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Making a case for the artificial disk

By Peter Pollack

Is it an expensive fusion or a viable alternative?

As a principal investigator for the U.S. Food and Drug Administration's clinical trials on using spinal artificial disks in the treatment of degenerative disk disease, **Fabien D. Bitan, MD,** is well-qualified to discuss the issues surrounding disk replacement as an alternative to spinal fusion.

"It's probably the number one controversy in spine surgery today," he said. "Some people say that the artificial disk acts like a fusion, and really what we are doing is nothing but a very expensive fusion."

To counter that argument, Dr. Bitan pointed to the results of two studies that found an increased range of motion in flexion and lateral bending among patients with in vitro and in vivo artificial disks, as compared to the natural disk.

He also cited Gillet's 2003 study on 90 spinal fusion patients with a follow-up of 5 to 10 years. Junctional disease developed in approximately one third of patients who received fusion at one or two levels; it occurred in two thirds of those patients who had fusion at three or four levels.

"That's a real problem," he said, "but some detractors say it is just the natural progression of the degenerative disease."

Motion and height

Dr. Bitan said that the artificial disk should restore not only motion, but also disk space height, because changes in disk space height can lead to back pain and leg pain by compression of the root in the foramen. Other goals of artificial disk replacements include preserving motion segment flexibility, preventing disk failure at adjacent levels, reducing or eliminating radicular pain, and improving the functional activities of the patient.

"The artificial disk works," he said. "It seems to be safe, at least in biomechanical testing; the polyethylene wear levels are very low, and it restores motion. Unfortunately, it's not perfect. There's no rotation limit and no shock absorption at all, which is probably acceptable if only one level is being replaced. If two or three levels are affected, you're probably going to have some axial rigidity problems with risks of facets overload."

According to Dr. Bitan, attention to detail—particularly patient selection and proper positioning—is critical in artificial disk replacement procedures. Positioning requires that the patient is perfectly flat and that the pedicles are perfectly symmetrical from the midline. His indications and contraindications for surgery are shown in Table 1.

Multiple levels and complications

Concerning multiple levels of artificial disks, Dr. Bitan reviewed the results of his own study, which looked at 226 patients with a follow-up of 10 to 16 years. Three European surgeons were involved. Among patients who received an artificial disk at one level, 81 percent had excellent or good results. Among patients who received an artificial disk at two levels, however, only 56 percent had excellent or good results.

For that reason, Dr. Bitan said that a hybrid construct may be a viable alternative to a two-level artificial disk replacement. A hybrid construct may also be used if the patient already has had fusion surgery at one level, has spondylolisthesis at one level, or has severe facets abnormalities or concentric spinal stenosis at one level. Economic considerations may also indicate a hybrid.

Complications of using a spinal disk prosthesis include epidural venous hemorrhage, cerebrospinal fluid leakage, and occasional radicular pain. Rare but possible early complications include subsidence of one plate into bone or spongious hernia, fracture of the posterior corner, and subluxation. Long-term complications may include sympathectomy effect, major vessel injuries, pelvic phlebitis, sexual complications, and abdominal hernia.

"We may be entering a new era of spine surgery (Fig. 1)," said Dr. Bitan. "Obviously, conservative treatment should be offered first. But new upcoming technologies—such as nucleus replacement or cell injections—will electively apply to early stages of the disease. Pursuing conservative management too long may deprive the patient of surgery that would be much simpler."

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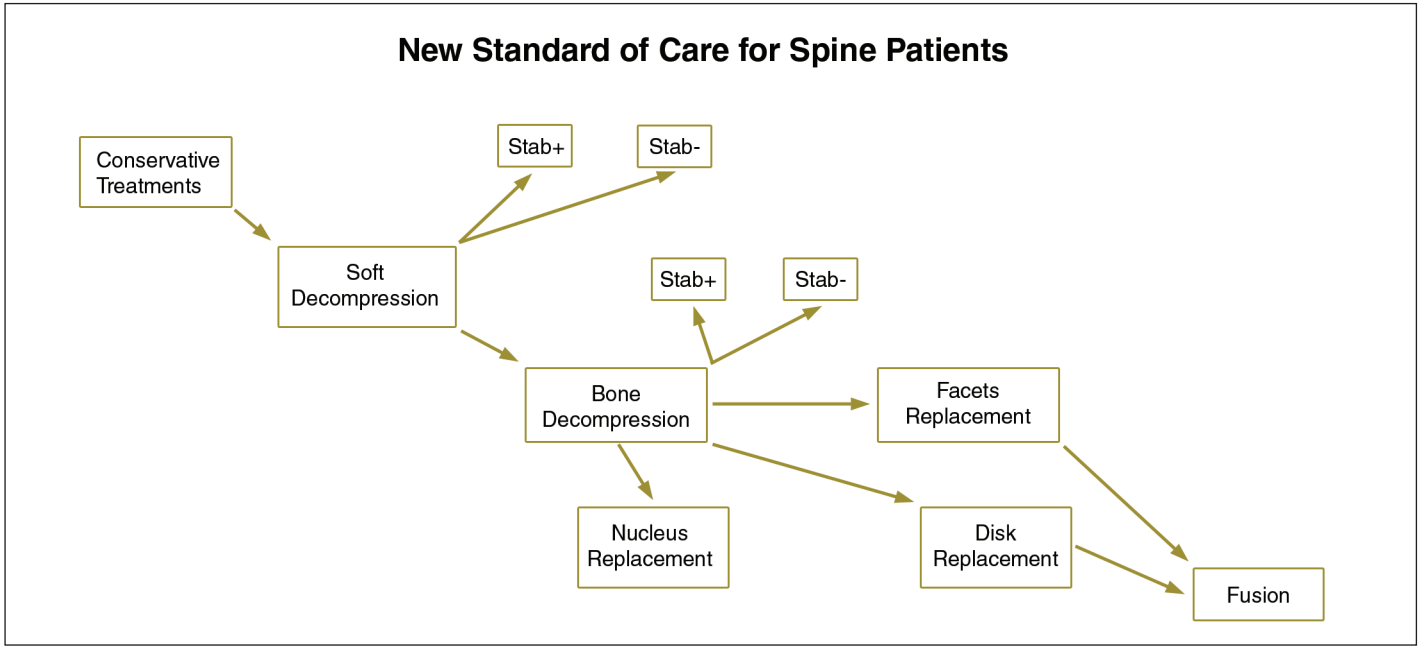

Figure 1 The treatment pattern for spine patients is changing with the development of new technologies.

Table 1 Indications and Contraindications for Artificial Disk Replacement

Indications:

- Young, motivated patients who have severe, chronic, diskogenic low back pain
- Patients whose diskograms show a good pain response
- Patients with computed tomography scans that indicate healthy facets
- Patients with recurrent hernias
- Patients who have degenerative disk disease at a level above an already fused disk (a staged hybrid construct)

Contraindications:

- Degenerative problems such as central stenosis, severe facet arthritis, and degenerative spondylolisthesis
- Previous back surgery, narrow disk, significant scar tissue around the root
- Lytic spondylolisthesis
- Scoliosis and kyphosis at the relevant level
- Osteoporosis, bone disease, and infection
- Obesity, anxiety, and vascular problems