ORIGINAL ARTICLE

Lumbar Interbody Fusion

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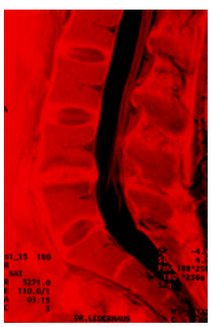
Lumbar interbody fusion (eg, fusing two lumbar vertebra together between the vertebral bodies) has been done for years. Initially, bone was packed in between the vertebral bodies after the disc had been removed. Occasionally (40-60%), a good fusion resulted. Due to ongoing movement of the spine and weight being transmitted through the vertebral bodies, the bone grafts would often reabsorb or the fusion would not be complete between the two bones. During the 80s cage devices were designed to be placed in the disc spaces to house the bone graft. A variety of interbody devices have been made in different shapes and materials, but each device services the same purpose. The FDA indications of lumbar interbody fusion are for treatment of chronic mechanical lower back pain. The fusion rates have been quoted above 90%. The FDA approved the devices for one or two levels to be used "stand alone" (e.g., without additional supplemental devices such as pedicel screws and rods). The clinical uses for interbody fusion devices remains the same, but off-label use has widened to include spondylolisthesis, recurrent disc herniations, massive disc herniations, degenerative subluxation with stenosis, and others. LDR Neurosurgery has performed approximately 700 cage devices since the end of 1996 when the cages were first FDA approved.

Picture 1

Chronic (e.g., over 6 months), mechanical (with motion) back pain is the primary indication for a lumbar interbody fusion device, as per the FDA backing (see photo #1 and #2). The ideal candidate is a patient under 60 years of age, non-diabetic, non-obese, non-smoker, who has had long-term back pain. The typical patient may have periods of severe back pain lasting a few weeks each year that may severely limit activity or become temporarily disabled each year when the back is "thrown out." They may notice a slow worsening of the pain each year and may severely restrict their physical activity and chose to live a sedentary lifestyle due to fear of bringing on the severe back pain. An MRI scan in these patients typically demonstrates severe disc degeneration. In the ideal patient one disc will be severely degenerative and disc collapse with reactive bone changes, and the rest of the lumbar discs being normal. Such patients have a very high likelihood of curing or significantly improving their back pain so that they may enjoy physical activities that they could not have performed. Similarly, these patients generally do not have to take days off work due to back pain issues once healed.

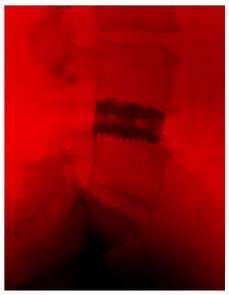
In patients who have severe back pain with more than one degenerative disc, the results are not as predictable or rewarding. MRI scans on these patients may demonstrate several discs that are dark (degenerative). Choosing which disc(s) to fuse becomes more challenging. Lumbar discograms (injecting contrast into the discs to elicit back pain) can be done, but the results of these tests are not particularly specific as such patients usually have moderate to severe pain on injection of several discs. Nevertheless, two-level procedures are fairly common, but the results are not as predictable and patients generally have some improvement in their pain, but these patients will usually have some degree of ongoing back pain issues eventhough they may have improved with surgery.



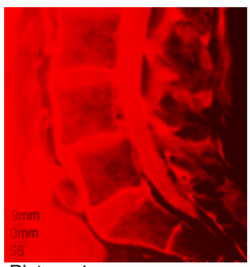
Picture 2

Congenital or degenerative spondylolisthesis patients with back and/or radicular leg symptoms do very well from fusion procedures. This can also be applied to degenerative subluxation with lumbar stenosis as well. Due to the subluxation, after the

cages are inserted into the disc spaces, supplemental stabilization needs to be done with pedicel screw and rod fixation at the level of the offset. If pedicel screws are not inserted then the spine is typically unstable and the vertebral bodies instrumented with cages alone have been reported to slip over implanted the cages. (See Photograph #3 and #4 for grade-one subluxation and photograph #5 and #6 for grade-two subluxation).


Picture 3

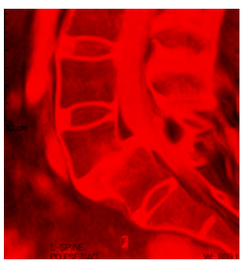
Recurrent disc herniation patients, should be fused with interbody fusion devices. The reasoning behind this is that with recurrent surgeries patients may undergo several surgeries at the same level. When this is done, many patients may develop a chronic pain cycle due to scar tissue. Multiple surgeries at the same level then can lead to chronic use and addiction to prescription pain medications, the use of lumbar morphine pumps, spinal cord stimulators, etc. Thus, to avoid such situations, we recommend a fusion operation with a recurrent lumbar disc herniations at the same level.


Picture 4

Massive disc herniations can be another indication for lumbar interbody fusions. These patients often require a bilateral discectomy and if the disc space is large, then removing a substantial amount of disc material will cause the disc space to collapse with a high chance of chronic back pain and/or further recurrent disc herniations. As with the recurrent disc herniation patients, these patients can avoid multiple surgeries at the same level for similar reasons.

Picture 5

Lateral disc herniations or significant foraminal stenosis with exiting root compression can also be an indication for a lumbar interbody fusion. The standard method of treating such patients would be to perform a complete facet joint removal. This can leave the spine unstable in up to 25% of the patients. Thus, a complete facet joint can be removed, the exiting nerve root is decompressed and the interbody fusion device then stabilizes the spine.


Picture 6


Picture 7

The use of interbody cages devices can be used in selected patients with simple disc herniations. This scenario might be the case of a fireman, or someone who does heavy lifting for a job, and who wishes to resume that same type of work after back surgery. If a standard discectomy were to be performed, then these patients would be limited in their lifting capacity and could no longer perform the heavy work they had done in the past. With the fusion devices, we have been able to get virtually all such patients, with few exceptions, back to the same line of work without restrictions in 4-6 months post op. Workman's compensation has found this very favorable as it saves then money on retraining, paying for disability status and long-term disabilities.

Non-indications for lumbar interbody fusion. Contraindications to a fusion operation are patients with any ongoing infection and intravenous drug addiction. High risk cases for fusion are patients who may be obese, diabetic, hypertensive, elderly, osteoporotic or smoking patients. Patients who have had a prior complete laminectomy cannot be fused with the interbody cage via a posterior approach, but may be a candidate for an anterior fusion at either the L4/5 and/or L5/S1 level. Anterior fusion cannot be done above the L4/5 level due to the aorta and inferior vena cava.

In the near future, the FDA is expected to approve artificial lumbar discs (see photograph #7) for use at one or two levels to be inserted only anteriorly. The advantages include no fusion with ongoing mobility of the joint, and a quicker return to activity (even heavy activity). The downside of this procedure may be the longevity of such a device which is currently not known. Replacement of such devices would be very difficult, if not impossible, due to scar tissue over the disc spaces with a high risk for injury to the great abdominal blood vessels. In the next few years, it is also anticipated that similar artificial discs may be used in the cervical spine for treatment of herniated cervical discs and neck pain.