Dr. Heather Baltzer works with patients like Michael Widdifield who live with chronic arthritis conditions.

Grasping the workings of the human hand

New clinical trial aims to focus on osteoarthritis of the small joints of the hand and wrist

Shannon Moneo

Osteoarthritis (OA) often strikes feet, knees, spines, hips and hands. When this cartilage-destroying condition targets hands, many times the hitchhiker's tool bears the brunt of the damage.

Exceptionally common and painful, OA of the thumb can become debilitating. This often-overlooked digit comprises 40 to 50 per cent of hand function. Yet, research into hand and thumb OA, as well as what can be done to improve the condition, has not been wide-ranging or abundant.

Scientists at the Krembil Research Institute are now conducting a clinical trial in which biomarkers are being collected from surgery patients for analysis. Biomarkers are measurable, organic substances whose presence can indicate disease, infection or environmental exposure. Learning more about biomarkers could help scientists find a control or a cure for OA.

Dr. Heather Baltzer, the Krembil clinician investigator leading the trial, says the research is needed because previous studies of hand OA have produced disparate conclusions.

What's known is that hand OA is more common in women, which could be attributable to changes in estrogen levels, and in those aged 65 and older, she says.

In other parts of the body, obesity is a known risk factor for OA because of extra strain on weight-bearing joints such as the hips and knees. But with the hands, there isn't the same impact from strain. So studying OA in the small joints of the hands may provide insight into other causes.

"This is really a good first step," says Dr. Baltzer, also a plastic surgeon who specializes in hand surgery at Toronto Western Hospital's Hand Program. She is specifically focusing on chronic conditions such as arthritis of small joints of the hand and wrist, acute trauma reconstruction (reattaching severed fingers) and reconstruction from cancer damage within the hand.

A cure for OA is not imminent and treatment is limited. "When we see patients early, we use steroid injections or use splinting," says Dr. Baltzer, a Nova Scotia native who did her undergraduate medical training and residency training in plastic surgery at the University of Toronto. She also completed one year of subspecialty fellowship training at the Mayo Clinic in Rochester, Minn.

Some people, says Dr. Baltzer, respond to steroid treatment, then stabilize and are able to function well. However, others receive no relief from anti-inflammatory drugs, so their hand or thumb OA becomes unbearable. Also, she points out, some hands or thumbs will display terrible OA damage in X-rays, but patients report no pain. She acknowledges that pain is subjective, and people tolerate it differently.

"But at a certain stage, there is pain all of the time. People wake up at night in pain," she says. That is when surgery is suggested.

For Michael Widdifield that was just the case. In October 2016, Michael, 59, was the recipient of Dr. Baltzer's expertise, when she and her team operated on his right hand. "I'm just so happy and very pleased with how the surgery went. I don't have chronic pain any more," says Michael, a retired Newmarket, Ont., resident.

Starting at age 17, Michael held construction jobs, wielding sledgehammers and manoeuvring small equipment, eventually becoming a tower crane operator. "I've had problems, like carpal tunnel syndrome, with my wrists since I was in my 20s," he says. "I've always had pain."

One day, about three years ago, he suddenly packed it in after the OA pain overwhelmed him. "I couldn't work any more. I climbed down from the crane, and that was my last day." Soon after, tests showed that not only were his hands and wrists full of OA, but also his whole body was plagued.

Taking up to seven heavy-duty painkillers per day, he asked his family physician to arrange wrist-replacement surgery. His doctor referred him to Dr. Baltzer, and their meeting was promising.

"She's been fantastic from day one," he says. "She was very confident. She knew what was wrong with me and told me she could fix it. And she treated me with a lot of respect and understanding."

Michael says his surgery involved the removal of bone at the base of the thumb, shaving another nearby bone, splitting tendons and then weaving the tendons between bones. Following the three-hour procedure, he wore a cast for six weeks. Michael is taking fewer painkillers and appreciating a life with diminished pain.

"I can't thank her enough for doing what she did," he says.

While Michael's OA could be attributed to his past occupations, Dr. Baltzer wants to better understand OA. "In end-stage OA patients, they're in so much pain," she says.

Her hope is that the biomarker study she and her team started in 2016 will lead to remedies that eliminate pain and restore function.

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Expected to finish the study by the end of the year, the clinical trial team plans to collect biomarkers from 10 to 15 patients who will undergo hand surgery for their thumb OA after steroids or splints failed to reduce pain. To date, the male and female patients have all been aged 50 and over, Dr. Baltzer says.

Biomarker material being collected includes synovial tissue, synovial fluid, blood, urine, cartilage and bone. The samples are frozen and stored in an arthritis biobank at Krembil.

Working with world-leading experts, including cartilage biologists and stem cell researchers, Dr. Baltzer says Krembil is "a really ideal venue to come up with answers."

While hundreds of biomarkers exist, approximately 50 that are more common in those with OA will be studied. They are also the elevated biomarkers in those with OA.

As the trial progresses, Dr. Baltzer wants to develop and refine the techniques used to acquire biomarker samples from patients. She will also be looking for patterns in those biomarkers that differ from the norm. The results will then be applied to develop the next level of research.

"I want to understand what could be a future target for treatment, and the difference between patients with pain and those without," she says. ■