Research Update

Light at the end of the catheter for heart-transplant patients

A new tissue-fluorescence technique could change the way biopsies are performed in adult heart-transplant patients. Vancouver's Biomax Technologies Inc. has developed an optical catheter that offers several advantages over the conventional endomyocardial biopsy technique, which removes up to 6 pieces of tissue from the right ventricle.

About 3000 heart transplants are carried out annually in North America. Patients undergo up to 18 endomyocardial biopsy procedures in the first year after transplantation to monitor potential organ rejection; there are some 62 000 of these biopsies each year, about 85% of which have normal results. The researchers say that the optical catheter technique could play an important role in avoiding a large number of the procedures, potentially cutting hospital costs. Endomyocardial biopsies can cause significant complications, including tissue scarring, puncturing of the heart wall, damage to the tricuspid valve and pneumothorax. There is also a risk of infection, mainly due to aggressive prophylactic treatment with immunosuppressant drugs following surgery. In fact, says Dr. David Morgan, the project manager for Biomax Technologies, "more patients die of infection than from transplant rejection."

The optical catheter has the advantage of being able to sample much larger areas of the heart in a single probe without removing tissue. "It makes the most sense in places where a biopsy is a bad idea," says Calum MacAulay, a director at Biomax.

The catheter is inserted through the tricuspid valve into the right ventricle. It produces a laser-generated blue light, which creates fluorescent light through the green and red wavelengths within the tissue. The light is analysed by a spectrometer and computer program, which generate a score indicating whether organ rejection is occurring.

The optical technique has been tested on rats and pigs. In those studies, characteristics in the spectra correlated with tissue rejection (*Circulation* 1999;100:1236-41). Because of the relative comparability of the pig's heart to the human organ, the researchers are hoping to find similar results when they begin human trials at St. Paul's Hospital in Vancouver. The human studies will compare the optical catheter technique with endomyocardial biopsies.

The company is applying for Health Canada approval and exploring Food and Drug Administration approval in the US. The optical catheter, which is designed for one-time use, is estimated to cost US$350 to $500. — *Heather Kent*, Vancouver

Scientists working on killer cure

Scientists at the Ontario Cancer Institute and Alberta's Cross Cancer Institute have found a way to use a toxin produced by the deadly *Escherichia coli* bacteria to purge cancer cells from bone marrow before transplantation.

Researchers are using a toxin called SLT-1 to clean blood cells by taking advantage of a receptor on the surface of the cancer cells that is recognized by the toxin. The toxin is removed from the blood cells prior to the reinfusion of stem cells into the patient.

Researchers say that although the toxin kills a broad range of cancer cells, particularly breast, lymphoma and multiple myeloma cells, it does not kill healthy blood stem cells. "There is a lot more work to be done to refine the technique and to ensure safety, but this could prove to be an important advance for myeloma patients and perhaps others," said Dr. Linda Pilarski, professor of oncology at the Cross Cancer Institute at the University of Alberta.

A group of researchers in Toronto led by Dr. Jean Gariépy originally pioneered the new technique while grappling with the failure of high-dose chemotherapy during stem cell transplantation, possibly caused by the reinfusion of contaminated tumour cells in the stem cell graft.

Dr. Andrew Belch, also an oncology professor at the Cross Cancer Institute, said a "clean" graft provided by the use of the toxin may help improve survival. "In studies using identical twin grafts, patient survival appears to be better than that when the patient's own cells are used for the graft, probably because the graft from the healthy twin is disease-free," said Belch. "We hope the toxin-based purging will provide a disease-free graft for the majority of patients who have no twin."

Results of the studies conducted by Belch and Pilarski were published in the Oct. 15 issue of *Blood*. — *Steve Wharry*, CMAJ