



DRS. ALBERT YEE AND HANS KREDER



REDUCING THE BURDEN

HOLLAND CENTRE RESEARCHERS WORK CLOSE TO THE BONE TO RESTORE QUALITY OF LIFE FOR PATIENTS

The woman lying on the operating room table is asleep, oblivious to the miracles about to unfold inside her body. They will be facilitated by a clutch of talented physicians who are bowed over her spotlight-lit hip bone intent on excavating the disease that poisons it. It is a display of surgical brilliance whose excellence is only partly tied to the way it seems to take place effortlessly. Musculoskeletal (MSK) research at Sunnybrook Research Institute (SRI) is on a path of progress, travelling along a network of avenues, each leading to new promise for a generation increasingly finding itself in need of MSK pioneers.

The raison d'être for the MSK research program at Sunnybrook's Holland Orthopaedic & Arthritic Centre, says Dr. Hans Kreder, Marvin Tile chair and chief of orthopaedic surgery, is to restore function and quality of life quickly to someone who has suffered sometimes-devastating injuries to the MSK system. Researchers at SRI focus on three groups of MSK problems: bone and soft tissue injury, arthritis and bone metastases. Superimposed over this are issues of access to care and an imperative to choose the least invasive option.

"We're approaching all of this," says Kreder, "by trying to understand the biology of these things, and make an impact in terms of interventions to understand the cellular mechanisms involved in these disease processes and hopefully improve primary and secondary prevention."

The first tool Kreder asks for in the OR is a pen. He uses it to draw an incision line along the front of the patient's hip and then traces the ink stroke with the blade of a scalpel. His actions are swift but precise. For Kreder and colleague Dr. Albert Yee, an associate scientist at SRI and surgeon-investigator, another day has just begun.

Demographics, says Kreder, are partly responsible for powering the activity of the research engine at the Holland Centre. An aging population means arthritis is increasingly prevalent. Moreover, better cancer treatment means patients are living longer and thus require more sophisticated care for their longer-lived, metastasis-ravaged bones. On top of that, the incidence of geriatric trauma is on the rise and more challenging for its

advancing onset of occurrence. "And it's patient demand," Kreder says. "Patients today demand to have a maximum quality of life until they drop dead."

Given this revised reality, Yee concerns himself with the beginnings of the biological continuum of orthopaedic care: people in their 20s and 30s whose bones, joints and tissues are suffering normal wear and tear. "A lot of what orthopaedic surgery does well is geared toward conditions in the end-stage," Yee says. "We really don't have a lot of good clinical therapies for treating this degenerative process early in the cascade."

For example, research on the spine shows that the earliest structural changes are not in the bone or facet joints (each vertebra is connected by two: one on each side of the spine) but in the intervening disc tissue between vertebrae. "There's less known about discal tissue and cells in the disc than is known about cartilage," says Yee, who spends his time in the lab studying the effects of abnormal loading of the disc.

To that end, much of his research considers the tissue-regenerative development of stem-cell-based materials that emulate a disc.

The surgeons focus their attention on the product of their incision. They take delivery of their instruments from their assistants with grace, receiving them in gloved hands, blade side down, and using them to work through the layers of tissue inside the patient's upper thigh. It is a lengthy process that plays out against an ironically upbeat soundtrack, courtesy of a crackling radio in the corner of the OR. They trade the lead back and forth, elegantly shifting surgical roles, always in pursuit of a common goal. At last, they reach their destination: the bone itself, awash in infected fluid. Now the real work begins.

One of the publications that has most recently sprung from the hospital showed that improving the system of care for hip fracture patients is essential. For each day a patient otherwise ready for surgery waits for treatment, the mortality rate climbs. Kreder points this out. "We need to build a system that gets patients to the operating room quicker."

Sunnybrook researchers have, over recent years, also shown that the least invasive surgery for wrist fractures leads to the best outcomes; that oft-prescribed blood thinners for patients with fractures below the knee are not as critical as they were once thought to be; that the highest risk of complications for hip and knee replacements is for patients operated on at a low-volume hospital; that collarbone fractures featuring completely displaced bones are better treated with surgery than a sling; that, depending on where you live, bone metastases surveillance varies wildly; and that there's a gender bias in terms of access to care for MSK patients, favouring men.

The surgeons are bent over the open wound. What they see inside it is something altogether different from what an inexperienced eye would see. Like trying to read a foreign language when you haven't got a clue. But the message for these doctors is clear, and they exchange few words as they set about deciphering it. They are thorough, and within 30 minutes they have entirely drained the bone of its toxin. For the patient whose body has been the subject of their careful ministrations during all of this time, the relief will be immediate.

At the end of the day, says Yee, the Holland MSK research program is committed to establishing a world-renowned centre of excellence in basic and clinical research discovery, health services research and policy development, and clinical care for musculoskeletal illness. Wherever possible, he says, prevention is the ideal, and excellent clinical care is the next best thing. Across the board, he says, orthopaedic surgery research at SRI aims to improve quality of life. "Through fostering emerging transdisciplinary research teams, our research efforts are integrally directed in research translation aimed at reducing the burden of illness in musculoskeletal conditions."

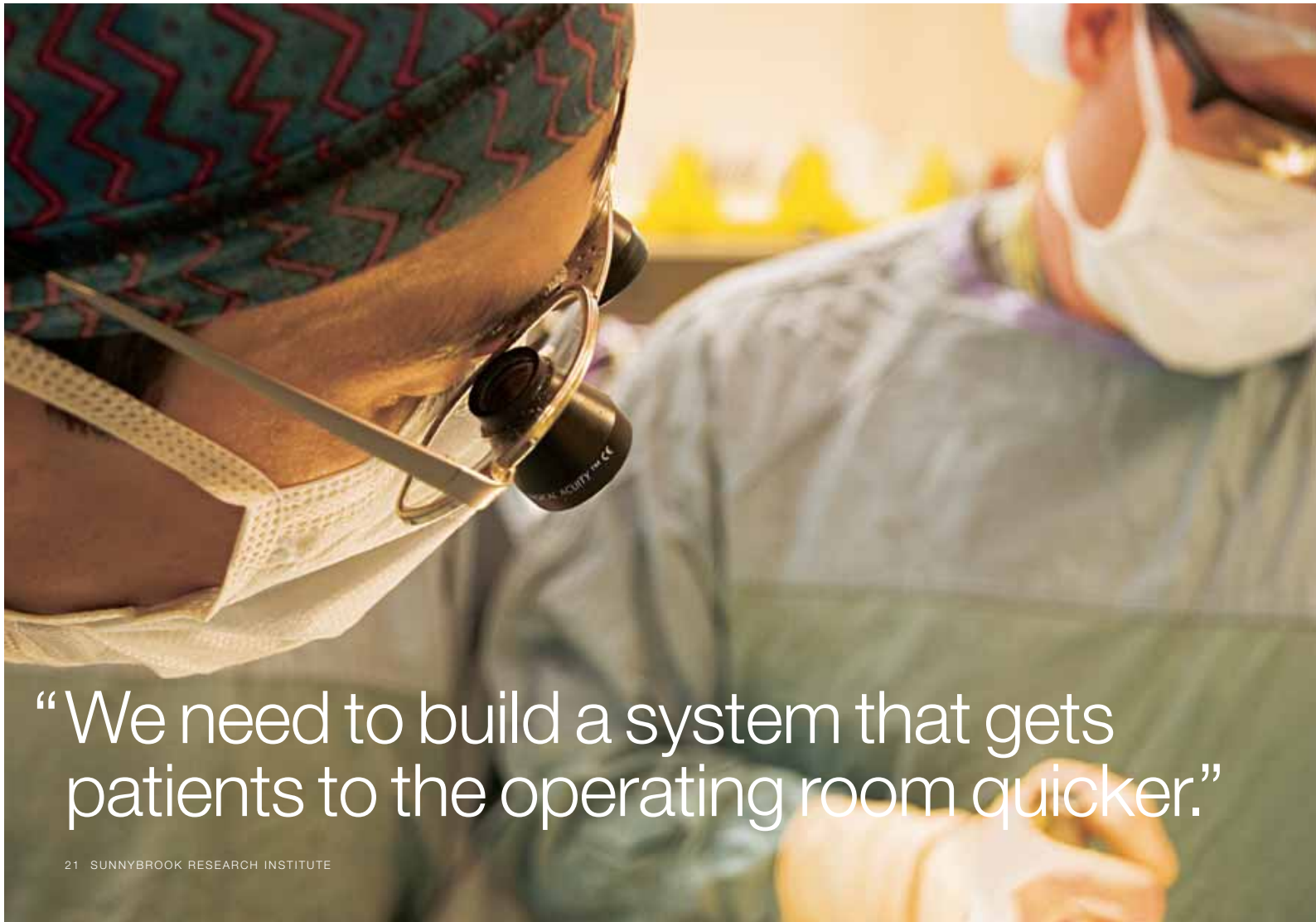
The patient will be revived shortly. All that remains is for her physicians to tuck into the pockets of her infected flesh 60 beads of polymethyl-methacrylate, a type of bone cement that will serve as a carrier for antibiotics that will leach into her system over the next two days. The tissue from the innermost depths of her hip closes in around the spheres, and then a surgeon completes the closure with gliding finesse and a length of nylon thread. The staples that seal the deal leave a neat row of 25 metal teeth crawling up her leg.

"It is done," says Yee, stepping away from the scene and allowing the patient to be awoken.

But of course he—and Kreder, too—know this not to be the case; they know it couldn't be for a long time yet. On the map of MSK research, there are still many roads to be travelled. **14**

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