

## SPINE CAGES: A NEW SOLUTION OR A NEW PACKAGE OF OLD PROBLEMS?

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### I. Definitions

- A. Cage – Metallic device that is inserted between two vertebrae to promote a bony fusion in place of an intervertebral disc.
- B. PLIF – “Posterior Lumbar Interbody Fusion” – Placing bone (or a cage) between the vertebral bodies in the disc space to promote a bony fusion from the back.
- C. ALIF – “Anterior Lumbar Interbody Fusion” – Placing bone (or a cage) from the front between the vertebral bodies in the disc space to promote a bony fusion.
- D. Discogram – Injecting a disc with saline or radioopaque dye to see if the injection reproduces the patient’s pain and shows degeneration within the substance of the disc itself.
- E. Fusion – A BIOLOGICAL PROCESS that stimulates a bony bridge between vertebrae that otherwise would be moving by virtue of the intervertebral disc and facet joints.

### II. Indications for a spine fusion

- A. Instability – Most commonly this is seen in severe spine fractures (“burst fractures”) or a spondylolisthesis that requires decompression for radiculopathy.
- B. Progressive deformity with or without associated spinal stenosis.
- C. Controversial:
  - 1. Discogram provoked painful disc.
  - 2. MRI or X-ray evidence of degeneration (Fusions for degenerative conditions of the spine are known to increase the stresses on the adjacent non-fused vertebral motion segments, hastening their degeneration)

### III. Current techniques for spine fusion (with no internal fixation)

- A. Posterolateral onlay graft (using autograft, patient’s own bone)
  - 1. Advantages – Long term studies available, allows neural decompression to be addressed at the time of surgery. Generally successful for non painful conditions like scoliosis.
  - 2. Disadvantages – Fusion mass takes months to mature, requires relatively large dissection of paraspinal muscles and potential for bone graft donor site morbidity
- B. ALIF (using allograft (donor banked bone) or autograft)
  - 1. Advantages – Doesn’t violate back muscles, puts bone graft under compression. Use of allograft eliminates graft site morbidity but fusion rate lower.
  - 2. Disadvantages – Grafts can collapse, retrograde ejaculation in 2% males.
- C. PLIF (using allograft or autograft)
  - 1. Advantages – Neural decompression can be done
  - 2. Disadvantages – Retraction of nerves or thecal sac can cause neurologic injury.
- D. Combination of A.+ B. or A.+ C.

### IV. Current techniques for spine fusion using internal fixation.

- A. Pedicle screw fixation. Uses screws into the vertebral pedicle to firmly hold the vertebra. These screws are then linked together by rods or plates.
- B. Hook fixation. Uses hooks attached to the laminae to hold the vertebrae. Not as rigid as pedicle screws. Hooks are then linked to rods.

- V. Theoretical advantages of cages:
- A. Allows immediate rigid fixation between the vertebral bodies
  - B. Puts bone graft under compression, where it heals best.
  - C. ALIF does not violate the back muscles.
  - D. Does not allow collapse of disc space.
- VI. Theoretical disadvantages of cages:
- A. Same as ALIF or PLIF surgical approaches.
  - B. No long term studies available on potential for late failure of fusion (late osteolysis around the threaded titanium implant HAS been a problem with acetabular screw in cups for total hip arthroplasty)
  - C. No long term studies on how osteoporosis of vertebral bodies (one of the first areas of our skeleton to manifest osteoporosis) will affect cages' ability to remain in correct position.
- VII. Current literature on the OUTCOMES of fusions. (THE BOTTOM LINE)
- A. Lumbar fusions performed on patients under Worker's Comp:
    1. Franklin, et al. Spine 17; 1994 "Outcome of Lumbar Fusion in Washington State Worker's Compensation" – Results: 68% patients remained work disabled, 23% required further lumbar spine surgery. The use of instrumentation doubled the risk of re-operation. 68% of patients stated that their back or leg pain was worse, 62% of patients said they would undergo the surgery again. (This study was performed by epidemiologists, NOT surgeons)
    2. Kuslich, et al. Spine 11: 1998 "The Bagby and Kuslich Method of Lumbar Interbody Fusion. History, Techniques, and 2 year follow-up results of a U.S. prospective, multicenter trial." Results: 91% fusion rate, pain reduced or eliminated in 84%, function improved in 91%. Complication rate was low. Worker's comp cases comprised 57% of cases. At one year post-op, 53% had returned to work, 88% at two years post-op. The authors caution:
      - a. Patients were carefully selected. Patients with inappropriate illness behavior avoided.
      - b. Surgeons in the study had high level of skill.
      - c. Only one or two level disease from L2 and below were eligible.
      - d. Compensation-related chronic back pain was carefully screened.
      - e. Very long term results remain unknown.
- VIII. Conclusions:
- A. The INDICATIONS for fusion remain the most important factor in determining outcome.
  - B. Patients with inappropriate illness behavior, compensation issues, or a perception of disability that exceeds objective findings will not do well with most any intervention.
  - C. We still do not know why a degenerative disc found on X-ray or an MRI may or may not be painful to an individual.
  - D. We do not have any longitudinal studies telling us about the natural history of discrometrically provoked pain, of disc degeneration (recent MRI studies suggest it is impossible to predict degeneration and symptoms in the lumbar spine)
- IX. My indications for lumbar spine fusion
- A. Spondylolisthesis (isthmic or degenerative types) when operated on for RADICULOPATHY
  - B. Severe, single level disc degeneration in a patient with over a year of mechanical back pain,(the more I do the worse it hurts) NO inappropriate illness behavior or compensation issues that make functional restoration questioned. (In other words, no patients who say, "Thanks for the fusion, Doc, I feel better, would do the surgery over again, but I simply cannot go back to work.")