ABSTRACT

Purpose. To compare early outcome of transforaminal lumbar interbody fusion (TLIF) for lytic versus degenerative spondylolisthesis.

Methods. 14 women and 8 men aged 20 to 60 (mean, 36) years underwent TLIF for lytic (n=15) or degenerative (n=7) spondylolisthesis. Of the 15 patients with lytic spondylolisthesis, 9 involved L4/L5 and 6 L5/S1. Of the 7 patients with degenerative spondylolisthesis, 3 involved L4/L5, 2 L5/S1, one L2/L3, and one L3/L4. The spondylolistheses were classified as grade II (n=15), grade III (n=4), and retrolisthesis (n=3). 11 patients with lytic and 2 with degenerative spondylolisthesis had sensory deficits (n=12), motor deficits (n=9), and diminished reflexes (n=7). Visual analogue score (VAS) for pain and the Oswestry Disability Index (ODI) of each patient were assessed at months 3, 6, and 12, and 6 monthly thereafter. Fusion status was assessed by radiologists. Comprehensive outcome of each patient was graded as excellent, good, fair, or poor.

Results. The mean VAS score for low back pain improved significantly from 7.4 preoperatively to 2.1 at year 1 (p<0.001), as did the mean VAS score for leg pain from 6.7 to 1.4 (p<0.001) and the mean ODI from 67.8% to 11.8% (p<0.001). No patient had any residual neurological deficit, and all achieved radiological fusion. The comprehensive outcome was excellent in 16 patients, good in 5, and fair in one. 16 patients returned to their previous level of activity.

Conclusion. TLIF is a safe and effective surgical procedure for the treatment of lytic and degenerative spondylolisthesis.

Key words: lumbar vertebrae; spondylolisthesis

INTRODUCTION

Spondylolisthesis entails a forward shift of the spinal column,\(^1\) characterised by severe instability secondary to a failure of the 3-column support. Reconstruction of the altered supporting structures is necessary.\(^2\) About 50% of such patients have lytic defects in the pars interarticularis, whereas 25% have degenerative...
changes in which the facet and disc translate forward secondary to intersegmental instability. Surgery is indicated to prevent further progression of the slip, relieve back and leg pain, reverse neurological deficit, and stabilise the segment. Fusion of the posterior lumbar elements combined with instrumentation achieves spinal fusion in up to 95% of cases.

Posterolateral fusion is considered the gold standard of treatment for adults with spondylolisthesis. Transforaminal lumbar interbody fusion (TLIF) is an alternative to posterior lumbar interbody fusion (PLIF). The interbody space is accessed through the far lateral portion of the vertebral foramen and necessitates less dissection and minimises nerve root manipulation. It minimises the risks of neural injury and postoperative instability and enables the placement of the grafts within the anterior or middle of the disc space to restore the lumbar lordosis. The additional surface of the contralateral lamina and spinous process enhances fusion. Additional use of posterior lumbar pedicle screw instrumentation is the standard for reconstruction. We compared early outcome of TLIF for lytic versus degenerative spondylolisthesis in 22 patients.

**Materials and Methods**

Between July 2008 and June 2011, 14 women and 8 men aged 20 to 60 (mean, 36) years underwent TLIF for lytic (n=15) or degenerative (n=7) spondylolisthesis in different private hospitals in Dhaka. Patients were excluded if they had spondylolisthesis of higher than grade III, a history of spondylodiscitis, or were medically unfit. Of the 15 patients with lytic spondylolisthesis, 9 involved L4/L5 and 6 L5/S1. Of the 7 patients with degenerative spondylolisthesis, 3 involved L4/L5, 2 L5/S1, one L2/L3, and one L3/L4. The spondylolistheses were classified as grade II (n=15), grade III (n=4), and retrolisthesis (n=3). 11 of the patients with lytic and 2 with degenerative spondylolisthesis had sensory deficits (n=12), motor deficits (n=9), and diminished reflexes (n=7).

Radiographs and magnetic resonance images of the spine were obtained to assess instability and delineate any intraspinal neurological condition (Fig.). Visual analogue score (VAS) for pain and the Oswestry Disability Index (ODI) of each patient were assessed at months 3, 6, and 12, and 6 monthly thereafter. Fusion status was assessed by radiologists. Computed tomography was performed when radiological fusion was doubted or deemed not achieved. Comprehensive outcome of each patient was graded using the Macnab criteria as excellent (full recovery of symptoms and no restriction of occupational or daily activities), good (residual or occasional symptoms but able to continue normal activities), fair (partial recovery of symptoms, difficulty or inability to work), or poor (no recovery or worsening of symptoms).

Mean values of each parameter were compared using the paired t test. Overall outcome was compared using the Chi squared test. A p value of <0.05 was considered statistically significant.

**Operative Procedure**

A posterior midline incision was made and advanced with subperiosteal muscular dissection. The facet joints were identified and the defect in the pars was dissected in cases of lytic listhesis. A unilateral laminotomy and partial facetectomy were performed on the affected side. Pedicle screws were placed. The disc space was then gradually distracted using the pedicle screws and rods with distractors. The intervertebral space was identified, and incision was made over the posterolateral portion of the annulus. Discectomy was performed and the hyaline cartilage of endplates was carefully removed using a box currette to protect the thecal sac and nerve roots.
After endplate preparation, the morcelised bone grafts from the excised spinous process and parts of the laminae were then introduced to the anterior part of the disc space and impacted with an L-shaped special impactor. A template was inserted to determine the size of the interbody cage. An interbody cage of appropriate size packed with bone grafts was then placed, while the dura was protected with a small retractor. A banana-shaped device was used to cover the disc space. After the grafts were placed within the interbody space, pedicle screws were attached to a lordotic rod and carefully tightened to restore the lumbar lordosis (Fig.). The exiting nerve roots were decompressed and the traversing roots were checked for any residual compression. Laminae and the remaining contralateral facet joint were decorticated, and packed with local autologous grafts. The lateral intertransverse area was also packed with grafts to achieve lateral fusion.

RESULTS

The mean operating time was 195 minutes and the mean blood loss was 370 ml. The mean length of hospital stay was 8.5 days. Patients were followed up for at least one year. The mean VAS score for low back pain improved significantly from 7.4 preoperatively to 2.1 at year 1 (p<0.001), as did the mean VAS score for leg pain from 6.7 to 1.4 (p<0.001) and the mean ODI from 67.8% to 11.8% (p<0.001) [Table]. Improvements in each follow-up at 3, 6, and 12 months for both the lytic and degenerative groups were also significant (p<0.001, Table). However, between the lytic and degenerative groups, the improvements in the mean VAS scores for both low back pain and leg pain were significantly more in the lytic group in the first 3 months (p<0.05), and the mean ODI was significantly better in the lytic group at one year (p<0.05).

No patient had any residual neurological deficit, and all achieved radiological fusion (although in 3 it was delayed). Respectively in the lytic and degenerative groups, the comprehensive outcome was excellent in 11 and 5 patients, good in 3 and 2, and fair in one and zero. 16 patients (11 from the lytic group and 5 from the degenerative group) returned to their previous level of activity; 14 of whom were housewives. One patient developed a superficial wound infection.

DISCUSSION

PLIF for spondylolisthesis enables neural decompression, stabilisation of the deranged motion segment, reconstruction of the disc height, and restoration of the sagittal plane translation and rotational alignment. Nonetheless, there is a risk of neural damage during retraction manoeuvres and damage to the cauda in higher levels. Unilateral TLIF with pedicle fixation is a variation of PLIF that requires less dissection and minimises nerve root manipulation, compared with other interbody fusion methods. In a series of 22 patients undergoing TLIF, 20 had good-to-excellent outcomes with minimal complications. In another study of 30 patients (33 levels) who underwent unilateral TLIF using a single cage for multi-level, low-grade, lytic spondylolisthesis, 20 of the levels were at L4/L5. 90% of these patients achieved excellent-to-good results, and 91% achieved fusion. One patient endured a superficial wound infection and another had transient postoperative paraesthesia. In a study comparing PLIF with TLIF for lytic listhesis, the mean VAS score for pain improved from 7.2 to 2.8. In another study of TLIF for 30 patients with spondylolisthesis, the VAS score for low back pain decreased from 7.0 to 2.1 and that for leg pain decreased from 6.4 to 2.0, whereas the ODI decreased.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Lytic spondylolisthesis (n=15)</th>
<th>Degenerative spondylolisthesis (n=7)</th>
<th>Overall (n=22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS score for low back pain</td>
<td>7.5±0.6</td>
<td>3.1±0.7</td>
<td>2.5±0.3</td>
</tr>
<tr>
<td>VAS score for leg pain</td>
<td>6.9±1.0</td>
<td>2.9±0.6</td>
<td>1.7±0.6</td>
</tr>
<tr>
<td>ODI</td>
<td>69.3±4.6</td>
<td>29.3±4.2</td>
<td>21.1±3.3</td>
</tr>
</tbody>
</table>
from 69.3% to 11.8%. Of these patients, 73% and 27% achieved excellent and good results, respectively, whereas 6.6% developed postoperative radiculitis and 3.3% had implant loosening. In another study of 40 patients undergoing a unilateral portal TLIF using 2 cages, 85% achieved good-to-excellent clinical results, and 90% achieved radiological fusion.

Our study was limited by the short follow-up period and small sample size. Long-term studies examining sagittal lordosis of a fused segment, disc height reduction, and adjacent segment degeneration are needed.

REFERENCES


