Preventing Postoperative Cognitive Decline in the Elderly

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Subtle Perioperative Brain Injury

- Emergence Delirium
- Postoperative Delirium
- Postoperative Cognitive Decline
Postoperative Delirium

An acute brain disorder that has a fluctuating course and characterized by disturbance of attention, memory, orientation, and perception.

Incidence (in elderly)
Noncardiac surgery: 10%-40%
Cardiac surgery: 20%-70%
Interplay of Factors Leading to Delirium

Steiner L, Eur J Anaesth, 2011
Predisposing Factors

- Age
- Functional impairment
- Cognitive impairment
- Medical co-morbidity
- Drugs
- Genetic factors (sigma 4 allele of apolipoprotein E4)
Precipitating Factors

- Admission to ICU
- Drugs
- Concomitant illness
- Primary neurologic disease
- Pain
- Use of physical restraints
- Prolonged sleep deprivation
Can Delirium be Prevented in the Postoperative Period?

- Pharmacological prevention
- Non-pharmacologic multicomponent strategies
  - Good nursing care
  - Regular orientation
  - Early mobilization
  - Reduce modifiable risk factors

Inouye S, JAMA, 1998
Pharmacologic Strategies

- Dopamine → Haloperidol
- Serotonin → Risperidone/Quetiapine
- Acetylcholine → Rivastigmine/Donazepil
- Norepinephrine → Dexmedetomidine
- GABA → Benzodiazepines
Reduced Delirium Prevalence with Dexmedetomidine vs Midazolam

Dexmedetomidine versus Midazolam, $P < 0.001$

“The brain is not a sausage, it’s more like a well tuned musical instrument”

Rudolfo Llinas

Endogenous sleep

Loss of response to external stimuli

Sedative component of anesthesia
# Monitoring Depth of Anesthesia and Postoperative Delirium

<table>
<thead>
<tr>
<th>Study</th>
<th>Routine Care</th>
<th>BIS-Guided</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radtke F, Br J Anaesth, 2013</td>
<td>124/580 (21.4%)</td>
<td>95/575 (16.7%)</td>
<td>0.036</td>
</tr>
<tr>
<td>Chan M, J Neurosurg Anesth, 2013</td>
<td>109/452 (24.1%)</td>
<td>70/450 (15.6%)</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Postoperative Delirium in Older Adults: Best Practice Statements from the AGS

- Perform a preoperative and postoperative assessment of delirium risk factors
- Physicians should be trained in the recognition of delirium
- Anesthesiologists may use monitors of anesthetic depth
- Avoid medications that may induce delirium
- Use regional anesthesia for postoperative pain control
- Put into practice multicomponent interventions
- Do not prescribe antipsychotics or benzodiazepines to patients who are not a threat for personal harm

Expert Panel on Postoperative Delirium, JACS, 2014
“He’s become so forgetful since…”
“He can’t concentrate on anything since…”
“She’s become childish and unreliable since…”
“He’s not just the same person since…”

CONCLUSION: Operations on elderly people should be confined to unequivocally necessary cases
Postoperative Cognitive Dysfunction (POCD):

An impairment of functioning in several cognitive domains: memory, executive functioning, attention, and comprehension
There are no laboratory test or imaging study which can be used to predict or diagnose POCD
Preoperative and Postoperative Cognitive Trajectories

Sanders R, Neurologic outcomes of Surgery & Anesthesia, 2013
Predisposing Factors: POCD

- Age
- Preoperative cognition
- Type of surgery
- Vascular risk factors
- Apolipoprotein E genotype (?)
Possible causes of POCD
Related to Surgery

- Altered cerebral perfusion
- Cerebral microemboli
- Anesthetics
- Inflammation
  - Surgery related
  - Patient related
Conceptual Model of POCD

MCI: Diagnosis

- MCI is diagnosed when there is:
  - Evidence of memory impairment
  - Preservation of general cognitive and functional abilities
  - Absence of diagnosed dementia

Morris J, Arch Neurol, 2001
Diagnostic and Treatment Possibilities Along the Evolution of Dementia

Cedazo-Minguez A et al., Exp Gerontology, 2010
Brain Images from Age Matched Cognitively Intact Individuals and AD Patients

Cedazo-Minguez A et al., Exp Gerontology, 2010
Study Design: Longitudinal Examination of Structural MRI From ADNI Database

- Apply MRI to study perioperative cortical volume change in surgical subjects
- Examine hippocampus, gray matter, white matter and lateral ventricle.
- Examine composite cognitive score
LV Volume Changes in a Surgical Patient with MCI

MCI with Surgery

Baseline (before surgery)

1st Follow up (after surgery)

Kline R, Anesthesiology 2012
Atrophy of Hippocampus in the Perioperative Period

Kline R, Anesthesiology 2012
POCD: Concluding Remarks

- Standardization of diagnostic criteria
- Neuroinflammation
- Low intraoperative cerebral oxygenation
- Patient-related factors:
  - Age
  - Pre-existing cognitive impairment
  - Cognitive reserve
  - Priming of the immune system
Low Tech Prescriptions for Longevity

“Swim, dance a little, go to Paris every August and live within walking distance of two hospitals”
Horatio Lure, at 80

“Stay busy, get plenty of exercise and don’t drink too much. Then again, don’t drink too little”
Herman “Jack Rabbit” Smith-Johannsen, at 103

“The secret to longevity is to keep breathing”
My observation