties of organ system dysfunction for which we routinely screen and evaluate surgical patients preoperatively. Why, then, don’t we routinely and formally assess cognition preoperatively?

The article by Evered et al.4 in this issue of the Journal sheds light both on the complexity of doing so and what we might find if we looked. Evered et al. prospectively assessed cognition in 152 patients older than 60 yr who were scheduled for elective total hip replacement. They used two different constructs to identify impairment. The first, called preexisting cognitive impairment (PreCI), is defined entirely by performance on neuropsychologic tests. In this case, it was defined by poor performance on two of seven cognitive tests, where impairment was defined as performance 2 SD below norms for a given test.4 This construct has been used previously in the context of cognitive decline associated with cardiac surgery.5 The second construct was a subtype of mild cognitive impairment (MCI) called amnestic MCI (aMCI). MCI is a formal, widely accepted neurologic syndrome characterized by subjective and objective evidence of impairments, including decreased performance on formal cognitive testing, but symptoms are mild enough that they do not interfere with activities of daily living.6,7 aMCI is a subtype of MCI characterized by memory complaints or decline as reported by the patient and ideally confirmed by an informant or nurse or physician; objective evidence of memory impairment on memory-related—but not other—neuropsychometric measures; essentially normal activities of daily living; and absence of dementia.6,7 Evered et al. asked subjects and informants structured questions about memory and tested immediate and delayed recall on a widely accepted test of auditory verbal memory; aMCI was diagnosed when a subject had subjective memory complaints and performed 1.5 SD below norms on two of three trials of the Auditory Verbal Learning Test.4 Their results are striking. Approximately one in five patients scheduled for elective total hip replacement surgery had either PreCI or aMCI, and prevalence increased with age, with PreCI identified in 55% of those in their 80s.8 Based on objective criteria alone (i.e., performance on neuropsychologic tests), 70% of patients with PreCI also satisfied criteria for aMCI but, when the subjective component of aMCI was included, only 33% of subjects classified as PreCI also met criteria for aMCI—so what one finds depends on how one searches. As far as we know, this is the first study to compare a construct of cognitive impairment adopted by anesthesiologists with one used by neurologists, and it has a number of important clinical implications.

First, Evered et al. show that mild cognitive deficits are a common affliction of elderly patients having major orthopedic surgery, even when they are able to perform normal activities of daily living. Not previously documented in noncardiac surgical patients, this result is perhaps no surprise because approximately 10–40% of community dwelling elderly patients have MCI.6,8 Accordingly, it is reasonable to assume that the data of Evered et al.4 apply to elderly patients having most types of major elective noncardiac surgery. The implication is clear: we are routinely anesthetizing and operating on a large percentage of elderly patients whose brain is compromised preoperatively. The problem is that the deficits are often subtle enough that they would be missed by casual observation in the preoperative testing center, and patients are often reticent to admit to memory or cognitive problems. This emphasizes that we should be formally testing for cognitive impairment preoperatively, just as we test for occult anemia, pulmonary dysfunction, or cardiac disease in certain age groups.

Second, the study of Evered et al.4 highlights the importance of coming to consensus about what and how to test. This is where the situation gets tricky. Because age-related cognitive decline affects specific cognitive domains, not global brain function, results obtained from a preoperative cognitive evaluation will vary with the tool used to perform the assessment. Evered et al. show, for example, that simply

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adding subjective report of cognitive complaints—one of the diagnostic criteria for aMCI—to objective neuropsychologic testing reduces the percentage of subjects defined as being impaired from 50% to 22%. With this in mind, Evered et al. argue that rather than creating new criteria and definitions of preoperative cognitive impairment we should use criteria established for MCI. We strongly agree with this approach, at least conceptually. As Evered et al. point out, adopting this convention would allow perioperative physicians to speak the same language as neurologists and psychogeriatricians. In addition, big dividends would accrue if cognitive risk and outcomes of surgical patients could be evaluated against the large database of the broader population, where the cognitive trajectory of MCI is well established, biomarkers are actively being sought, and interventions to prevent or slow decline are being developed.

Why might thinking in terms of MCI be helpful? The reason is that a diagnosis of MCI has diagnostic utility, which derives mainly from two features. The first is the growing recognition that for treatments of dementing illnesses such as Alzheimer’s disease to be successful, it might be that they must be started before the brain is severely damaged, in the predementia phase. MCI presumably identifies such people.

The second is that MCI identifies patients with a high risk of progressing to dementia; patients with aMCI convert to dementia at a rate of 6–15% per year, with the higher rate progressing to Alzheimer disease-related dementia.6,7 Nonethe-

less, identifying individuals with MCI (or even mild but previously undiagnosed dementia) before surgery might help us anticipate perioperative cognitive problems better than we do now, predict long-term cognitive outcome, and affect plans for perioperative care, postoperative management, and recovery because these patients are probably at higher risk for confusion or delirium and more likely than unimpaired persons to have difficulty following through on postsurgical instructions. But adopting an MCI construct is easier said than done. Much like POCD,8 the diagnosis of MCI is not iron clad in part because of controversy about implementation (e.g., population heterogeneity, variability in outcomes, use of normative data) and relevance (is it a clinical or pathologic entity, or both?).7 However, an updated consensus on diagnostic criteria for MCI (or its equivalent) is currently being formulated by a National Institute on Aging-Alzheimer Association consensus conference, and a parallel process is revising criteria to be published in Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. This suggests that firmer clinical criteria for MCI are soon to be at hand, which will make using the construct preoperatively even more attractive.

In a broader context, knowing something about preoperative cognitive function would allow us to consider two bigger questions. One is whether preexisting cognitive impairment is a risk factor for POCD. Data on the subject are equivocal9 and the work of Evered et al.4 does not speak to it directly but some causal relationship between preexisting cognitive disability and postoperative cognitive morbidity makes sense and the crude numbers fit the narrative (i.e., the prevalence of PreCI or aMCI is approximately 20% and the incidence of POCD is 10–15%).2,4 Recent data also suggest that a large percentage of apparently clinically normal individuals older than 70 yr have a positive positron emission tomography scan for amyloid and, as assessed by a sensitive functional magnetic resonance imaging protocol, impaired function of neural networks, likely indicating they are in a preclinical phase of Alzheimer disease.10 As such, they may be set up for worsening of cognitive function postoperatively.

The second question is more provocative: might most, if not all, of the cognitive decline that occurs postoperatively be progression of unrecognized MCI, independently of any dementia-inducing effect of anesthesia or surgery? Some data support this idea1,1,12 but it is unlikely that a clinical diagnosis of MCI will prove the theory. First, as already mentioned, defining preoperative cognitive status by clinical and neuropsychologic criteria for MCI is not a panacea. MCI is typically diagnosed with a structured interview instrument called the Clinical Dementia Rating Scale. This tool uses an interview and completion of a few questionnaires, a neurologic examination, and multiple neuropsychologic tests for memory, executive function, language, and visuospatial skills. In contrast, MCI was diagnosed by Evered et al. based on a structured questionnaire to probe for memory difficulties and performance on one test of the Consortium to Establish a Registry for Alzheimer’s Disease battery, the Auditory Verbal Learning Test. Although not as extensive a battery as used in many Alzheimer disease research settings, this approach likely identifies most individuals who are impaired. Yet, it is a still time-consuming solution for the preoperative setting and has not been validated by long-term follow up. Second, many people newly diagnosed with MCI remain cognitively stable for years. More than 40% of patients in whom MCI is diagnosed at an initial visit, as was the case in the study by Evered et al. and would also be true for testing performed initially in a preoperative clinic, will actually improve and return to normal function 1 yr later.6,7 This test-retest variability is an inherent limitation of the Clinical Dementia Rating Scale. Consequently, although a diagnosis of MCI, and especially aMCI, identifies a group at high risk for progression to dementia, it is by no means a definitive measure of a predementia state, particularly if it is based on testing at a single visit, because many factors (e.g., mood, medications) in addition to neurodegeneration affect cognitive performance on a given day.

Indeed, there is no easy solution to screening for dementia, let alone MCI, which is why current emphasis is on finding biomarkers in cerebrospinal fluid or blood.13,14 Cerebrospinal fluid measures already appear to be fairly reliable.
indices of Alzheimer-type pathology in the brain, even pre-
symptomatically. Although a preoperative lumbar puncture
may not prove practical, optimism about the ultimate
development of Alzheimer disease-related, plasma-based
screening tools is high. Moreover, talking about MCI rather
than PreCI or POCD gets us no closer to understanding the
neurobiology of perioperative cognitive morbidity because
MCI is itself a constellation of symptoms rather than a de-
fined clinical-pathologic entity. Nonetheless, an effort to
clinically identify patients with MCI preoperatively would
be a good, if imperfect, first step, because it could serve as a
warning sign that may affect clinical care decisions and ex-
pectations and position us to capitalize on suitable biomark-
ers as they become available.

This leaves us with two major challenges. The first is to
identify cognitive impairment in patients before they come
to the operating room. This requires that we look for it. A
paradigm shift is therefore necessary such that cognitive as-
essment becomes a routine part of the preoperative screen-
ing of elderly patients, not just a research tool. Developing
and validating a cognitive evaluation tool that is practical,
reproducible, and robust will not be easy, because the brain is
a complex organ and cognitive assessment is a complicated
business under any circumstances, let alone under the pro-
duction pressure of the preoperative clinic or operating
room. But the task is an important and necessary one, and
framing the approach toward identifying MCI (and even mild
dementia, which is frequently not detected clinically) has
tangible and theoretic benefits. An abbreviated and valid-
ated assessment tool for MCI, much like the Confusion
Assessment Method is a surrogate for the longer and more
complicated Diagnostic and Statistical Manual of Mental
Disorders, Fourth Edition criteria for bedside assessment of
delirium, would be a valuable addition in this respect. Ad-
mittedly, routine preoperative assessment of cognition will
consume already constrained time and resources. However,
time and resources are currently expended with preoperative
tasks such as obtaining electrocardiograms and chest radi-
ographs to guide decision-making and head off potential
problems that are less common and cause less morbidity
during the perioperative period than cognitive dysfunction.
Although cognitive assessment alone may not be as definitive
as we would like for preoperative identification of the patient
with a compromised brain, it is undoubtedly better than cur-
tent practice, which is no cognitive assessment at all.

The second challenge is to begin to use knowledge such as
provided byEvered et al. about preoperative cognition to
better understand perioperative cognitive morbidity. Are
PreCl and POCD new animals or just MCI by other names?
It would not be surprising if MCI were present in patients
who develop POCD. Are delirium and POCD the expres-
sion of new brain injury or dysfunction that occurs during or
after surgery and anesthesia or, as some recent studies sug-
gest, the natural trajectory of a preexisting condition? Per-
haps both occur, but it seems self-evident that knowledge of
the preexisting condition is important clinically. These are
critical questions because if it turns out that POCD and MCI
are similar entities, POCD would move from being a new
syndrome somehow created de novo by anesthesia and sur-
gery to a preexisting condition of reduced cognitive reserve
that is unmasked by anesthesia and surgery. Such
knowledge would profoundly affect how we think about
the problem of perioperative cognitive morbidity, measure
ment and validating it, and intervene to mitigate it.

The work of Evered et al. is the best documentation to
date that many elderly patients presenting for major ortho-
pedic, and presumably most elective noncardiac surgery pro-
cedures, are cognitively compromised at baseline. The fact
that we currently make no effort to identify such patients
preoperatively is an embarrassing state of affairs considering
that the brain is a principal target of general anesthetic
agents, the field of anesthesiology champions thorough pre-
operative evaluation, and perioperative cognitive morbidity
in the elderly is so common and costly. It is time to be as
concerned about the preoperative functioning of the brain in
vulnerable patients as we are about preoperative functioning
of other vital organ systems. As such, it is time to routinely
screen elderly surgical patients preoperatively for the pres-
ence of cognitive impairment. Long neglected, the brain de-
serves the attention and what we learn will help improve
cognitive outcomes in the older surgical patient.

Gregory Crosby, M.D., Deborah J. Culley, M.D., Bradley
T. Hyman, M.D., Ph.D. †Harvard Medical School, Depart-
ment of Anesthesiology, Perioperative, and Pain Medicine,
Brigham and Women’s Hospital, Boston, Massachusetts,
gcrosby@zeus.bwh.harvard.edu. †Harvard Medical School,
Department of Neurology, Massachusetts General Hospital,
and Alzheimer Disease Research Center, Charlestown,
Massachusetts.

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