ORIGINAL ARTICLE

Cage Displacement after anterior Decompression and Interbody Titanium Mesh Cage Placement in Caries Spine

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ABSTRACT

Background: Spinal tuberculosis 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. Treatment of spine tuberculosis may be conservative when it presents in early stage. Surgical treatment is preferable when patient presents with problems of deformity and neurologic deficit. Pseudo-arthrosis, pain or failure of chemotherapy is an issue. Surgical intervention may be limited to debridement, or radical resection with auto-grafting and instrumentation.
Aim: To determine the percentage of cage displacement after anterior decompression and interbody titanium mesh cage placement in caries spine.
Study design: Descriptive case series.
Setting: Department of Orthopaedics and Spinal Surgery, Ghurki Trust Teaching Hospital/Lahore Medical & Dental College, Lahore.
Duration of study: Six months (1st July 2011 to 31 December 2011).
Methods: All patients fulfilling the inclusion criteria were included. Interbody Titanium Mesh Cage with packed bone graft was placed. Post-operative anterior & lateral radiographs were taken to check and record the position of the cage. Brace was applied for at least 6 months.
Results: There were 34 males and 16 females with ratio 2.2:1. The patients age range was 15-60 years with mean age being 35.65±12.12 years. 28 patients underwent thoracolumbar decompression, 13 thoracic decompression while 9 had lumbar decompression. Forty eight patients had no cage displacement while 2 patients had cage displacement.
Conclusion: Titanium mesh cage was used as an interbody spacer in caries spine exhibiting immediate rigid fixation and successful bone union.
Key words: Caries spine, Titanium mesh cage, Anterior decompression

INTRODUCTION

Tuberculosis is the world's leading cause of death. Globally, Pakistan is ranked 8th amongst the most burdened countries with an incidence of 181 per 100,000 population. It is an endemic, chronic infection, commonly caused by Mycobacterium Tuberculosis. Despite the adequate control of pulmonary tuberculosis, the incidence of musculoskeletal tuberculosis is increasing[1].

Tuberculosis of the spine or Pott's disease and or caries spine is the commonest presentation of tuberculosis of the bone[2]. Percivall Pott coined this spinal deformity with curvature due to abscess and vertebral destruction associated with paralysis of lower limbs as Pott's Paralysis[2,3]. Its prompt diagnosis and treatment is necessary to avoid complications. Delayed diagnosis and treatment of tuberculosis spine could result in an avoidable outcome as longstanding disability from spastic paraplegia[4].

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Several approaches have been used in the management of caries spine. These range from conservative regimens of computerized tomography guided biopsy followed by bed rest and drug therapy to the radical strategies that involved extensive debridement of vertebral body followed by instrumentation.[5] As the caries commonly affects the anterior column of spine, so anterior decompression and instrumentation using titanium mesh cages with bone grafting became a popular treatment option.[6] Other options include anterior debridement and decompression with 360^0 circumferential fusion through transpedicular screw fixation. Posterior decompression only causes spinal instability[4].

Prime indication of surgery is the Progressive neurological deficit. Other indications are failure of conservative treatment, kyphosis, pain due to pseudoarthosis, structural destruction with instability, epidural abscess and recurrent disease[7].

The radical debridement followed by anterior stabilization with a titanium cage and bone grafting is a preferable surgical treatment option for tuberculous spondylitis. The presence of a titanium cage in an area of mycobacterial infection did not preclude infection

control or lead to recurrence[5]. Inter body cages are available in different sizes both in diameter and length, for the cervical, thoracic and lumbar spine. Similarly, these cages are either adjustable or fixed devices.

Inter body titanium cages with serrated edges provide prompt and early stability and correction of deformity by reconstruction of anterior column of the spine. Serrated edges of these cages get impacted strongly within the bodies of the adjacent vertebrae thus giving immediate stability[2]. These cages are firmly packed with fine bone graft before placement between adjacent vertebrae. The packed bone graft later gets fused at both the upper and lower ends of the adjacent vertebrae, providing a solid fusion and biological stability to the spine. Because of the intact anterior longitudinal ligament (ALL) in spinal tuberculosis, the inserted cage would retain its position and prevented to be displaced through the ligament-taxis of ALL. Under such circumstances, no added fixation is required in the form of screws and plates or screws and rods to prevent cage displacement[8].

Although many investigators previously have reported the benefits of titanium mesh cages (TMCs) and rigid fixation in reconstruction of the cervical spine following cervical corpectomies, some of recent reports have warranted the caution. Cage displacement being one of the complications of the procedure was studied in different countries[9,10]. A Korean study showed 16% cage displacement in cervical spine[11]. Hee et al[12] reported specifically on the complications of this technique in multilevel corpectomies. Their overall complication rate was 33%. Of their 21 patients, 6(28%) had cage, plate, or screw complications; and three (14%) had significant subsidence. More recently, Daubs reported that the failure rate of fixation with cage subsidence and distal plate extrusion was 30% (7 of 23 patient), which was higher than previous reported results[13].

We place the cage between vertebral bodies without anterior support of plate considering support of ALL as sufficient. So we assumed cage displacement to be <20% in our study. No local data is available as this is a relatively newer technique in our part of the world. Our study would help to assess the efficacy of the given surgical procedure, and develop guidelines for better outcome of this procedure in future.

The objective of the study is to determine the percentage of cage displacement after anterior decompression and inter-body titanium mesh cage placement in caries spine.

MATERIALS AND METHODS

This descriptive case series study was conducted from 01-07-2011 to 31-12-11 at the Department of Orthopaedics and Spine surgery Ghurki Trust Teaching Hospital, Lahore Medical and Dental College, Lahore. Sample Size of 50 cases, calculated with 95% confidence level, 11% margin of error and taking assumed percentage of cage displacement after anterior decompression and inter-body titanium mesh cage placement in caries spine i.e., 20%. Sample technique was non-probability (purposive) sampling

Inclusion Criteria

- Patients between the age of 15 – 60 years
- Neurological status of any grade
- Caries disease involving less than three vertebrae
- Patients diagnosed clinically, radiologically and histologically with caries spine

Exclusion Criteria

- H/o previous spinal surgery
- Patients having congenital spinal deformity
- Medically unfit and un-stable patients due to co-morbidities on pre-anesthesia assessment

Data collection: All patients qualifying the inclusion criteria were included in the study. Written informed consent was secured. Patients were prepared for surgery. After induction of general anesthesia patient were placed in left lateral position. Using antero-lateral approach, vertebral resection and pus drainage was done thoroughly. A locally made fixed interbody Titanium Mesh Cage, packed with bone graft, was placed. The surgically removed tissue was sent for histopathology, culture sensitivity and detection of Acid Fast Bacilli. Post-operatively, anterior & lateral radiographs were taken to check and record the position of the cage. Patients stayed in hospital for pain control and rehabilitation. A brace was applied for at least 6 months to provide external support to spine. All procedures were carried out by the senior consultant and followed by researcher himself.

The cage displacement was assessed on each 2nd, 6th, 10th, 14th, 18th and 24th week follow up respectively (as per operational definitions) and recorded on a proforma.

Data analysis: The data was entered in SPSS 11.0 version and analyzed accordingly. The variables to be analyzed were included age, gender and cage displacement. The variables were calculated using simple descriptive statistics using mean and standard deviations for quantitative data like age.

RESULTS

The study was conducted in Orthopaedics Department of Ghurki Trust Teaching Hospital Lahore on 50 patients during six months to see cage displacement. There were 34 males (68%) and 16 females (32%). Male to female ratio was 2.2:1 (Table 1). The patients shown in Table 2 were divided into

three age groups. The first age group patients aged 15-30 years 20(40%), second age group patients aged 31-45 years 16(32%) and in the third age group patients aged 46-60 years 14(28%). The mean±SD between the ages was 35.65±12.12 years. According to surgical procedure, 28 (56%) underwent thoracolumbar decompression, 13(26%) had thoracic decompression while 9 (18%) had lumbar decompression (Table 3). Out of 50 patients, 48 patients (96%) had no cage displacement while 2(4%) had cage displacement (Table 4).

Table 1: Frequency and distribution of patients according to gender (n = 50)

Gender	Frequency	%age
Male	34	68.0
Female	16	32.0
Male to female ratio	2.2:1	

Table 2: Frequency and distribution of patients according to age (n = 50)

Age in years	Frequency	%age
15 – 30	20	40.0
31 – 45	16	32.0
46 – 60	14	28.0
Mean±SD	35.65±12.12	

Table 3: Frequency of patients according to surgical procedure (n = 50)

Surgical Procedure	Frequency	%age
Thoracic decompression	13	26.0
Lumbar decompression	9	18.0
Thoracolumbar	28	56.0

Table 4: Frequency of patients according to cage displacement (n = 50)

Cage Displacement	Frequency	%age
Yes	2	4.0
No	48	96.0

DISCUSSION

Tuberculosis is most endemic chronic infection, which paralyses the majority when it affects the spine due to its resultant neurological deficit. So it has tremendous socioeconomic and orthopedic impact as it hits the spine of not only the patient but also the whole community. Despite the adequate control of pulmonary TB, the incidence of musculoskeletal TB is increasing[14].

This continuous rise in the victims of TB spine not only in the under developed countries but also in the developed countries has led to a challenging problem and created an increasing demand on the orthopedic department. The situation is further complicated and horrified by the emergence of multi-drug resistant strains[15].

Moreover protracted and prolonged natural course of disease and slow recovery impairs physical, social and emotional capacitors of the patient. All this poses a very grave effect on financial and economical balance of society. These disabilities demand a more quick, rewarding and practicable mode of treatment of these patients in the form of full physical recovery and quiescence of the disease. But the picture had been quite opposite and confusing regarding treatment options especially in anterior column disease which is the most frequent presentation and most often leads to paraplegia. In the pre-chemotherapy era, the balance was more in the favor of surgery. In this regard, Hodgson and Stock contributed the most and made the situation quite clear by establishing and popularizing anterior decompression and fusion as a definite mode of treatment of anterior column TB. But with advent of chemotherapy, situation became more debatable regarding conservative versus surgical procedure. It was the trials of MRC&WP which made the situation quite clear but their last report favored conservative approach. As this grave disease is quite endemic in Pakistan so the need for a local study was always felt[16,17,18].

Lonstein reported lower rates of penetration, breakage, collapse, and pseudarthrosis of the rib grafts with use of anterior instrumentation than with use of posterior instrument.[19] Other authors have stated that, when more than two levels are involved, there is anterior instability and the kyphosis progresses rapidly.[20,21] However, we believed that sufficient stability and correction can be obtained with anterior instrumentation and bone-grafting after decompression of the tuberculous spine without increasing the rates of persistent or recurrent tuberculous infection. It should be kept in mind that use of anterior instrumentation alone is possible only if the posterior column is intact. Anterior instrumentation should not be used to correct kyphotic deformity when the posterior column is affected. Better correction of the deformity and maintenance of the correction can be obtained with anterior instrumentation[22].

Previous reports on the use of titanium mesh cages and rigid, constrained anterior plating after cervical corpectomies have shown favorable outcomes, with successful fusion rates ranging from 95% to 100% and implant complication rates of 6% to 28%.[23-25] The initial report of this technique by Majd et al[24] indicated only one (2.9%) cage extrusion. Thalgott et al[25] also observed a 100% fusion rate with only one patient having significant subsidence of the cage and screw back-out. In the present study, 96% of the patients had stable titanium mesh cage while only 4% of the cage displacement was reported. Our results are comparable with international literature. We believe that titanium mesh cage with 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.

CONCLUSION

On the basis of observations made in this study, we can conclude that Titanium mesh cage with bone graft is more effective without additional support of plate for surgical stabilization in spinal tuberculosis. As anterior longitudinal ligament is not damaged by tuberculous infection, so it gives sufficient support to prevent the titanium mesh cage displacement.

REFERENCES

1. Aziz S, Alam SE. Implemenation of directly observed treatment short course at a trust hospital in Karachi. Pak J Med Res 2009;48:15-7.
2. Chun HJ, Oh SH, Yi HJ, Ko Y. Efficacy and durability of the titanium mesh cage spacer combined with transarticular screw fixation for atlantoaxial instability in rheumatoid arthritis patients. Spine 2009;34:2384-8.
3. Deverajair BR, Ghori RA, Memon N, Memon MA. Pattern of spinal tuberculosis at Liaquat University Hospital, Hyderabad/Jamshoro. J Liaquat Uni Med Health Sci 2006;5:33-9.
4. Odey FA, Umoh UU, Meremikwu MM, Udosen AM. Potts disease in children and adolescents in Calabar, Nigeria. J Infect Dis 2007;6:345-9.
5. Wang XY, Li KH, Hu JZ, Liang JY, Hu B. Different operation methods for thoracolumbar spinal tuberculosis. Zhong Nan Da Xue Xue Bao Yi Xue Ban 2006;31:427-9.
6. Chritodoulou AG, Givissis P, Karataglis D, Symeonidis PD, Pournaras J. Treatment of tuberculous spondylitis with anterior stabilization and titanium cage. Clin Orthop Relat Res 2006;444:60-5.
7. Chen CL, Chou CW, Su WW, Cheng CY, Yu CT. Dislodged upper thoracic cage in the gastrointestinal tract: a case report and literature reviews. Spine 2008;33:E802-6.
8. Akamaru T, Kawahara N, Sakamoto J, Yoshida A, Murakami H, Hato T, et al The transmission of stress to grafted bone inside a titanium mesh cage used in anterior column reconstruction after total spondylectomy: a finite-element analysis. Spine 2005;30:2783-7.
9. Pawar UM, Kundnani V, Nene A. Major vessel injury with cage migration: surgical complication in a case of spondylodiscitis. Spine 2010;35:E663-6.
10. Talbot Jc, Q Bismil Q, Saralaya D, Newton DAG, Shaw DL. Musculoskeleted tuberculosis in Bradford: a 6 year review. Ann R Coll Surg Eng 2007;89:405-9.
11. Chung DY, Cho DC, Lee SH, Sung JK. Preliminary surgical result of cervical spine reconstruction with dynamic plate and titanium mesh cage. J Korean Neuorosurg Soc 2007;41:111-7.
12. Hee HT, Majd ME, Holt RT, Whitecloud TS 3rd, Pienkowski D. Complications of multilevel cervical corpectomies and reconstruction with titanium cages and anterior plating. J Spinal Disord Tech 2003;16:1-8.
13. Daubs MD. Early failures following cervical corpectomy reconstruction with titanium mesh cages and anterior plating. Spine 2005;30:1402-6.
14. Brriere V, Gepener P, Bricaire F, Bletry O, Caumes E. Current aspects of the spinal tuberculosis. Ann Med Intern 1999;150:363-9.
15. Moon MS. Tuberculosis of the spine; controversies and a new challenge. Spine 1997;22:1791-7.
16. MRC&WP on TB spine: A 03 years controlled of short course regimens of chemotherapy in the ambulatory treatment of spinal tuberculosis. JBJS (Br) 1993;75:240-8.
17. MRC&WP on TB spine: A 5 year assessment of controlled trials of shot course chemotherapy regime for 09 months duration for spinal tuberculosis in patients with ambulatory from standard radical surgery. In J Orthop 1999; 23:73-81.
18. MRC&WP on TB spine: A 15 year assessment of controlled trials comparing 09 months ambulant chemotherapy with radical and debridement series for spinal TB. JBJS (Br) 1998; 80-B: 456-62.
19. Lonstein JE, Postalminectomy deformities: thoracic and lumbar spine. In: Bridwell KH, Dewald RL, editors. The textbook of spinal surgery. 2nd ed. Philadelphia: Lippincott-Raven, 19997;1:1055-75.
20. Tabakim AY, Ucaner A, Culhaoglu M, Bicimoglu A and Gunel U. The balance problem of patients treated with anterior fusion in Pott's diseases. J Turkish Spinal Surg 1992;3:14-8.
21. Nussbaum ES, Rockswold GL, Bergman TA, Erickson DL and Seljeskog, EL. Spinal tuberculosis a diagnostic and management challenge. J Neurosurg 1995;83:243-7.
22. Eysel P, Hopf C, Vogel I and Rompe JD. Primary stable anterior instrumentation or dorsoventral spondylodesis in spondylodiscitis? Results of a comparative study. Eur Spine J 1997;6:152-7.
23. Das K, Couldwell WT, Sava G, Taddonio RF. Use of cylindrical titanium mesh and locking plates in anterior cervical fusion. Technical note. J Neurosurg 2001;94:174-8.
24. Majd ME, Vadhva M, Holt RT. Anterior cervical reconstruction using titanium cages with anterior plating. Spine 1999;24:1604-10.
25. Thalgott JS, Xiongsheng C, Giuffre JM. Single stage anterior cervical reconstruction with titanium mesh cages, local bone graft, and anterior plating. Spine J 2003;3:294-300.