

During the final hours of July 4, 2000, when the fireworks shows had run out of ammunition, 19-year-old Zachary Hinderyckx decided to pedal his way home on his bicycle.

It wasn't a quiet night; the Fourth of July rarely is. Neighborhood parties continued on into the night, but there wasn't a lot of traffic where Zak was going.

Spent sparklers and empty rockets lay silently among scorched cardboard cones and cutouts abandoned in the street. The last stretch to Zak's house was up hill. Pedaling strongly up the incline, Zak noticed sparks of a live firecracker dancing in the dark ahead of him. He carefully rode around it — strangely, not a soul was in sight. And then he heard an ear-shattering kaboom!

"I guess I was in shock because I blacked out after that and don't remember much," Zak says. His leg was badly injured; the pain made it impossible to walk. "Somehow I managed to crawl down the street to a house and I threw my bike helmet at the door."

The surprised occupants of the house called 9-1-1 and Zak was taken to University of Washington Medical Center's Emergency Department.

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Dr. Nancy Kadel



Dr. Peter Simonian

"Zak came to the ER with a large laceration on his knee that went down to the bone, exposing his joint," says **Dr. Nancy Kadel**, UW assistant professor of orthopaedics. "We could see a fracture of his joint surface on X-ray."

After thoroughly washing out the injury, the doctors found a piece of plastic from the firecracker embedded in his joint surface. There was also damage to the cartilage, along with a fracture and a 1-inch hole blown out of his femur just above the knee. The fracture was repaired and Dr. Kadel referred Zak to **Dr. Peter Simonian**, chief of the Sports Medicine Clinic at UW and an orthopaedic surgeon, to reconstruct his joint surface.

"In the case where the defect is small, cartilage and bone plugs can be taken from another area of the knee to help fill the defect," says Dr. Simonian. "But Zak's was too big for that." Another option was to take bone from his hip to fill the hole, then go back after that had healed and try to resurface the area with a cartilage transplant. "The best option that made the most sense was to use a size-matched cadaver transplantation of bone and cartilage for Zak," Dr. Simonian says, "and that's what we did."

After the transplant, Zak was in a brace for a month. He wasn't allowed to put any weight whatsoever on his left leg. When he would walk again was questionable. After that month, physical therapists worked with Zak. He spent hours in the pool "walking" in the water to build strength in his leg. "It was better than sitting on the couch getting depressed," Zak says.

Soon Zak was applying weight to his leg. By early September he was walking again. "It was the best feeling I've ever had," Zak says. "My goal had been to just walk. As soon as I could walk again, I was going to walk everywhere!"

Zak's remarkable recovery was due to exceptional medical care, his diligent approach to rehab, and the support of his family and friends.

He was even able to head back to Snoqualmie Pass where he taught snowboarding all winter long. "Once I realized where I could have been... I feel very lucky. Everything I do is fun.

At least I am alive." *(continued inside)*



Zak with his girlfriend, Nikki Gibbs.

Joint Replacement

Zak was too young to have been a candidate for a total replacement of his knee joint, but the option does exist for older patients. Prosthetic joints are made of metal or plastic, which restore smooth bearing surfaces. Hip replacements were invented by Dr. John Charnley, of Great Britain, over 40 years ago. Now, just about any joint can be replaced. The UW Department of Orthopaedics & Sports Medicine has active joint replacement programs for the knee, hip, and shoulder, elbow, wrist, ankle, and finger joints.

Dr. Jim Bruckner, UW associate professor of orthopaedics and sports medicine, says that joints are replaced for degenerative arthritis, rheumatoid arthritis, or trauma, among many reasons. UW researchers are hoping to discover why joints become arthritic and are studying the ultra-structure of cartilage and cartilage response to injury, he says. They're also looking for ways of preventing the destructive arthritis that leads to joint replacements and ways to induce the body's own stem cells to regenerate a new biological joint surface.



Dr. Jim Bruckner

The first hip replacement was made of highly polished metal and polyethylene, the same sort of plastic that food containers are now made of.

The Knee

There are 206 bones in the human body, and all but one of those bones meets with another at a joint. Ligaments hold bones together and tendons connect muscles to bone. The knee is a joint linking four bones: the femur (the large bone in the thigh), the tibia (the large bone in the lower leg), the fibula (the small bone in the lower leg), and the patella, or knee cap. On the side of each knee are two ligaments, the medial collateral ligament and the lateral collateral ligament. Inside the knee, between the femur and the tibia, is the posterior cruciate ligament at the back of the knee, and the anterior cruciate ligament in the front.

Cartilage covers the ends of the bones at the joints to absorb shock and provide an extremely smooth bearing surface to facilitate motion. In the knee, cartilage covers the ends of the femur, the top of the tibia, and the back of the patella. Of course there are other parts to a knee as well: the patellar tendon, quadriceps tendon, and quadriceps muscles, so when one part is injured, the entire knee function is compromised, as are the muscles supporting it.

That's what **Daniel Estep** quickly learned the night of his accident.

"It happened on a Friday evening. My buddies and I were going to celebrate our 40th birthdays, but we never made it out of the parking lot," Daniel says.



"I was standing nearby when my friend started his car without realizing it was in gear. His car lurched forward and pushed me into another car, trapping my right leg between the two bumpers. My other friend had to grab me to keep me from collapsing," Daniel says.

A large hematoma (collection of blood) formed on Daniel's leg as his friends drove him to the hospital. Throughout the weekend, Daniel hobbled around on crutches and painkillers. On a friend's recommendation, Monday morning Daniel went to UW Medical Center.

"I couldn't stretch my foot in any direction because the swelling in my leg was so great," Daniel says. "I underwent physical therapy (PT) at the UW Sports Medicine Clinic five days a week for five weeks to work out the hematoma before **Dr. Roger Larson**, UW associate professor of orthopaedics, could manipulate my knee enough to determine my ACL was suspect."



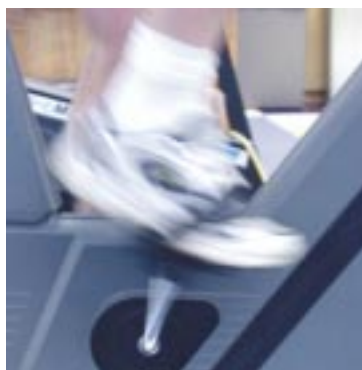
Dr. Roger Larson

An MRI showed that Daniel's anterior cruciate ligament (ACL) was damaged and would require surgery.

Daniel continued with PT three days a week for six weeks after his surgery.

Deb Lehtinen, Daniel's physical therapist, began therapy gently to protect the graft that repaired his ACL. "My goal was to get him on a bike as soon as possible," Lehtinen says, "and further down to the line, to get him up to a 20-minute workout at a good level."

Physical therapy began with an examination and a few measurements to see how his movements had increased. Lehtinen then used a hand-held ultrasound unit to warm up the deep tissues of Daniel's knee.



Other leg-strengthening exercises include tossing balls and rotations on the BAPS (biomechanical ankle platform system) board.

With the joint good and warm, Lehtinen performed a deep tissue massage to help break up scar tissue that invariably forms after surgery. Then Daniel headed to the bike.

All of the equipment in the Sports Medicine Clinic is meant to improve range of motion and build strength, Lehtinen says. After pedaling for 20 minutes, Dan would move on to a leg press machine to strengthen his quadriceps. He'd also do single leg balances, calf raises, one-legged squats and step up/step downs. Electric stimulation could also be used to "wake up" atrophied muscle—that is, muscle that has diminished from lack of use after surgery.

"The stronger Dan's leg muscles are the more supported his knee will be," Lehtinen says. "Exercise is very important, but you have to be careful not to overdo it."

The Spine

Limberness and flexibility, which come from regular stretching and exercise, are crucial to positive bone and joint health, says Dr. Jens Chapman, UW associate professor of orthopaedics and a surgeon who specializes in the spine.

The most important "bone" in the body is the spine, which is made up of hollow tubes called vertebrae, which hold us erect. "The spine reflects our modern times," Chapman says. "Wear and tear, metabolic issues, health care related issues, disorders, medicines that you take... all affect the spine," he says.

Patients can do a lot for themselves to stay healthy and to improve a problem situation, Chapman says.

"In general, surgery for back pain is probably over used, though for structural spine problems, early and well-performed surgical interventions on properly selected patients can be very helpful."



Cathie Bellipanni loves her job. As a transit operator for Metro since 1987, she says, "It's like seeing your friends every day." But in December 1994, her job started causing her a lot of pain in her back.

The driver's seat couldn't be adjusted forward enough for Cathie to reach the gas pedal and brake in a way that was healthy for her lower back. Her right hip was continually being pulled out of position, causing undo strain on her spine. "The doctors said I had herniated the L5 -S1 disk," she says. "To me it meant excruciating pain."

Sitting was the worst position for Cathie to be in. Thirty minutes was the most she could bear. "I tried every form of therapy I could think of," she says, "from massage, to rolfing, to chiropractic. The only thing I didn't try was acupuncture." Relief was short-term and Cathie began to lose hope.

"I started turning into a nutcase," she says. "I couldn't work and I started to get very depressed."

Along with the medications Cathie took for pain and inflammation, she soon added antidepressants.

"I worked light duty for Metro for a year and a half," she says, "and then received workman's compensation from Washington State for the

next two and a half years. My doctor wanted me to accept the fact that I'd never drive again, but I wasn't up for that and decided that maybe it was time to look at a surgical solution."

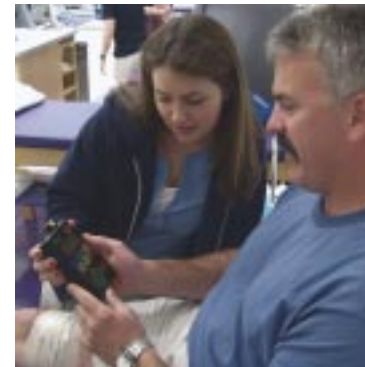
Cathie's doctor referred her to **Dr. Jens Chapman**, associate professor of orthopaedics at UW and an orthopaedic surgeon.

A minimally invasive intralumbar fusion was the answer to her problem. Going in through the abdomen, Dr. Chapman used tiny scopes to identify and remove the damaged disc before fusing a small titanium cage and bone pieces from her hip, replacing the damaged disc.

"I wore a corset for three months and did lots of pool therapy," Cathie says. "I was back to work in six months!"

Dr. Chapman hoped her recovery would reach 80 percent of normal. Cathie swears it's closer to 97 percent. "I had the surgery in 1998 and each year it's better and better."

Today, Cathie enjoys walking and stretching to keep her back healthy. She still drives for Metro, which has since purchased buses with ergonomically designed driver seats to help prevent such injuries in the future.



Vanessa Duque, UW physical therapy aid, shows Daniel Estep how to read the display of the electric stim device. "As an underground lineman for Seattle City Light, I'm on my feet all day," Daniel says. "It's hard on my knee. The physical therapy and stretching really helps." He has continued PT since the surgery, though he goes only once a week or less now.

The vertebra at the top of the spine allows the head to nod back and forward; the vertebra right below it allows the head to rotate from side to side.

Myth or Fact

Is caffeine bad for you? Caffeine is a diuretic. It washes out the minerals in your bones. FYI: Nutritional supplements are mostly unregulated by the Food and Drug Administration and may contain products that are diuretic in nature or contribute to osteoporosis.

Does milk really "do a body good?" Yes. An alternative to milk would be a calcium-rich diet. Calcium supplements alone are ineffective; 99 percent gets filtered out in the kidneys.

Posture and flexibility are crucial! Yes. Dr. Chapman has seen people with posture so bad that they exhibit contractions in their hips and pelvis and don't even know it.

Obesity is a form of malnutrition. Yes. Excessive trunkal obesity continuously compresses lumbar disks. Our collagen isn't made to handle such weight.



Dr. Jens Chapman