

Pioneering Alberta cardiac surgeons walked into uncharted territory 40 years ago



Features

Chroniques

Richard Cairney

In Brief

WHEN DR. JOHN CALLAGHAN PERFORMED CANADA'S first successful open-heart surgery in Edmonton in 1956, the operation took 10 hours and the heart-lung pump he used looked like it had come from the shelves at Canadian Tire. Today the operation takes a couple of hours and the heart-lung pumps used cost \$150 000. This article discusses Callaghan's pioneering work, which was recently honoured by University Hospital in Edmonton.

En bref

QUAND, À EDMONTON EN 1956, LE DR JOHN CALLAGHAN RÉUSSIT pour la première fois au Canada une intervention chirurgicale à cœur ouvert, l'opération dura 10 heures et la pompe cœur-poumon utilisée à l'époque ressemblait à un assemblage de pièces achetées au Canadian Tire. De nos jours, l'intervention dure à peine deux heures, et la pompe cœur-poumon coûte 150 000 \$. Cet article parle du travail de pionnier du Dr Callaghan, récemment honoré par le University Hospital d'Edmonton.

When Dr. John Callaghan stepped into an operating room at the University of Alberta Hospital in Edmonton on Sept. 18, 1956, he never intended to make history. His plan was simply to save the life of 10-year-old Suzanne Beattie. However, Callaghan and his team accomplished both tasks by performing the first successful open-heart surgery in Canada.

When the hospital unveiled the J.C. Callaghan Cardiovascular Surgery Intensive Care Unit last September to honour his pioneering work, the opening marked the 40th anniversary of the procedure, the first in a series of significant milestones from the early days of cardiac surgery.

The operation performed on Beattie would be considered simple by today's standards, but in 1956 it pushed every one of surgery's boundaries. Using a modified distillery pump called the Lillihei-DeWall heart-lung pump, Callaghan and his team corrected their young patient's atrial septal defect.

The pump, which ran on a gravity-feed system, had almost as many parts as a car: nearly 40 tubes of differing diameters and lengths had to be sterilized and connected before an operation could begin. Callaghan hands credit for his team's success to 2 American surgeons, Walton Lillihei and Richard DeWall.

Following research trips to the University of

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Dr. John Callaghan: a pioneer who expanded the boundaries of cardiac surgery



Minnesota, Callaghan and his team decided to follow Lillihei's exact instructions. "Walt Lillihei had mentioned that almost everybody who came to visit him changed something and it didn't work," Callaghan recalls. "There were a lot of failures because a lot of people thought they were smarter than Walt Lillihei, but I knew fully that I wasn't, and we made sure there were no errors. That was the secret of our success."

Still, use of the Lillihei-DeWall pump could prove challenging. On more than one occasion oxygenated blood spilled from the pump, coating the operating room floor. During one procedure, the pump itself failed. Callaghan took on the role of mechanic while Dr. Les Willox finished the operation. Years later, a power failure knocked out a more advanced pump in the middle of a procedure. John Fortin, a member of the perfusion team, ran it manually for 80 long minutes, keeping the patient alive by applying brute strength. Such events make for riveting stories, says Callaghan, but the work itself was relatively simple.

Callaghan, who retired in June 1990, was lured to the

U of A Hospital photos



The Lillihei-DeWall heart-lung pump allowed surgeons to break new ground in cardiac surgery

University of Alberta by University Hospital's chief of surgery, Dr. Walter Mackenzie. He first made overtures during a 1950 conference in Boston, where Callaghan had unveiled some ground-breaking work.

Callaghan, who graduated from the University of Toronto in 1946, had been involved in research on the use of hypothermia in cardiac surgery with Dr. Wilfred Bigelow of the Banting Institute. Meanwhile, Mackenzie had helped him land postings, such as a fellowship in cardiac surgery at Guys Hospital in London, England, and at Stanford Medical Center in the US.

It wasn't surprising, then, that at the age of 32 Callaghan was able to perform an operation many considered miraculous. Although Suzanne Beattie underwent the first successful open-heart operation performed in Canada, she was actually the fourth patient Callaghan's team operated on. Just prior to beginning their work on Beattie the team lost 2 infants, but team members were confident about her case.

"We didn't have that 'I-hope-this-works' attitude," Callaghan recalls. "We planned to make it work and we just hoped the surgery part of it was not that difficult. It wasn't."

Experimental work on animals had helped the team learn to use the Lillihei-DeWall heart-lung pump properly and prepared Callaghan for the job ahead. "I had developed tremendous skills in the laboratory setting. We knew our system was going to work because with the animals we operated on, we were able to do it. We learned our skills on animals — they made a great contribution in the early days of heart surgery. None of us wanted to operate on them, but there was no way we could experiment on humans."



An operating room at the University of Alberta Hospital, circa late 1950s

Beattie, who grew up to become a nurse and now lives in Yellowknife, NWT, was the first in a long line of successes at University of Alberta Hospital. The first successful "blue baby" operation performed in Canada was completed in December 1956, while the first Canadian open-heart surgery performed to correct a complex form of tetralogy of Fallot was performed early in 1957.

By 1967, the hospital was performing 1000 open-heart operations annually. Callaghan says a study of the first 100 patients revealed the program's worst mortality rate, 25%. However, the figure was considered a staggering success at the time; many programs failed because their mortality rates were simply too high. "Ours were always acceptable," says Callaghan. "The team was always ambitious and innovative."

The program also takes credit for the first successful mitral prosthesis implant, completed in 1962. Today, the hospital is one of the nation's busiest transplant centres, the Lillihei-DeWall pump has been replaced by heart-lung pumps costing \$150 000 and the 10-hour operation Callaghan performed on Beattie takes a couple of hours. The fees surgeons earn are also considerably higher than what Callaghan earned for his 10 hours' work. The hospital's 3 operating rooms now may witness 25 open-heart procedures a week; Callaghan's team handled 1 a week.

Although many open-heart procedures are considered routine today, Dr. Arvind Koshal says there is still uncharted territory for pioneering surgeons to explore.

Koshal, the current director of cardiothoracic surgery, says advances

in cardiac care mean more referrals for the hospital. By mid-October, the waiting list for adult open-heart surgery had more than 200 names on it.

He considers patients in the end stages of heart disease his specialty's great challenges. "How can we increase the number of donors?" he asks. "We are working in our lab here to see if we can use pigs as suitable donors for humans. That idea is not as far-fetched as one would have believed a few years ago."

Today, he adds, the pioneering work is being done in the areas of genetic engineering and microbiology, suggesting the possibility that heart tissue may eventually be provided by a laboratory.

Koshal said today's surgeons still feel the frustration of losing patients, but the disappointments are much rarer than in Callaghan's pioneering days. "It must have been very frustrating. At the time it was a surprise if the patient survived. At that time, it was quite an achievement to touch the human heart — no one knew what might happen if you put a suture in it."

Koshal is pleased that a pioneer like Callaghan has been honoured for his work because "I certainly have benefited from it."

For his part, Callaghan, now 73, says the work being done today makes him dizzy, because even very basic procedures used to take 10 hours. "Today, when you look at what has been done and research that's going on, it makes my work look naïve," he said. "When I got involved, little or nothing had been done — no one had ever taken over the heart's action. I got the easy work . . . any work today to expand the perimeter takes a lot more effort." ?

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