

Osteoarthritis: Off-loading devices offer alternative to surgery

By Andria Segedy

The aging of America dictates that knee osteoarthritis will increase in prevalence and incidence. This does not mean that replacing knees will keep surgeons busy day and night. In fact, it is estimated that only one in 10 patients is a candidate for surgery. The majority of knee OA sufferers will receive alternative therapies before—and in most cases instead of—arthroplasty or total knee replacement.

Practitioners agree that the operating room isn't for everyone. What they don't agree on is what to do for patients who are too young for surgery, have only mild to moderate symptoms, or just don't want to face the risks of surgery.

Mechanical knee bracing is entering its teen years, a seasoned modality compared to the newer alternative therapies such as intraarticular hyaluronic acid and neutraceuticals like oral chondroitin sulfate and glucosamine.^{1,2} Physical therapy, of course, is the granddaddy of treatments. Opinions on the effectiveness of each were presented in March at the nonoperative treatment of knee osteoarthritis symposium during the annual meeting of the American Academy of Orthopedic Surgeons.

More research focused on mechanical bracing is proving how effective unloading the knee can be in relieving pain and prolonging the natural life of the knee.³⁻⁶ And while an unloader mechanical brace might be cumbersome, it is noninvasive, chemical-free, and a practical alternative to surgery for people younger than 60 with unicompartamental disease.⁷

Fewer than 500,000 of the estimated five million people with knee osteoarthritis today are candidates for surgery this year, said symposium moderator Joseph Buckwalter, MD, professor and chairman of orthopedics at the University of Iowa Hospital in Iowa City. An average of 200,000 total knee replacement surgeries take place each year. Through the symposium, Buckwalter wanted to raise awareness of nonsurgical alternatives to the prescription of anti-inflammatory drugs and waiting until the pain can no longer be tolerated.

“I've been making an effort to increase awareness of the population of patients who don't need an operation but still are disabled by OA. There aren't many physicians who are very interested,” he said “They tend to give them arthritis medicine and tell them to come back when it's worse—or they don't do anything for them.”

Buckwalter feels there are a lot of treatment modalities in addition to surgery that can make a big difference in a person's life, even if they don't cure the disease or stop the progression.

"I think people came away from the symposium feeling that knee bracing definitely has a role, that it's probably going to be for patients who have relatively mild to moderate disease, not for patients with severe disease," he said.

Rheumatologist Kelly Krohn, MD, sees 75 to 100 patients a week with knee OA. He is an assistant professor of medicine and orthopedics at Oregon Health Sciences University and the Portland VA Medical Center.

"Traditionally doctors, particularly family doctors, internists, rheumatologists, have relied too heavily on pills. Pills have great value; I'm a big pill prescriber. But the nonpharmacologic therapies, including physical therapy and proper assistance devices like canes and walkers and knee braces, also have a great role," Krohn said.

Approximately 20% to 30% of his knee OA patients might be candidates for a mechanical brace, he said. He believes his prescription of mechanical braces is on target, particularly with patients who have single compartment OA.⁷ Patients' symptoms must be localized in the compartment that shows up on x-rays as being damaged, as osteoarthritic.

"If the x-rays show medial compartment disease, but their symptoms are in the lateral compartment, it doesn't make sense to give them a brace. Their symptoms have to match the x-ray," he said.

If a patient comes in a little bowlegged and he can get them to relax on the table while straightening the leg out manually, it is likely that a mechanical brace will do a similar job.

"The chances are better that they are going to benefit from it," he said. "Patient selection is really important. That's a clinical art that I've improved upon in the past three or four years with more and more experience."

Krohn has just completed a study of 42 patients in which he found between 30% and 35% less pain with a knee brace and 25% functional improvement using the Western Ontario McMaster University Osteoarthritis Index.

"The world's best ibuprofen pill gives you about 30% pain relief. So the improvement we saw with the brace is definitely in the ballpark of well-accepted therapies for knee osteoarthritis," he said. "In our study, the patients were already on ibuprofen, naproxen, or Tylenol. The improvement of 30% to 35% in pain relief is on top of traditional medical therapy. So that's enough if the guy is going for a walk on the beach and he wasn't before and he's taking fewer pills—that's victory."

The surgeons in Krohn's group have basically eliminated the high tibial osteotomy.

"We've made the decision that we can achieve a similar goal with an external brace and not put the patient through that surgery," he said. "There has not been a high tibial osteotomy in our VA hospital for about five years. We used to do 20 to 25 a year."

Opening Joint Space

Representing orthoses on the six-physician AAOS symposium panel was Douglas Dennis, MD, clinical director of the Rocky Mountain Musculoskeletal Research Laboratory and a professor at the Colorado School of Mines in Denver. Results of his recent study showed that braces cause the joint space to remain open so the compartment with the arthritis is relieved of load bearing. His study looked only at medial compartment osteoarthritis, which is the most common arthritic pattern in the OA patient.⁸

Applying forces externally through the brace to the underlying soft tissue and bone transfers the load, he explained.

"You are trying to rock the knee to a more valgus, or knocked-kneed, position from a varus, or bowlegged, position. We've used off-loading braces for years and there have been numerous anecdotal studies that show they do provide pain relief," he said. "What we wanted to look at in our lab was: Does the application of the brace actually separate the femoral condyle from the tibial condyle? Every one of the patients we studied had bone-on-bone narrowing of the medial compartment."

The analysis was done using video fluoroscopy instead of the snapshot results found with x-rays. Patients walked under the fluoroscopic surveillance device, testing at heel strike and at midstance of gait.

At heel strike, 78% of the patients demonstrated condylar separation after the brace was applied, he said. At midstance, it was 70%.

"In three out of four patients, 75% roughly, the application of the brace did provide condylar separation that we could see under fluoroscopy," Dennis said. "There was a good correlation of pain relief with condylar separation. If the brace actually did separate the medial femoral and tibial condyles, it was very good at providing pain relief. The other important factor we observed was that the brace did not work well in obese lower extremities."⁸

The reduced soft tissue girth of patients who are not obese allows more efficient transfer of the externally applied brace forces to the underlying femur and tibia, Dennis said.

"We were trying to apply forces that actually transmit directly to underlying bone. If you have a very large soft tissue envelope around that bone, a lot of the externally applied

forces of the brace are dissipated in the soft tissue and don't transmit to underlying bone. That is a key take-home message.”

Valgus Load

What correlations exist between the amount of unloading of the medial compartment that occurs versus the clinical outcomes is being researched by James Otis, PhD, research director at the Motion Analysis Laboratory of the Hospital for Special Surgery in New York City. The blinded study includes 75 patients.

“Some patients do well with the brace,” Otis said. “We’re trying to understand the reason for that. It may be the valgus load that is applied to the knee, or it might be an issue of proprioception, or the additional stability that is provided. In order to determine the role of valgus loading, we’ve taken the approach of instrumenting the brace so we know how much (load) is applied.”

One can’t always know how much load is applied to the knee from the amount of correction that is put in, according to Otis.

“Everybody’s knee is a little bit different. You can put in the same amount of correction across two knees and the loads would be different. We’ve taken this approach of measuring the brace load to allow us to estimate what the medial compartment force is when we consider the other loads on the knee that occur during gait. Along with this, we’re measuring the clinical outcomes of these people,” he said.

He has found no study that has looked at brace load.

“Studies have looked at gait and made inferences about how braces are performing. But it doesn’t allow you to isolate how much load is going to the knee and how much is going to the brace,” Otis said.

As an engineer, Otis does believe bracing is something that works.

“The success can be greater if we can better determine which patients will be successful with it,” he said.

The typical patient prescribed a brace by Dennis is younger than 60 and wants to remain athletic, is a laborer, and is, ideally, too young for total knee arthroplasty.

“Through the use of the brace, we can provide patients with relief of pain and allow them to continue to function for a longer period before a total knee arthroplasty,” Dennis said. “Take a patient who is 50 years of age. I can get him to use a brace and buy five or 10 years before we have to do the total knee replacement. That will certainly be a benefit to the patient. The ideal situation is to perform a total knee arthroplasty and have it last the

life of the patient. If you look at the survivorship data of total knee replacement, you are looking at better than 90% for 10 years, probably 80% at 15 years.”

Richard Coutts, MD, a professor at the University of California, San Diego, and medical director of orthopedics at Sharp Healthcare, ended the symposium with a critical review of the presentations. He asked the ultimate question regarding mechanical bracing: Does it help enough that an individual would be willing to use it for a lifetime, and would it work for that length of time?

“There are individuals so dead set against a surgical procedure that they’ll put up with it. But the braces have the disadvantage of being somewhat cumbersome. They are a little bit annoying to use. They are constantly requiring readjustment because they move. They can produce some discomfort of their own, particularly these unloader braces, because they require pressure on the knee in order to prevent deformity from occurring. It takes a special person to put up with that sort of thing on a long-term basis,” Coutts said.

Dennis himself wears an unloader brace for medial compartment OA.

“The effectiveness of the brace is going to be based on the topography of the limb and the compliance of the user,” he said. “A brace isn’t going to work unless you wear it. It is a relatively long, large brace. It’s not the most comfortable brace to wear. Some people just do not like to wear it, although we’ve proven in our laboratory that the brace will benefit the majority of patients with unicompartamental osteoarthritis of the knee.”

Surgery: The Last Resort

“There are a lot of good surgeries for torn cartilage, sometimes to get loose bodies out of there. Even just sometimes going in there and lavaging and removing that stuff might help,” Krohn said. “But before people do osteotomy procedures or total knee replacements, we should try an awful lot of things.”

Surgery is not risk free and not everybody will have a great outcome, Coutts added.

“When you talk about surgery, which truly is your ultimate last resort solution for these people, the worse off they are, the better your chances of making them better,” he said. “You don’t want to be operating on people who are moderately to mildly symptomatic. The trick is, how do you get them to that point (from mild to acute)? In some circumstances, maybe they will never reach that point if your other modalities are effective. You may save some people from a surgical procedure.”

Once they have a way of measuring how a brace can open up a joint, manufacturers can design better braces and better ways to use them, Buckwalter added. Not only might the number of people using braces increase because the prevalence of the disease is increasing, but use might increase because better braces are being made.

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