



Clinical Update

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Is Bypass a Factor in Cognitive Decline After CABG?

Conventional wisdom would not ask the question about *whether* cardiopulmonary bypass is a factor in post-operative cognitive decline (POCD), but rather the pathophysiology of the factors that affect cognition after patients have been on bypass. However, research released last week reporting on a five-year follow-up that compared the POCD between groups of off-pump CABG (coronary artery bypass graft) and on-pump CABG patients found no difference in long-term cognitive changes between two matched groups¹. First, we'll review the pathophysiology related to cardiopulmonary bypass, and then explore the latest research about the differences in patient outcomes when bypass is or is not used during CABG surgery.

Pathophysiology Related to Bypass

A review of POCD in *Chest*² suggests that cerebral injury associated with POCD results from a complex interaction between cerebral microemboli, global cerebral hypoperfusion during surgery, and an inflammatory response at the cellular level. The inflammatory response comes about in three ways: contact between blood and the artificial tubing of the bypass circuit activates the immune system; cross-clamping the aorta causes ischemia in the heart, lung, and kidneys followed by reperfusion that activates cellular and humoral responses, leading to a systemic inflammatory response; and the non-specific activation of immune response seen with any major surgery. Hypothermic bypass attenuates the overall inflammatory response when compared with normothermic bypass.

The non-pulsatile flow generated during bypass is thought to exacerbate regional differences in distribution of blood flow in the brain, and post-bypass reperfusion injury that occurs once pulsatile flow is reestablished contributes to the inflammatory activation.

Another review in *Neurologic Clinics*³ identifies five factors that have been associated with short-term cognitive changes after CABG with bypass.

1) During aortic cannulation, decannulation and cross-clamping, showers of emboli are common. However, there is no consensus in the literature as to the clinical importance of these particles, or their effect on cognitive function. The authors suggest that the key factor may be the patient's baseline status; those without pre-existing cerebrovascular disease may not have measurable effects, while those with widespread vascular disease are much more sensitive to small disturbances in blood flow. In fact, some studies have shown one-third of otherwise asymptomatic people have silent brain infarcts visible on MRI at baseline.

2) One-third of bypass patients will develop new atrial fibrillation (AF) postop. The most consistent risk factor for new-onset AF is older age, which is also a risk factor for POCD. AF is widely recognized as a significant risk factor for stroke.

3) As people age, the vascular system becomes less elastic and the brain needs a higher driving pressure to assure perfusion. This makes older patients even more susceptible to both regional and global cerebral hypoperfusion associated with bypass.

4) General anesthesia for any reason results in cognitive decline — one study demonstrated cognitive changes in 19% of patients aged 40 to 60 years 7 days following surgery.

5) Depression is common after CABG, and some researchers suggest depression skews assessments of cognitive function. However, the greatest predictor of postop depression is preop depression, and in prospective studies in which cognitive function was measured preop, there is no correlation between depression and POCD.

Comparing Surgical and Non-surgical Patients

Researchers from Johns Hopkins University examined cognition in four groups of patients: those undergoing CABG with bypass; those undergoing CABG without bypass; those with similar cardiovascular disease, but not having surgery; and a heart healthy control group.⁴ Compared with the healthy group, the other three groups had lower cognitive scores from the start, particularly in the areas of executive function (in which the brain coordinates multiple cognitive tasks simultaneously, plans, and shifts attention), psychomotor speed (the time it takes to physically respond to a signal), and motor speed (which can be as simple as tapping fingers). These findings were consistent with assessments of other groups of people who had diabetes and hypertension, without overt coronary disease.

The four cardiac groups were followed with cognitive assessments at baseline (preop in surgical patients), 3 months and 12 months. The heart healthy group showed no significant changes in cognitive function. Surprisingly, there were no significant differences in cognitive changes between those with heart disease who had surgery on bypass, surgery without bypass or medical management alone. Significantly more surgical patients *reported* declines, but they were not confirmed with objective assessment.

Long-Term Analysis

What makes the new *JAMA* report¹ particularly interesting is that patients had follow-up testing at 5 years after surgery — the longest interval examined to date. This timeframe presented special challenges for researchers who needed to differentiate between "normal" changes associated with aging and those attributable to CABG surgery. After adjusting for elapsed time, researchers found no difference between bypass and non-bypass patients in cognitive outcomes, subsequent rate of cardiovascular events, angina, or quality of life. Thus, the authors suggest focusing on other aspects related to cognitive function, such as age and health at the time of surgery, preoperative risks for cognitive decline, and the concept of how major surgery itself sets off a systemwide inflammatory response. Evidence is showing that use of cardiopulmonary bypass is not itself responsible for POCD after CABG surgery.

Sources on page 2.

Check Your Knowledge...

Q. In 2004, the most recent year for which statistics are available, how many CABG procedures were performed in the US? What percent of that total is men, and what percent is women?

Answer on other side

Clinical Update is an educational newsletter provided by Atrium Medical Corporation and is edited by Patricia Carroll, RN,BC, CEN, RRT, MS.

In The Literature

What Chart Audits Miss

The current issue of the *Journal of Infusion Nursing* has a valuable article about evaluating the implementation of evidence-based recommendations for vascular access, nursing assessment, and device selection by auditing charts. The researchers wanted to evaluate whether a chart audit captured the same elements as observing the nurse in practice. The tools designed by the researchers sought to capture a patient profile, use of IV guidelines, and patient outcomes.

It turned out that the focus on chart audits captured improvements in documentation, but not necessarily in nursing practice. In particular, chart audits did not capture the clinical decision-making process nurses do, often subconsciously, every day. While this research was about vascular access, the underlying findings on the usefulness of chart audits can apply in any practice setting.

Source: Higuchi KA, Edwards N et al: Development of an evaluation tool for a clinical practice guideline on nursing assessment and device selection for vascular access. *Journal of Infusion Nursing* 2007;30(1):45-54.

ER to ICU Time

A study reported in the current issue of the *Journal of Emergency Nursing* examined whether wait times between the time of ICU transfer order and the time the patient arrives in a critical care setting affect in-hospital mortality. ED nurses are experts in identifying life-threatening conditions and responding quickly to stabilize patients, but are not experts in specialized ongoing critical care these unstable patients require. These researchers discovered that mortality rate was higher when more time elapsed between the ICU transfer order and the physical transfer to a critical care unit. On a weekend, mortality rates were even higher, largely due to the delays in diagnostic testing related to different staffing patterns compared with weekdays.

This is another study that shows that nurses do the best job they can with the resources available, but when the hospital capacity is stretched to its limit, patients' outcomes suffer. Nurses must be involved in the process to redesign care so that the cascade of "no critical care beds" that leads to ED nurses providing ongoing care to critically ill patients (which reduces ED nursing efficiency) that leads to full EDs, long wait times and eventually, closed EDs with EMS on diversion can someday be a relic of the past.

Source: Clark K, Normile LB: Influence of time-to-interventions for emergency department critical care patients on hospital mortality. *Journal of Emergency Nursing* 2007;33(1):6-13.

Sources from page 1:

1. vanDijk D, Spoor M et al: Cognitive and cardiac outcomes 5 years after off-pump vs on-pump coronary artery bypass graft surgery. *JAMA* 2007;297(7):701-708.
2. Gao L, Taha R et al: Postoperative cognitive dysfunction after cardiac surgery. *Chest* 2005;128(5):3664-3670.
3. Selnes OA, McKhann GM et al: Cognitive and neurobehavioral dysfunction after cardiac bypass procedures. *Neurologic Clinics* 2006;24(1):133-145.
4. McKhann GM, Grega MA et al: Is there cognitive decline 1 year after CABG? *Neurology* 2005;65(7):991-999.

Check Your Knowledge...

A According to statistics compiled by the American Heart Association, there were 427,000 revascularization procedures done in the U.S. in 2004. Men had 71% percent of procedures, while women had only 29%. More procedures were done in the South than in any other region, almost by a factor of 2.

Heart Disease and Stroke Statistics — 2007 update, American Heart Association. Available at: <http://tinyurl.com/3bzrdw>

On the World Wide Web



Last month, the Joint Commission held a press conference to address an issue coming to the forefront of patient safety: low health literacy. JCAHO issued a white paper with 35 recommendations. Not sure if this is a problem for your patients? According to the National Assessment of Adult Literacy, about half the U.S. population has difficulty using text to accomplish everyday tasks. How many of those are your patients?

Joint Commission Resources

The Joint Commission has established a Web page with access to many resources for health professionals working with patients with low health literacy. From a 64-page white paper that provides a crosswalk between National Patient Safety Goals, the risks presented by low-literacy, and communications-related solutions; to case studies and strategies to address communication needs across the continuum of care, to fact sheets, streaming video presentations, and a link to additional resources — nurses are sure to find some new ideas and strategies for patient education here.

http://www.jointcommission.org/NewsRoom/PressKits/Health_Literacy/default.htm

CASAS

The Comprehensive Adult Student Assessment System, CASAS, is the most widely used system for assessing adult basic reading, math, listening, writing, and speaking skills within a functional context. That means determining whether people can do things based on their understanding, not just repeat words and numbers that are unrelated to functional tasks. For example, knowing the date and time of an appointment, arranging transportation, and determining how long it will take to get from home to the office or clinic is functional literacy, not just saying "two-thirty at my doctor's office." CASAS arranged with Portland State University to make a national database available for free. You can search adult literacy figures by state, county, congressional district, and city or town. These data will give you a snapshot of the community served in your practice area, so you can focus on those particular needs.

<https://www.casas.org/lit/code/search.cfm>

Health Literacy Consulting

A leading expert in designing materials that are sensitive to literacy issues is Helen Osborne of Natick, MA. She is generous with the amount of information she provides on her site. She's just started providing video tips as well. And, Helen is the driving force behind Health Literacy Month every October.

<http://www.healthliteracy.com/>