Lumbar interbody fusion

Lumbar interbody fusion is a common treatment for a variety of spinal pathologies.

The influence of interbody cage positioning on clinical outcomes following lumbar interbody fusion is not well understood, though it has been hypothesized that insufficient mechanical loading of the interbody graft can prevent proper fusion of the joint.

Lumbar interbody cages placed from an anterior or lateral approach are desirable due to their large size, providing a stable fusion environment. Posterior implants are typically limited by their access corridor. Expandable footprint TLIF interbodies may allow for a minimally invasive TLIF approach with the biomechanical benefits of an ALIF-sized graft; however this requires experimental investigation [1)].

see Endoscopic lumbar interbody fusion

Types

The main surgical techniques used are:

Posterior lumbar fusion (PLF)

Anterior lumbar interbody fusion (ALIF).

Posterior lumbar interbody fusion (PLIF)

Lateral lumbar interbody fusion (LLIF)

Oblique lumbar interbody fusion (OLIF)

Oblique lateral lumbar interbody fusion OLLIF

Extreme lateral lumbar interbody fusion (XLIF)

Posterior

Posterior lumbar interbody fusion(PLIF)

Transforaminal lumbar interbody fusion(TLIF)

Extraforaminal lumbar interbody fusion (ELIF)

Anterior

Anterior lumbar interbody fusion (ALIF)

Endoscopic assisted anterior lumbar interbody fusion (ALIF)

Axial lumbar interbody fusion (Ax-LIF)

Lateral

Lateral lumbar interbody fusion (LLIF)

Extreme Lateral lumbar interbody fusión (XLIF).

Complications

In elderly patients with severe osteoporosis, instrumented lumbar interbody fusion may result in fixation failure or nonunion because of decreased pedicle screw pullout strength or increased interbody graft subsidence risk. Thus, given its many advantages, percutaneous pedicle screw fixation with cement augmentation can be an effective method to use in elderly patients.

Outcome

The aim of a study was to determine if patients with lumbar intervertebral disc disease who achieve radiographic fusion after single-level lumbar interbody fusion have better clinical outcomes than patients with radiographic pseudarthrosis at 12 and 24 months postoperative.

Individual patient-level data of 4 randomized controlled trials (RCTs) were obtained from the Yale University Open Data Access Project project and analyzed. Clinical outcomes (Oswestry Disability Index [ODI]; Numeric Rating Scales [NRSs] for back and leg pain) were compared between patients with radiographically confirmed fusion and those with radiographic nonunion 1 and 2 years postoperative. The results of each study were first analyzed separately, and then were pooled by metaanalysis. The GRADE approach was applied to evaluate the level of evidence.

A total of 496 patients with clinical and radiographic data at 1- and 2-year follow-ups were identified. Of these, 5.5% (95% confidence interval: 3.7; 8.3) had radiographic nonunion which did not require reoperation. Patients with fusion had better improvements in ODI ($P<0.001$) and NRS back pain scores ($P<0.001$). The overall percentage of fused patients with ODI and NRS back pain scores that exceeded the criteria for minimal clinically important differences was also significantly higher than that of patients with nonunion (ODI, odds ratio [OR] = 2.7, $P=0.019$; NRS back pain, OR = 3.5, $P=0.033$). The predictive values of fusion for clinical outcomes, however, were poor, with low specificity and low negative predictive values.

The presence of radiographic fusion is clinically significant, as patients with fusion had better clinical outcomes at 1 and 2 years postoperative than those with nonunion; however, patient-centered clinical outcomes should also be taken into consideration as independent, complimentary variables when assessing treatment success [2)].

Bone Remodeling in Lumbar Interbody Fusion

Bone Remodeling in Lumbar Interbody Fusion

Case series

From January 2007 to December 2019, 141 adult patients who underwent multilevel interbody fusion for Lumbar Degenerative Disc Diseases were enrolled. Regarding the approach, patients were divided into the ALIF (n=23), OLIF (n=60), and TLIF (n=58) groups. Outcomes, including local radiographic parameters and global sagittal alignment, were then compared between the treatment groups.

Results: Regarding local radiographic parameters, ALIF and OLIF were superior to TLIF in terms of the change in the anterior disc height (7.6 ± 4.5 mm vs. 6.9 ± 3.2 mm vs. 4.7 ± 2.9 mm, p=0.000), disc angle (-10.0° ± 6.3° vs. -9.2° ± 5.2° vs. -5.1° ± 5.1°, p=0.000), and fused segment lordosis (-14.5° ± 11.3° vs. -13.8° ± 7.5° vs. -7.4° ± 9.1°, p=0.000). However, regarding global sagittal alignment, postoperative lumbar lordosis (-42.5° ± 9.6° vs. -44.4° ± 11.6° vs. -40.6° ± 12.3°, p=0.210), pelvic incidence-lumbar lordosis mismatch (7.9° ± 11.3° vs. 6.7° ± 11.6° vs. 11.5° ± 13.0°, p=0.089), and the sagittal vertical axis (24.3 ± 28.5 mm vs. 24.5 ± 34.0 mm vs. 25.2 ± 36.6 mm, p=0.990) did not differ between the groups.

Although the anterior approaches were superior in terms of local radiographic parameters, TLIF achieved adequate global sagittal alignment, comparable to the anterior approaches [3].

1)
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2)
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3)
Yoon J, Choi HY, Jo DJ. Comparison of Outcomes of Multi-level Anterior, Oblique, Transforaminal Lumbar Interbody Fusion Surgery : Impact on Global Sagittal Alignment. J Korean Neurosurg Soc. 2022 Aug 23. doi: 10.3340/jkns.2022.0112. Epub ahead of print. PMID: 35996945.