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A Possible Correlation Between Bypass Surgery and Neurocognitive Deficit

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Heart bypass surgery is a relatively routine procedure today. Conventional heart bypass surgery (in which the heart is stopped and the patient is placed on the heart-lung machine) continues to be common and effective, but can produce complications for the patient such as neurocognitive problems, infections, and damage to blood cells. Some researchers believe these complications may be the result of patients being placed on the heart-lung machine during surgery, and further studies are underway to explore this possible correlation.

In order to study neurocognitive decline, a series of neurocognitive tests are usually performed after surgery measuring for cognitive function. In some studies the tests are performed before discharge, and six weeks, six months and five years after surgery. Some of the effects a patient may experience include difficulty concentrating or subtle changes in personality. Neurocognitive decline can also include attention or memory deficits, and language problems.¹ Cognitive decline may also occur well after surgery, but some studies suggest the late decline may simply reflect the effects of aging on the brain.

To continue improvements in bypass surgery, researchers are examining the effects of surgery on cognitive function. Although more research is needed, there is increasing recognition and evidence that traditional bypass surgery may affect neurocognitive functions in patients.

- The reported incidence of short-term cognitive decline following conventional bypass surgery varies widely, from 33 percent to 83 percent or more.²
- In one study, the incidence of cognitive decline following traditional bypass surgery was 52 percent at discharge, 36 percent at six weeks, 24 percent at six months, and 42 percent at five years.³
- Those patients at highest risk for neurocognitive decline after surgery include older patients, those who have a history of stroke and those who spent less time in school.³

To further determine the clinical outcomes and cost effectiveness of beating heart surgery as it compares to traditional alternative forms of revascularization, Medtronic is collaborating with leading research centers in the U.S. and the Netherlands for the following studies:

-The "Octopus Study" being conducted at the University of Utrecht consists of two multicenter randomized clinical trials in which coronary artery bypass grafting (CABG) on the beating heart (off-pump CABG) is compared to intracoronary stent implantation and conventional CABG utilizing the heart lung machine. The primary endpoint in the comparison of off-pump CABG versus stent implantation is medical effectiveness (i.e., absence of reintervention and major adverse cardiac and cerebrovascular events at 1 year after treatment). The primary endpoint in the comparison of off-pump CABG versus conventional CABG is cerebral function (i.e., absence of neurologic injury and cerebrovascular events at 3 months after treatment). Secondary endpoints in both trials include presence and severity of angina, quality-of-life, exercise capacity and cost-effectiveness. A total of 560 patients have been enrolled.

-The SMART Study (Surgical Management - Arterial Revascularization Treatments) is a 200 patient, randomized trial being conducted by a single surgeon--Dr. John Puskas--at Emory University. Patients eligible for CABG surgery are randomized to one of two groups--those undergoing CABG with CPB (control) and those patient patients undergoing surgery without CPB (experimental or off-pump). Outcome analysis will focus on several categories of variables: a) graft patency, b) neurologic and neuropsychological function, c) pulmonary function, d) indices of inflammation, e) routines measures of postoperative morbidity and mortality and f) cost analysis. Graft patency will be assessed by cardiac cauterization prior to discharge and again at one year following surgery.

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References

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- 2Coronary-Artery Bypass Surgery and the Brain. *NEJM*. February 8, 2001.
- 3Newman M, et al. Longitudinal assessment of neurocognitive function after coronary artery bypass surgery. *NEJM*. 2001;344(6):395-402.