ABSTRACT

The aims of spinal tuberculosis treatment are to eradicate the disease, to prevent the development of paraplegia and kyphotic deformity, to manage the existing deformity and neurological deficit, to allow early ambulation and to return the patient back to daily life. Methods for the treatment of tuberculosis of vertebra are still controversial. Conservative treatment includes medical therapy as well as external supports and surgery is indicated for deformity of spine, severe pain, or neurological compromise conditions. Most cases in our country were late presentations with disc space already infected, and after débridement there was a large gap needing bone graft to enhance bony fusion and anterior column support. Although the spine was infected, instrumentation posed no additional hazard in terms of tuberculous discitis. Oga et al. reported that M. tuberculosis has low adhesion capability and forms only a few microcolonies surrounded by a biofilm. Moon et al. stated that interbody fusion performed with classical anterior radical surgery per se was ineffective in the correction of kyphosis and did not prevent the increase in kyphosis angle. The present study focuses on collected clinical and radiographic outcomes in ten patients who underwent Posterior Lumbar Interbody Fusion (PLIF) for tuberculous lumbosacral spine. All the cases had instability with kyphotic deformity or loss of lordosis. Clinical outcomes were measured by Visual Analogue Scale (VAS), modified MacNab Criteria, and radiographic outcomes (segmental kyphotic angle and total lumbar lordotic, TLL, angle) on follow-up to six months. The mean VAS back scores showed decrease, and kyphotic angles and lordotic angles improved. Three cases had excellent results, six good and one fair using the modified MacNab criteria.

Key Words:
Spinal tuberculosis, Posterior Lumbar Interbody Fusion, Visual Analogue Scale, MacNab criteria

INTRODUCTION

The treatment of tuberculosis of the spine (Pott's disease) is essentially conservative and a vast majority of patients can be successfully managed on anti-tuberculous therapy (ATT) alone1. Surgery is indicated in a few specific cases where deformity of spine, pain, or neurological compromise become a serious issue. The most important route of dissemination of TB to the spine is haematogenous2. Spinal TB usually develops insidiously, and there is thus a gap of several months between onset of symptoms and appropriate medical attention.

Spinal TB patients present with various signs and symptoms which may include back or leg pain, kyphotic deformity, palpable mass in the paraspinal region, and neurological compromise. The two most important sequelae of TB spine are kyphotic deformity and neurological compromise. Neurological deficits occur due to the kyphotic deformity, spinal abscess and/or granulation tissue compressing the spinal cord or cauda equina. Most cases in our country presented late, and the disc space was already infected. After débridement there was large defect which needed bone rafting to enhance bony fusion and anterior column support.

Those patients whose neurological deficit was progressing despite adequate ATT would benefit from anterolateral spinal cord decompression and instrumentation. In these patients, the histological diagnosis also needed to be established beyond doubt. Kyphotic deformity, either progressive or established, is a major indication for surgical intervention2. Furthermore, kyphotic deformity, particularly with pseudoarthrosis, can be a source of significant pain in the patient.

Kyphosis is however unusual in lumbar spine where there is a tendency for telescoping of collapsed vertebral bodies. Although the spine is infected, instrumentation poses no additional hazard in terms of tuberculous discitis. In selected patients, early operative treatment with instrumentation, when indicated, combined with chemotherapy, minimizes neurological deterioration and spinal deformity. Intractable pain is mainly due to presence of epidural mass compressing the theca and nerve roots, along with spinal instability. Both can be dealt with effectively by débridement, decompression and spinal instrumentation2.
MATERIALS AND METHODS

This is a prospective study of clinical and radiographic outcomes in ten patients who underwent Posterior Lumbar Interbody Fusion (PLIF) for tuberculous spine. All cases operated between June 2013 and Jan 2014 were assessed with radiography, MRI and laboratory parameters before operation. All the cases had instability with kyphotic deformity or loss of lordosis. Clinical outcomes measured included Visual Analogue Scale (VAS), modified MacNab criteria at six months, neurological status and radiographic outcomes (segmental kyphotic angle and total lumbar lordotic, TLL, angle) only up to six months. To continue follow-up on cases in this study, cases will be continued follow-up to 12 months and finally check with CT imaging for status of fusion.

Patients were positioned in prone position for posterior exposure. Bilateral pedicle screws were inserted at one upper and lower segment from the lesion level, and another single screw was inserted at one affected level. Rods were placed without correcting the existing kyphosis for temporary fixation. Abscess was drained after removing the lamina and infected single facet joint. Sequestered bone fragments and infected disc were removed until good cancellous bone was seen, the rods were removed and contoured to correct the kyphotic deformity, a titanium mesh filled with cancellous chip allograft in affected site. With an appropriate contour obtained, rods were placed and locked. Patients were mobilized with thoracolumbar extension brace up to 12 weeks after surgery.

RESULTS

The affected vertebrae in four cases were at L2/3 level, two at L3/4, three at L4/5 and one at L5/S1. There were equal number of male and female patients, with average age of 36.1 years (range, 19-54 years) (Table I). Mean operative time was 129.4 minutes. All cases were transfused with only one unit of blood during surgery; we could not assess exact amount of blood loss.

<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Sex</th>
<th>Reg;No.</th>
<th>Operation Date</th>
<th>Level</th>
<th>Bone Graft (Bg)</th>
<th>Titanium Mesh+Bg</th>
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<tr>
<td>1</td>
<td>23</td>
<td>F</td>
<td>1906</td>
<td>30.5.13</td>
<td>L3,4</td>
<td>+</td>
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<tr>
<td>2</td>
<td>47</td>
<td>F</td>
<td>1645</td>
<td>15.5.13</td>
<td>L5,51</td>
<td>+</td>
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</tr>
<tr>
<td>3</td>
<td>24</td>
<td>M</td>
<td>1088</td>
<td>25.5.13</td>
<td>L2,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>53</td>
<td>M</td>
<td>2139</td>
<td>17.6.13</td>
<td>L3,4</td>
<td>+</td>
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</tr>
<tr>
<td>5</td>
<td>42</td>
<td>M</td>
<td>2245</td>
<td>24.6.13</td>
<td>L4,5</td>
<td>+</td>
<td></td>
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<tr>
<td>6</td>
<td>54</td>
<td>F</td>
<td>2431</td>
<td>8.7.13</td>
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<tr>
<td>7</td>
<td>37</td>
<td>M</td>
<td>3955</td>
<td>28.10.13</td>
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<tr>
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<td>33</td>
<td>F</td>
<td>4798</td>
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<td>F</td>
<td>1098</td>
<td>3.14</td>
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</tr>
</tbody>
</table>

Initial pain scores in patient-reported questionnaires (VAS back) showed fast and lasting pain relief and improvement in daily activities. Mean VAS back scores decreased from 6.7 to 2.85 at three week follow-up. After three months, mean VAS back scores decreased to 1.24, and after six months the mean VAS back scores decreased to 0.5. Mean segmental kyphotic angle was reduced from 23.5 to 0 degree after operations, it was maintained up to six months and mean total lumbar lordotic angle improved from 23.9 to 41.5. At three months, the mean value was 40 with no change at six months. These coronal plane angles did not change much up to 6 months follow up but we need long term follow up to further comment on this study, in addition to establish the status of fusion in all the cases.

There were no intra-operative complications. The bleeding during operation was much more in obese patients though not measured. 1 case had post-operative superficial infection but no organism was cultured and it healed well by 6 weeks after wound débridement and dressing. Neurological examinations revealed numbness at L5 dermatome in two patients and one with one patient numbness at S1 dermatome area. All recovered at three months.

Modified MacNab criteria was used to evaluate the clinical results after six months of surgery. Overall, three cases had excellent results six good and one fair.

DISCUSSION

The goals of spinal tuberculosis treatment are to eradicate the disease, to prevent the development of paraplegia and kyphotic deformity, to manage the existing deformity and neurological deficit, to allow early ambulation and to return the patient back to daily life. Methods for the treatment of tuberculosis of vertebra are still controversial. Chemotherapy is a very effective way of controlling and treating the disease and is an indispensable treatment strategy. Conservative treatment includes medical therapy as well as external supports such as bed rest and/or full body plaster immobilization or body braces. Conservative management is indicated for mild to moderate form of the
Tuberculous Lumbosacral Spine

Fig. 1: Radiograph showing kyphotic angle and total lumbar lordotic angle measurements.

Fig. 2: Radiographs and MRI of patient with tuberculous infection of spine L2/3 (kyphotic angle 20, TLL angle 23).

Fig. 3: Post-op. radiograph at 3 weeks (kyphotic angle 0, TLL angle 30).
Fig. 4: Post-op radiograph showing correction at 3 months (kyphotic angle 0/TLL angle 30).

Fig. 5: Post-op. radiograph at 6 months (kyphotic angle 0/TLL angle 30).

Fig. 6: Radiographs of tuberculous spine L2/3/ (kyphotic angle 40, TLL angle 0).

Fig. 7: Post-op radiograph at 3 weeks (kyphotic angle 0/TLL angle 34).

Fig. 8: Post-op radiograph at 3 months (kyphotic angle 0/TLL angle 34).
Tuberculous Lumbar Spine Disease if there is no marked abscess formation, spinal deformity and collapse or neurological deficit and vertebral instability. Anterior debridement and arthrodesis allow access to the focal point of the disease directly, effective debridement of the focal point, rapid bony union with the grafts and prevent progressive collapse and kyphosis.

However, it has been reported that such successful outcomes are not observed in progressive collapse and kyphosis, particularly in two or more levels of involvement, risks of graft insufficiency and increasing kyphotic deformity. Moon et al. stated that interbody fusion performed with classical anterior radical surgery per se is ineffective in the correction of kyphosis. Moon suggests that in addition to its failure in some cases to correct the existing kyphosis, anterior arthrodesis does not prevent the increase in kyphosis angle. Rajasekaran et al. also reported progression in kyphosis particularly in anterior arthrodesis at two or more levels and recommended additional stabilization methods.

Studies have shown that implants can be safely used in tuberculosis infections. In their study on stainless steel, Oga et al. reported that M. tuberculosis has low adhesion capability and forms only a few microcolonies surrounded by a biofilm. Benli et al., Yılmaz et al. and Jin et al. showed that anterior implant can be safely used in tuberculous spondylitis. In the literature, there are many studies showing that in addition to anterior debridement and arthrodesis, anterior or posterior stabilization is an effective method for correcting the existing kyphosis and maintaining the correction achieved.

![Fig. 9: Post-op radiograph — at;6 months (kyphotic angle 0/TLL angle 34).](image)

![Fig. 10: Modified MacNab Criteria at 6 months follow-up.](image)

![Fig. 11: Mean VAS back scores.](image)

![Fig. 12: Mean segmental kyphotic angle.](image)

![Fig. 13: Mean total lumbar lordosis angle.](image)
It is clear that posterior instrumentation is more effective in kyphosis correction and prevention of late-term progression especially in kyphosis with two or more levels of involvement or in moderate or severe kyphosis. In this study, mean VAS back scores significantly decreased at three months. After six months, mean VAS back scores decreased to 0.5, because of satisfactory stabilization and clearance of infection. Mean segmental kyphotic angle was reduced from 23.5 to 0.0 degree after operations, and it was maintained up to 6 months. Effective correction of kyphosis is very important for long-term mechanical stability and total sagittal balance, as correction of kyphosis shortens the lever arm and reduces the stress over the affected spine. In addition, it maximizes the total contact surface area of adjacent vertebra which further promotes union and stability.

Mean total lumbar lordotic angle improved from 23.9 to 41.5, at three months mean value was 40 and remained so at six months. These sagittal plane angles were not much changed up to 6 months follow-up, but we need long-term follow-up to further comment, and to establish the status of fusion for all cases.

There were some weak points in this study, as we were unable to subject the results to statistical analysis because of the limited number of cases. We are collecting further cases to continue with this study. Even though modified MacNab criteria was used to evaluate, it only reflects patient satisfaction and some clinical results without scoring for functional outcome.

CONCLUSION

Radical debridement and reconstruction using posterior instrumentation is an acceptable surgical option for the treatment of lumbar-sacral spinal TB. It is clear that posterior instrumentation is more effective in kyphosis correction especially in kyphosis with two or more levels of involvement or in moderate or severe kyphosis, because it provides maximum contact surface to promote solid bony fusion, good clinical outcomes as well as improvement of mechanical function. The need for long-term follow-up is important to add further value to this study.

REFERENCES

Tuberculous Lumbosacral Spine


