Is there long-term brain damage after bypass surgery? More evidence puts the blame on heart disease

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Brain scientists and cardiac surgeons at Johns Hopkins have evidence from 227 heart bypass surgery patients that long-term memory losses and cognitive problems they experience are due to the underlying coronary artery disease itself and not ill after-effects from having used a heart-lung machine.

Researchers say their latest findings explain study results presented last year, which showed that the heart-lung machines - used to pump blood and supply the body with oxygen while the heart is stopped during surgery - did not cause postoperative long-term brain deficits.

"Our results hammer home the message that heart-lung machines are not to be blamed for cognitive declines observed years later in people who have had bypass surgery," says lead study investigator Ola A. Selnes, Ph.D., a professor in the Division of Cognitive Neuroscience in the neurology department at the Johns Hopkins University School of Medicine.

The new results stand in contrast to the impact of heart-lung machines on so-called "pumphead" syndrome, the temporary memory loss, vision and slurred speech observed right after surgery in many heart bypass patients.

According to another of the study's investigators, William A.

Baumgartner, M.D., former cardiac surgeon in charge at The Johns Hopkins Hospital, the short-term syndrome led many surgeons and patients alike to assume that long-term losses must also be due to use of heart-lung machines, an assumption proven wrong by the latest evidence.

"Now we can assure these people that the disease, not the machine itself, is the cause of the problem," says Baumgartner, vice dean for clinical affairs and the Vincent L. Gott Professor in Cardiac Surgery at the Johns Hopkins University School of Medicine and its Heart and Vascular Institute.

Neurologists on the study team say the results highlight the need for further research into the long-term consequences of cardiovascular disease on the brain, and the brain's complex network of tiny blood vessels.

"Neuroscientists do not yet have good measures on heart disease and how the burden of this disease impacts brain function," says study senior investigator and neurologist Guy McKhann, M.D., a professor at Johns Hopkins, who next plans brain imaging studies to look at changes before and after heart bypass surgery to determine if there are any early, even predictive signs of cognitive problems, and if surgery could fix them.

McKhann notes that previous studies have found some 50 percent of patients awaiting heart bypass surgery already have some early indication of brain damage.

"If we can eventually figure out how heart disease and declines in brain function are linked over the long term, then it is feasible to think that we can diagnose problems earlier and, ultimately, intervene and prevent, or even lessen, these cognitive problems," says McKhann.

During heart bypass surgery, more formally known as coronary artery

bypass grafting, or CABG, blood vessels from other parts of the body are removed and re-attached to the heart to restore open blood flow when the natural blood supply becomes constrained from coronary arteries that are diseased and blocked. Patients often spend an hour or more connected to a heart-lung machine during the surgery.

Results of the new study, published in the August 2009 issue of *Annals of Thoracic Surgery*, showed no differences in brain impairment in those who had heart bypass surgery, including a group of 75 heart patients who had so-called off-pump bypass surgery, and another group of 99 heart patients who opted for drugs and arterial stents to keep their blood vessels open instead of bypass, with none requiring use of a heart-lung device.

But all 326 patients in the three groups were found to have experienced significant cognitive decline over the six-year study period on 16 different scores of verbal and visual memory when compared to 69 heart-healthy people who had no known risk factors for coronary artery disease.

The study, on heart patients from the Baltimore-Washington, D.C., region, is believed to be the first controlled study of its kind directly looking at the underlying causes of brain impairment, a phenomenon seen since the 1960s, when the CABG procedure was first introduced.

Adding to patients' fears was a 2001 report by researchers elsewhere, which found that 42 percent of heart bypass patients experienced some long-term cognitive impairment.

McKhann says CABG has "really evolved" along with heart disease treatment since the heart bypass machines and restorative procedure were first introduced, with procedure volumes peaking in the 1990s, but dropping afterwards, as physicians and patients began opting for less-

invasive procedures. According to the latest estimates from the American Heart Association, roughly 469,000 CABG procedures were performed in the United States in 2005 on some 261,000 patients.

He points out that the procedure remains in widespread practice as patients considered safe to have the CABG procedure are getting older and sicker. People as old as 80, he says, are now candidates for CABG.

"With these new data, patients can now more accurately and confidently weigh the risks and benefits of bypass surgery against off-pump surgery or even more conservative options," says McKhann.

All study participants underwent an hour-long series of cognitive tests five times and during regularly scheduled annual study visits. In one test of verbal memory, patients had to memorize 15 words in a specific order and within 30 minutes.
In another test of visual memory, patients had to trace on paper a complex diagram, which was then taken away, and then redraw the diagram from scratch.

Source: Johns Hopkins Medical Institutions