

# A RARE GLIMPSE THE SPY SYSTEM OFFERS CARDIAC PHYSICIANS AN EXTRAORDINARY OPPORTUNITY FOR AN OF-THE-MOMENT QUALITY CHECK

The better the quality assurance in the operating room, the better a patient's chances for recovery and survival.

Or so the theory goes.

Historically, an absence of a particular kind of diagnostic imaging technology has meant coronary bypass surgery couldn't see the theory through. Surgeons' inability to look at the quality of a graft in the OR is a significant omission, considering the revelations of studies on postoperative patency and angiography: of grafts that fail, a number do so while the patient is on the table.

Enter the SPY system, a made-in-Canada angiography device that has revolutionized how—and, most significantly, when—grafts are assessed. The SPY system, which Sunnybrook cardiac doctors have been using since 2001, allows doctors to do an angiogram without using x-rays or a toxic-to-kidneys contrast dye. Instead, indocyanine green (a green pigment) injected into the vascular system is fluoresced with the near-infrared laser light of an imaging head that can penetrate up to two millimetres of soft tissue, and also houses a tiny

video camera. The result is an image that surgeons can view on a computer screen at the end of a procedure, before the patient is sewn up, to gauge the graft's effectiveness. Graft problems it reveals—a stitch taken too deep, a vessel kinked off, a clot at the junction between two channels—can then be repaired in the OR. Its influence now extends to between 5% and 10% of the patients it monitors.

"It's real-time, real-life, clinically applicable research," enthuses Dr. Nimesh Desai, a research fellow and chief resident in cardiac surgery at Sunnybrook. "That's very gratifying, especially if you take a SPY angiogram of someone, find a problem and fix it right there. You've prevented a whole pile of grief in the long term."

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the same longevity as the internal thoracic artery without the surgical demands or attendant side effects.

Moreover, Fremes, who is a senior scientist at Sunnybrook Research Institute, had a personal interest in the subject. "Most surgeons have something they're known for," he says. "I had a reputation for being a very good coronary surgeon." He was troubled, though, by the coincidence of the risk of vein-graft disease and late cardiac events among the two-thirds of patients who die beyond the first one to 12 months following coronary surgery. "That's the scientific rationale for looking at other bypasses."

At the time of the study's launch, the radial artery was acknowledged for various intrinsic advantages, but was also suffering variable reports about whether its results could be characterized as excellent or mediocre. Ultimately, there was equipoise, meaning that the information relating to the question was balanced: there was no good evidence in favour or not of the radial artery.

Recruitment for the study took place between 1996 and 2001. It was a multicentre trial that spanned the country and included one international site. Results were published in *The New England Journal of Medicine* in 2004.

One year postoperatively, tests of the 561 participants revealed a significantly greater proportion of the radial arteries were functioning


better than the saphenous veins. What's more, the radials were 40% less likely to fail at one year.

The research also spoke convincingly of the link between radial patency—the state of being open and unblocked, and a key predictor of long-term survival—and the extent of disease within the target vessel. If a vessel had a 90% or higher obstruction, the radial artery would remain patent; if the obstruction was between 70% and 90%, patency declined. "That's something that surprised us," says Fremes.

All told, says Desai, who is a research fellow and chief cardiac surgery resident at Sunnybrook, "the results were very encouraging. They confirmed what we were doing in clinical practice, and will hopefully persuade others to look at that strategy, as well."

In practical terms, it means cardiac surgeons at Sunnybrook—and those throughout the world, particularly in Australia and Europe—are expanding their use of the radial artery on the strength of this evidence that it will eventually surpass the saphenous vein in effectiveness.

Up next for Fremes and Desai: a five-year examination of postoperative outcomes, along with studies that seek to understand why bypass grafts fail over the long term.

The drama continues. 

Fremes' and Desai's research was funded by the Canadian Institutes of Health Research.