ORIGINAL ARTICLE

The Improvement in Kyphotic Angle after Anterior Decompression and Cage Placement in Tuberculosis of Thoraco-lumbar Spine

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ABSTRACT

Background: *Musculoskeletal Tuberculosis is a rare form of TB comprising only 3% of all Tuberculosis patients. The commonest and most dangerous form of Tuberculosis, Spinal Tuberculosis accounts for 50% of all cases of musculoskeletal Tuberculosis. The anterior decompression with cage alone without added instrumentation with bone graft is cost effective as compared to added instrumentation in patients of third world countries.*

Objective: *To determine the improvement in terms of mean change in postoperative kyphotic angle after anterior decompression and cage placement with bone graft in tuberculosis of Thoraco-lumbar spine.*

Materials and Methods: *The Quasi Experimental study was conducted in the Department of Orthopaedics and Spine of Ghurki Trust Teaching Hospital, Lahore from 1st May 2014 to 31st Apr 2016.60 patients who qualify the inclusion criteria were included. All patients underwent anterior decompression and placement of Inter body Titanium Mesh Cage with packed bone graft. Pre, Post-operative and follow-up lateral view x-rays were taken to check and record the post operative change in kyphotic angle as well as loss in follow up. All the patients were followed for at least 1 year. Boston brace was applied for at least 6 months. Data was analyzed using SPSS 17.0*

Results: *There were 38 (63.3%) males and 22 (36.7%) females. The patients aged between 15 – 30 years were 32 (53.3%), those between aged 31 – 45 years were 15 (25%) and between 46 – 60 years there were 13 (21.7%). There were 10 (16.6%) patients with 0 – 10 degree improvement, 36 (60%) patients with 11 – 20 degree improvement and 14 (23.4%) patients with 21 – 30 degree improvement. Paired t-test result for change in angle is p = 0.000 which is statistically significant.*

Conclusion: *Anterior decompression with Standalone Titanium mesh cage and bone graft in patients suffering from caries spine showed immediate post operative improvement in kyphotic angle as well as no significant loss in correction in follow-up.*

Key Words: *Caries spine, Titanium mesh cage, Anterior decompression, kyphotic angle.*

INTRODUCTION

Worldwide, the leading cause of deaths from infectious diseases is Tuberculosis.[1] According to the WHO report 2007, Pakistan ranks sixth with an annual incidence of 181/100,000 population amongst the top 22 high burden Tuberculosis countries.[2] Inadequate and insufficient health care resources, poverty and increasing incidence of AIDS in developing countries is associated with this global increase in Tuberculosis nowadays.[1]

Musculoskeletal Tuberculosis is a rare form of TB comprising only 3% of all Tuberculosis patients.[3] The commonest and most dangerous form of Tuberculosis, Spinal Tuberculosis accounts for 50% of all cases of musculoskeletal Tuberculosis.[4] Spinal Tuberculosis or pott's disease was first described by Percival Pott and is associated with pain, kyphotic deformity of spine and neurological impairment.[2] Delay in early diagnosis

and rapid treatment of spinal Tuberculosis can result in long standing disability from deformity and paraplegia which has a very bleak outcome.[5]

Several treatment options have been used for the management of spinal Tuberculosis namely conservative management with anti-tuberculous drugs, decompression and posterior instrumentation and anterior debridement and stabilization with or without instrumentation.[1,4] Studies have shown that in patients with neurological impairment and kyphotic deformity due to spinal Tuberculosis, decompression of spinal cord along with anterior stabilization with implants have favorable outcome.[3]

The disease process involves the anterior column of spine leading to kyphotic deformity for which decompression through anterior approach and placement of titanium cages is becoming popular worldwide.[5] Studies have also shown loss of postoperative kyphotic correction after posterior decompression and instrumentation which leads to spinal instability.[6] In our practice we do anterior decompression with Interbody titanium cage placement in patients with kyphotic deformity resulting from caries spine. These cages are available in different sizes and have serrated edges which provide immediate stability and correction of kyphotic deformity by strongly integrating within bodies of adjacent vertebrae making desirable correction of kyphotic deformity possible. Moreover, the postoperative incidence of cage displacement is lower as compared with anterior stabilization done with autologous bone graft only.[5]

Rimier et al reported 11° immediate mean post operative improvement in kyphotic angle after anterior fusion in a series of 29 patients.[1] In a series of 62 patients. Obaid et al reported mean improvement of kyphotic angle of 2.8° ± 5.5° in patients who underwent modified Hong Kong procedure and mean improvement of 8.9° ± 7.6° in patients who underwent additional instrumentation[2] (Dynamic Compression plate, fixator spine). Wang B et al reported average reduction of 14.3° post operatively after anterior debridement and reconstruction with cage in a series of 69 patients.[5]

No local study is available which has evaluated the correction of kyphotic angle after anterior decompression with stand alone cage. The rationale of this study is to determine the improvement in kyphotic angle after anterior decompression plus cage in caries of Thoraco-lumbar spine. Moreover this study will serve as a primary data source on this topic as there is limited data available on post-operative improvement of kyphotic angle after titanium cage placement in patients with kyphotic spinal deformity due to TB spine.

MATERIALS AND METHODS

The study was conducted in the department of Orthopaedics and spine surgery, Ghurki trust teaching hospital, Lahore after approval from Hospital Ethical Committee and from concerned department. The Quasi experimental study was done from 1st May 2014 to 30th Apr. 2016. The sample size were 60 using 95% confidence level, p = 0.02 with an assumed mean improvement as 8.6 ± 7.6 in angle postoperatively. The patients of either sex aged between 15 – 60 years, caries spine diagnosed on history, examination, investtigations and histopathology report, involving less than three vertebrae, followed for at least 1 year and kyphotic deformity of any degree were included in our study. Those patients having kyphotic deformity of spine due to some other causes or having previous spine surgery. Loss in follow-up and those with co-morbidities were excluded from the study. The patients were divided into three age groups i.e. between 15 – 30 years, between aged 31 – 45 years and between aged 46 – 60 years.

A Written informed consent were taken for surgery after taking proper history, examination ,all investigations including x-rays lumbo sacral spine i.e. Antero posterior and lateral view. After induction of general anesthesia, patients were placed in left lateral position. Vertebral resection and pus drainage were done through an antero lateral approach. The anterior column then were reconstructed using fixed inter-body titanium mesh cage placed with bone graft (Figure 1). The surgically removed tissues were sent for histopathology, culture sensitivity and Z-N staining. Post operative standard anteroposterior and lateral radiographs were taken to measure the post operative kyphotic angle and the subsequent improvement in kyphotic angle as compared with the pre operative kyphotic angle. Patients were discharged on 4th Post operative day and Boston brace were applied for about six months to provide external support to the spine. All procedures were carried out by the senior consultant and followed by the researcher himself. Patients were followed for 1 year for any adverse event. All the patients were put on Anti Tuberculosis Therapy for 9 months. The data were initially entered on a preformed Proforma and then were entered in SPSS 17.0 version and analysed accordingly. The variables were age, gender and pre operation, post operation and after 1 year

follow-up change in kyphotic angle. The variables calculated using simple descriptive statistics using mean and standard deviations for quantitative data like age and pre-operative plus post-operative kyphotic angle and change in kyphotic angle. Paired sample t test were applied to determine significant difference in angle pre and post-operatively. P-value < 0.05 were considered significant.

Fig. 1: *Titanium Cage.*

RESULTS

There were 38 males (63.3%) and 22 females (36.7%). Male to female ratio was 1.7:1 with mean age of 33.416 ± 1.267. The patients were divided into three age groups. The first age group patients aged 15 – 30 years (n = 32) 53.3%, in second age group patients aged 31 – 45 years (n = 15) 25% and in the third age group patients aged 46-60 years (n = 13) 21.7%.

Ten (16.67%) of patients having previous history of tuberculosis. Fifteen (25%) of patients presented with lower backache only, 25 (41.67%) patients presented with backache and neurological symptoms. The remaining patients presented with more than two symptoms.

According to surgical procedure, 09 (15%) thoracolumbar decompression, 34 (56.6%) thoracic decompression and 17 (28.4%) lumbar decompression have undergone. The mean operation time was 100 ± 25 min (range 75 – 150 min) with an average blood loss volume of 450 ± 95 mL (range 300 – 1100 mL).

There were 10 patients (16.6%) with 0 – 10 degree improvement, 36 (60%) patients with 11 – 20 degree improvement and 14 (23.4) patients with 21 – 30 degree improvement. Paired t-test result for change in angle is p = 0.000. The Mean Pre opp angle were 57.8° while after surgery the mean angle were 28.4°. After 1 year follow up the mean loss in kyphotic deformity was 0.5° which is statistically insignificant. Mean change in angle in males were 16.263° and Mean change in angle in females were 16.727°. Moreover the fusion rate was 100% in 5.4 ± 1.3 months.

DISCUSSION

Pott's disease is the most common granulomatous bacterial infection of the spine and the most common bone TB with 50 – 60% of cases.[7] Due to the usual late presentation, most TB spine patients present with some degree of kyphosis.[8] Due to lack of adequate infrastructure (number of capacity to afford cost of implants at public healthcare facility or cost of treatment at private healthcare facility.[9]

Intervertebral fusion and instrumentation for spondylodiscitis can be performed through the anterior-posterior approach (in one or 2 stages), anterior fusion and grafting only (with or without anterior instrumentation) or a posterior approach combined with interbody bone grafting, with or without posterior instrumentation.[10] The different studies conducted in different countries with different types of procedures and their mean change in kyphotic angle is given in table 1.

Table 1: *Different studies at different countries with changes in kyphotic angle.*

Author	Year	Country	No. of Patients	Procedure	Mean Change in Kyphotic Angle	Follow-up
Thaker et al[11]	2009	India	25	AD + CAGE	21.2	15 months
Wang[12]	2002	China	39	Cage with anterior instrumentation	10.1	5 years
Refae HH[13]	2015	Egypt	22	TPSF	10	2 – 4 years

Author	Year	Country	No. of Patients	Procedure	Mean Change in Kyphotic Angle	Follow-up
Elio Ramírez[14]	2012	Ecuador	10	Cage with anterior instrumentation	7.58	18 Months
Xiongjie Shen[15]	2007	China	11	tpsf	15.2	1 year
Liljenqvist[16]	2003	England	10	Cage with graft	8.5	2
Farzad Omidi-Kashani[17]	2008	Iran	23	Cage with tpsf	15.3	2

Our results are comparable with international literature. We believe that Anterior Decompression with standalone titanium cage with autologous bone graft is more effective without additional stabilization of plate for reducing the deformity and stabilizing the vertebral column in patients who have tuberculosis of the spine. There are certain limitations in our study. Firstly the sample size is very few .Moreover other variables are not discussed like improvement in neurology. So, further studies needed which can give more reliable results.

CONCLUSION

Tuberculosis of spine is being endemic in underdeveloped countries including Pakistan has considerable socioeconomic and orthopedic concern. This slow but fatal disease still affects considerable number of cases and makes them disabled and even paralyzed in spite of all the advances regarding diagnosis, treatment and control of many diseases. We believe that Locally made Titanium cage with autologous bone graft is more effective without additional support of plate. These cages have serrated edges which provide immediate stability and correction of kyphotic deformity by strongly integrating within bodies of adjacent vertebrae making desirable correction of kyphotic deformity possible.

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REFERENCES

1. Reimer B, Dunn R. Anterior only transthoracic surgery for adult spinal tuberculosis. SA Orthop J. 2011; 10 (3): 43-47.
2. Rahman O, Ahmad S, Hussain T. Anterior surgical interventions in spinal tuberculosis. J Coll Physician Surg Pak. 2009; 19 (8): 500-505.
3. Camillo FX, Infections of the spine. In; Canale S T, Baety J H editors. Campbell's Operative Orthopaedic 12th Edition. Pennsylvania: Mosby Elsevier, 2013: 1965-1991.
4. Garg AK, Garg P, Ayan S, et al. Anterior decompression and anterior instrumentation of tuberculosis of cervicothoracic spine by cervicomanubrial approach. Al-Ameen J Med Sci. 2012; 5 (2): 124-131.
5. Wang B, LG, Liu W, et al. Anterior radical debridement and reconstruction using titanium mesh cage for the surgical treatment of thoracic and thoracolumbar spinal tuberculosis: Minimium five year follow-up. Turk Neurosurg. 2011; 21 (4): 575-581.
6. Uchida K, Nakajina H, Yayama T, et al. Vertebroplasty-augmented short-segment posterior fixation of osteoporotic vertebral collapse with neurological deficit in the thoracolumbar spine: copmparisions with posterior surgery without vertebroplasty and anterior surgery. J Neurosurg Spine November, 2010; 13: 612-621.
7. Abdel Rahman Hafez, and Mona Fattou, One-Stage Posterior Instrumentation and Fusion for the Treatment of Tuberculous Spondylodiscitis of Dorsal and Lumbar Spine. Journal of American Science, 2012; 8 (9): 85-90.
8. B Jadav, M Prabhakar. *Primary Posterior Fixation for Tuberculosis of the Spine*. The Internet Journal of Orthopedic Surgery, 2007; Volume 10 Number 1.
9. Jha DK, Singh R, Pant I. Transpedicular Surgical Decompression of Dorsal Spinal Tuberculosis (Pott's Disease) with Vertebral Collapse without Fixation. Neurosurg. 2016; 1: 2.
10. Stefan Endres, Axel Wilke ,Posterior interbody grafting and instrumentation for spondylodiscitis. Journal of Orthopaedic Surgery, 2012; 20 (1): 1-6.
11. Thaker RA, Gautam VK. Study of Vertebral Body Replacement with Reconstruction Spinal Cages in Dorsolumbar Traumatic and Koch's Spine. *Asian Spine Journal*. 2014; 8 (6): 786-792. doi:10.4184/asj.2014.8.6.786.
12. Wang B. et al: Anterior Radical Debridement and Reconstruction Using Titanium Mesh Cage for the Surgical Treatment of Thoracic and Thoracolumbar Spinal

Tuberculosis: Minimium Five – Year Follow. Turkish Neurosurgery, 2011, Vol. 21, No. 4: 575-581.
13. Refae HH. One – stage posterior approach for the treatment of tuberculous spondylitis with kyphosis. Egypt Orthop J. 2015; 50: 223-6.
14. Ramírez Elio, Ochoa Marcelo, Ordoñez Fausto. Surgical treatment of spinal tuberculosis by anterior approach. Coluna/Columna [Internet], 2013 Dec. [cited 2016 Aug 13]; 12 (4): 308-311.
15. Xiongjie Shen et al. Surgical treatment of selected patients with multilevel contiguous thoracolumbar spinal tuberculosis by only posterior instrumentation without any bone fusion. Int J Clin Exp Med. 2015; 8 (10): 18611-18619.
16. Liljenqvist, U., Lerner, T., Bullmann, V. et al. Eur Spine J. 2003; 12: 606.
17. Farzad Omidi – Kashani, Ebrahim G. Hasankhani, Mohamed H. Ebrahimzadeh, Anterior spinal surgery alone in the surgical treatment of thoracolumbar spinal tuberculosis: a prospective study, MJIRI, Dec. 2011; Vol. 25, No. 4: pp. 209-215.

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