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, anesthesia) makes people sick transiently. 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.3 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.6,7 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
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 es-
tablished 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
progression to dementia; patients with aMCI convert to de-
mentia at a rate of 6–15% per year, with the higher rate
applying to people referred to a memory disorders clinic and
the lower to the elderly population at large.6,7 It is essential to
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the lower to the elderly population at large.6,7 It is essential to
remember, however, that MCI is not equivalent to a diagno-
sis of Alzheimer disease; up to 40% of MCI patients do not
progress to Alzheimer disease-related dementia.6,7 Nonetheless,
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 per-
sons to have difficulty following through on postsurgical in-
structions. 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
table, population heterogeneity, variability in outcomes, use
of normative data) and relevance (is it a clinical or pathologic
entity, or both?). However, an updated consensus on diag-
nostic criteria for MCI (or its equivalent) is currently being
formulated by a National Institute on Aging-Alzheimer As-
sociation consensus conference, and a parallel process is re-
vising 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 preoper-
ative cognitive function would allow us to consider two bi-
ger questions. One is whether preexisting cognitive impair-
ment 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 POCD or aMCI is approximately 20% and the
incidence of POCD is 10–15%).2 Important data also suggest
that a large percentage of apparently clinically normal indi-
viduals 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 de-
mentia-inducing effect of anesthesia or surgery? Some data
support this idea but it is unlikely that a clinical diagno-
sis of MCI will prove the theory. First, as already mentioned,
defining preoperative cognitive status by clinical and neu-
ropsychologic criteria for MCI is not a panacea. MCI is typi-
cally diagnosed with a structured interview instrument called
the Clinical Dementia Rating Scale. This tool uses an inter-
view and completion of a few questionnaires, a neurologic
examination, and multiple neuropsychologic tests for mem-
ory, 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 Ver-
bal 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 vari-
ability 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 pro-
gression 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 perform-
ance on a given day.

Indeed, there is no easy solution to screening for demen-
tia, let alone MCI, which is why current emphasis is on
finding biomarkers in cerebrospinal fluid or blood.13,14 Ce-
robospinal fluid measures already appear to be fairly reliable
indices of Alzheimer-type pathology in the brain, even presymptomatically.\textsuperscript{15} 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 defined 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 expectations and position us to capitalize on suitable biomarkers 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 assessment becomes a routine part of the preoperative screening 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 production 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 validated 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,\textsuperscript{16} would be a valuable addition in this respect. Admittedly, 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 radiographs 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 current practice, which is no cognitive assessment at all.

The second challenge is to begin to use knowledge such as provided by Evered et al.\textsuperscript{4} about preoperative cognition to better understand perioperative cognitive morbidity. Are PreCI 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 expression of new brain injury or dysfunction that occurs during or after surgery and anesthesia or, as some recent studies suggest,\textsuperscript{17} the natural trajectory of a preexisting condition? Perhaps 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 \textit{de novo} by anesthesia and surgery to a preexisting condition of reduced cognitive reserve that is unmasked by anesthesia and surgery.\textsuperscript{17} Such knowledge would profoundly affect how we think about the problem of perioperative cognitive morbidity, measure and validate it, and intervene to mitigate it.

The work of Evered et al.\textsuperscript{4} is the best documentation to date that many elderly patients presenting for major orthopedic, and presumably most elective noncardiac surgery procedures, 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 preoperative 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 presence of cognitive impairment. Long neglected, the brain deserves the attention and what we learn will help improve cognitive outcomes in the older surgical patient.

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