

Outcome of single level instrumented posterior lumbar interbody fusion.

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Abstract: Lumbar Interbody fusion surgery has been considered to be a treatment of choice for instability in lumbar degenerative disc disease⁽¹⁾. A posterior lumbar interbody fusion (PLIF) has the advantages of spinal canal decompression, anterior column reconstruction, and reduction of the sagittal slips from a single posterior approach⁽²⁾. The PLIF using cage with iliac crest bone grafting and posterior pedicle screw construct is still a standard practice. Many studies state one two levels fusion in all such cases.

This is a prospective cohort study of 50 consecutive patients, who underwent single level instrumented PLIF surgery. The average follow-up was 26 months. The indications for the surgery were as follows: 24 patients had disc herniations, with back pain of instability type, normal disc height on radiology. 16 patients had grade 1 spondylolisthesis, with significant back pain and translational instability on radiography. Five patients were redo spine surgeries, and Five patients had healed spondylodiscitis with significant back pain and instability. All patients were regularly followed up and decision of spinal fusion or no fusion was taken at 2 years using modified criteria of Lee⁽³⁾.

Results by this method were satisfactory and comparable with other studies published. single level instrumented PLIF can be used as a means of spinal fusion in patients . This has got a good fusion rate.

Key words: Posterior Lumbar Interbody fusion, Interbody cage, Iliac crest bone graft.

I. Introduction:

Interbody fusion surgery has been considered by many to be a treatment of choice for instability in lumbar degenerative disc disease⁽¹⁾. This is especially true with advent of pedicle screws for spinal fusion. A posterior lumbar interbody fusion (PLIF) has the advantages of spinal canal decompression, anterior column reconstruction, decompression of foraminal stenosis, and reduction of the sagittal slips from a single posterior approach. The double level PLIF using cage has been a standard practice^(2,3). However, there are many studies now with single level PLIF using cage and iliac crest bone grafting with comparable results and lesser complications.

With time there has also been an evolution in the type and techniques in bone grafting in the spinal fusion. Since the introduction of the PLIF procedure by Ralph Cloward, iliac crest has been considered as an appropriate source of bone graft, in terms of quality and quantity.

We present radiologic results of spinal fusion in patients with single-level instrumented PLIF with cage and iliac crest bone grafting.

II. Materials And Methods:

It is a prospective cohort study of 50 consecutive patients (34 males and 16 females), with an average age of 41.44 years (ranging from 21-62 years), who underwent single level instrumented PLIF surgery. The average follow-up period was 26 months (ranging from 12 to 55 months). All patients, with single level instrumented PLIF surgery, were included in the study. After discectomy the endplates were cleared of the cartilage. The cage was placed in the disc space and filled with iliac crest bone grafting. The bone graft was impacted well using a bone graft impactor. The screw rod assembly was tightened and held in compression. Before wound closure, any free bone graft fragment pressing on neurological structures was removed.

Of total, 29 patients had the pathology at the L4-L5 level, and 21 patients had pathology at the L5-S1 level. The indications for surgery included, spinal instability due to the following pathologies. Of these, there were 24 patients who had disc herniations (02 were recurrent discs) with back pain of the instability type, normal disc height, and spinal instability on radiology. Sixteen patients had significant back pain and grade 1 translational instability on radiography (three were degenerative spondylolisthesis), five cases were redo spine surgeries who underwent spinal fusion for instability following previous surgery and five patients had healed spondylodiscitis (one was healed TB) with severe back pain of instability type as an etiology for PLIF.

All patients were mobilized out of bed on their second or third postoperative day depending on pain compliance. Bending, sitting squatting, and lifting weights were allowed at 3 months. All these patients were

followed up at regular intervals, three monthly for the first 6 months, followed by at 6 months in the first year and then yearly. Decision of fusion or no fusion was taken at 2 years following surgery. At each follow-up, all patients were assessed for spinal fusion by an independent observer using modified criteria of Lee *et al.*

III. Results:

Of total 50 patients, there were 34 males and 16 females, with a mean age of 41.44 years (range 21-62 years). Thirty-six patients presented with radicular leg pain and 14 patients had low back pain as significant complaint, which failed to conservative treatment required surgical fusion. Modified Lee's radiological criteria were used to assess the spinal fusion. There were 26 patients with definitive fusion, 21 patients with possible fusion, 3 patients with possible pseudoarthrosis, and no patient with definitive pseudoarthrosis.

At 2 years follow-up, the average loss of disc height was only 3 mm in eight patients. In 10 patients with grade 1 spondylolisthesis, central decompression and root canal stenosis release were attempted; however, we did not aim reduction of the slip and correction of the slip angle. Of these, three patients at last follow-up had a localized kyphosis of more than 3° at the fusion level. The mean time for fusion to occur was 16 months. There was no patient with the pedicle screw loosening and implant failure in this series.

Six patients presented with preoperative neurologic deficits (MRC grade 4/5, $n=04$, 3/5 $n=2$). Stainless steel variable screw placement (VSP) plates and screws were used in six patients for spinal instrumentation. In remaining patients, standard poly axial 6 mm pedicle screws of various brands were used for spinal instrumentation. The average blood loss was 350 ml (range 200-750 ml). The average operating time was 155 min (range 90-250 min).

IV. Discussion:

The concept of using cages for in ter body fusion evolved with the aim of restoring disc height in situations of collapsed degenerated discs and to afford immediate anterior load sharing construct without the morbidity of iliac crest site bone grafts⁽⁴⁾.

Using bone graft with cage is more stable. Tricortical iliac crest graft has the comparative quality of a cage in terms of restoring disc height and affording instant anterior column support⁽⁵⁾. The fusion rates achieved with iliac crest bone is as high as 90-100%.

The Iliac crest bone graft and cage provide immediate anterior column support. However, in the presence of pedicle screws, the fixation becomes a fairly rigid construct⁽⁶⁾. Given the current strength of the metals used in manufacturing pedicle screws, fatigue-related screw breakage is unlikely to occur within the first year in single level PLIF. This time seems to be usually adequate for spinal fusion to occur.

This is especially true in this technique, where there is ample quantity of healthy corticocancellous autograft is in contact with large bone graft bed⁽⁷⁾. This fact is exemplified in our series where we had no implant failures. Of course, one may want to be cautious in using this technique in cases with overt three column segmental instability like fractures or high grade/dysplastic listhesis. Restoration of disc height is the key⁽⁸⁾. This can, however, be easily achieved in most cases using the pedicle screws to maneuver the disc space as appropriate. A proper surgical technique with adequate discectomy and optimum lateral and facet release would contribute greatly to restoring the best possible disc height⁽⁹⁾. In our series, the average loss of disc height, over a 2-year follow-up, was only 3 mm in 8 patients, further justifying this argument.

V. Conclusion:

The best indications for this procedure would be (1) Primary fusion for degenerated discs with instability, where there is usually a disc height loss. (2) The more demanding indications would naturally be spondylolisthesis where anterior load sharing and disc height restoration are more significant issues. (3) Cost effective method for Indian scenario.

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