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Efficacy and safety of instrumentation in caries spine

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Background: Spinal instrumentation may be used in tuberculosis of spine for prevention or correction of deformity.

Methods: Thirty eight patients of caries spine underwent surgery with spinal instrumentation in the last 3 years. Out of these patients, 30 cases have completed a minimum follow-up of 9 months (Range 9 to 39 months, mean 12.8 months). The regional distribution was 1 in the craniocervical junction, 7 in the subaxial cervical spine, 3 in the cervicothoracic junction, 3 in the thoracic region, 4 in the thoracolumbar junction and 8 in the lumbar region and 1 in the lumbosacral junction. All the cases had anterior lesions except one, which had both anterior and posterior lesions. All of them had decompression, debridement of the lesion and instrumented fusion. Indication of surgery was caries spine with neurodeficit and /or osseous destruction and deformity, which was not responding to conservative treatment of one month.

Results: Results were analyzed keeping in mind the clinical and radiological criteria. The former included recovery of pain, and neural deficit with a feeling of general well being. The latter included correction of deformity and evidence of fusion. There was no case which had wound healing/infection related problems. Complications included one case of implant failure and one case of transient neurological deterioration. Results were excellent in 20, good in 5, fair in one and poor in one patient. Majority of the patients were very satisfied with the surgery and all the patients had full anti-tubercular chemotherapy for one year.

Conclusions: In properly selected patients, spinal instrumentation is justified because of its safety and efficacy in achieving deformity correction and solid fusion.

Key-words: Spinal tuberculosis; Spinal instrumentation; Fusion; Kyphosis; Neurological deficit.

Tuberculosis in the spine is still extremely common in our country and the fact that it is basically a "medical" disease cannot be over-emphasized. The role of spinal instrumentation in caries spine has been addressed to in the current literature on two issues. The first issue to be considered is about putting in a foreign body in an infected zone. The first clinical and biological study of the same was published a dozen years back and was shown to be experimentally safe with the added newer generation antitubercular medicines[1]. Subsequently it was questioned whether it is better to put in posterior hardware only given the fact that the infected zone is basically the anterior structures because posterior element tuberculosis is quite uncommon[2]. Subsequently it has been shown that anterior instrumentation also is very safe so far as the problem of persistent infection relating to the usage of foreign body is concerned[3, 4,5] .

Potential advantages of spinal instrumentation are correction of deformity, increased rate of fusion, especially multilevel spinal fusion, early mobilization, wider resection of unhealthy bone without fear of instability and addressing the problem of instability when present.

Materials and Methods

Thirty eight patients of caries spine underwent surgery with spinal instrumentation in the last 3 years at our institute. Out of these patients, 30 cases have completed a minimum follow-up of 9 months (Range 9 to 39 months, mean 12.8 months). Three of them were not available for follow-up and hence have been excluded from the study. So the present study constitutes 27 patients (12 males and 15 females) of caries spine.

Adjunctive spinal instrumentation was used for the following indications.

1. Neurological deficit not responding or worsening with anti-tubercular drugs (or rapidly progressive gross neurology at initial presentation)
2. Bony destruction leading to kyphotic deformity (>40 degrees) +/- Instability.
3. The need for establishing the diagnosis

Generally speaking, gross osseous destruction (especially in more than 2 vertebrae involvement) and kyphosis more than 40 degrees or additional frank instability were the absolute indications of instrumentation.

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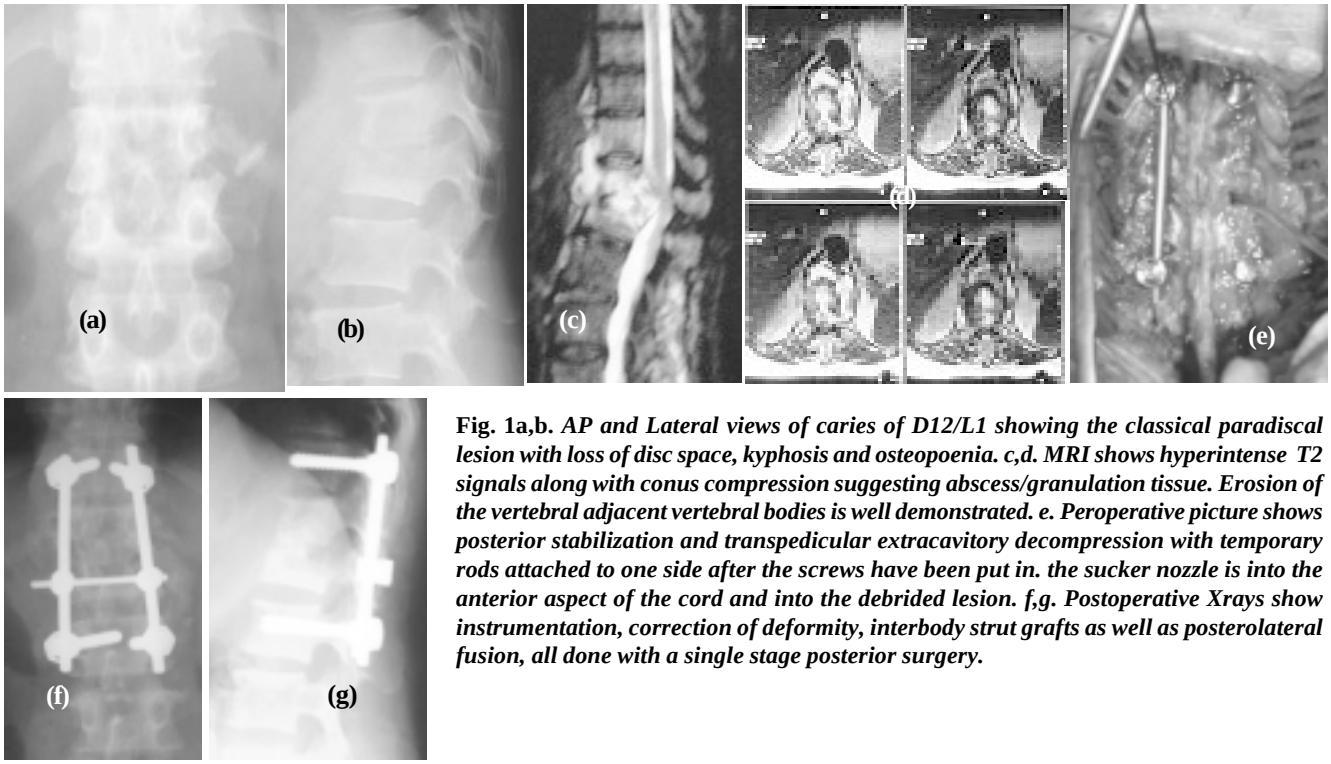

Fig. 1a,b. ***AP and Lateral views of caries of D12/L1 showing the classical paradiscal lesion with loss of disc space, kyphosis and osteopoenia. c,d. MRI shows hyperintense T2 signals along with conus compression suggesting abscess/granulation tissue. Erosion of the vertebral adjacent vertebral bodies is well demonstrated. e. Peroperative picture shows posterior stabilization and transpedicular extracavitory decompression with temporary rods attached to one side after the screws have been put in. the sucker nozzle is into the anterior aspect of the cord and into the debrided lesion. f,g. Postoperative Xrays show instrumentation, correction of deformity, interbody strut grafts as well as posterolateral fusion, all done with a single stage posterior surgery.***

The regional distribution was 1 in the craniocervical junction ($C_{0/1/2}$), 7 in the subaxial cervical spine ($C_{3/4/5/6/7}$), 3 in the cervicothoracic junction ($T_1/T_2/T_3$), 3 in the thoracic region (T_4 to T_{10}), 4 in the thoracolumbar junction ($T_{11/12/}L_{1/}L_2$) and 8 in the lumbar region ($L_{3/4/5}$) and one in the lumbosacral junction (L_5/S_1). All the cases had anterior lesions except one, which had both anterior and posterior lesions.

All of them had decompression, debridement of the lesion (except the 2 cases in the carniocervical region where posterior stabilization and fusion alone was done) and instrumented fusion. The types of surgeries were:

a) Anterior decompression/debridement + fusion with anterior instrumentation – i.e. *anterior alone surgery* – 6 pts. (All were patients of sub axial cervical spine affection and 2 of the cervicothoracic junction)

b) Anterior decompression/debridement + fusion with posterior instrumentation and fusion – i.e. *anterior and posterior surgery* – 7 pts. (2 in thoracic and 3 in thoracolumbar areas

c) Posterior transpedicular decompression/ debridement with posterior instrumentation and fusion – i.e. *posterior alone surgery* – 14 pts. (3 in thoracic, 2 in thoracolumbar, all lumbar, lumbosacral and craniocervical areas though in the latter it was posterior stabilization and fusion alone without transpedicular decompression)

The average duration of surgery / blood loss in these groups were 220 mins/400cc, 430 mins/750cc and 310 mins/ 600cc respectively. All patients had a single general anesthesia. For anterior surgery, the approach in the cervical spine was a standard anterior approach, for the cervicothoracic spine, it was manubrial splitting, for the thoracic and thoracolumbar spine, it was a transthoracic (+/- trans-diaphragmatic), for the lumbar spine it was a retroperitoneal and for the lumbosacral spine, it was a suprapubic approach. For posterior surgery, it was a midline posterior approach.

Instrumentations used include Hartshil rectangle with sub laminar wiring in 7, plate/screw fixation in 6, hartshil with plate/screw in 1 and transpedicular instrumentation in the remaining 13.

Postoperative protocol used was similar in all cases with category b patients going to the ITU initially. All patients had drain removal on the second day and were made to sit up. Chest and limb physiotherapy was started and when the neurology permitted, they were out of bed from that day onwards. Stitch removal was usually on the 10th day and the average postoperative hospitalization was 11.4 days.

Patients were followed up at the end of 1, 3, 6 and 12 months and then on once every year. All patients had a full antitubercular chemotherapy (4 drugs for 3 months, 2 drugs

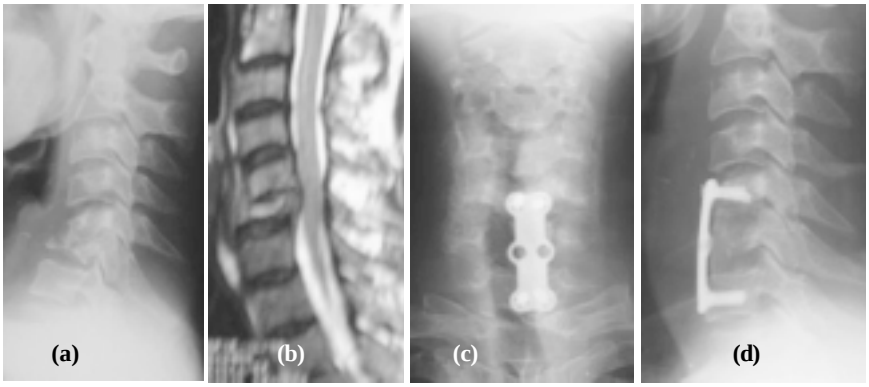

Fig 2a. ***Preoperative X-ray, b. MRI of a patient with Caries C6 with kyphosis, instability and neurodeficit, not responding to conservative treatment. c,d. and postoperative X-ray – note the correction of kyphosis and the stable construct after C6 corpectomy, strut bone grafting from the iliac crest.***

for 9 months) and intolerance leading to modulation of the drug regime/dosage had to be done in 10 out of the 27 patients (37%). The average follow-up time is 12.8 months (range 9 months to 3 years 3 months). All patients had regional X-rays and blood ESR, CRP estimation at 3 months, 6 months and one year followed by once every year.

Results

Results were analyzed according to clinico-serological criteria of disease control, neurological recovery/functional improvement, and pain control. Radiological analysis was done according to percentage of deformity correction and evidence of fusion. Following was the protocol used by us in assessing our results.

Excellent: Complete normalization of ESR/CRP, full neurological recovery, restoration of preoperative functional status including return to work, pain status < 3 on the Visual Analogue Score (VAS), and complete radiological fusion with > 80% correction of deformity

Good: Complete normalization of ESR/CRP, full neurological recovery, restoration of preoperative functional status including return to work, pain status < 5 on the VAS, complete radiological fusion with >70% correction of deformity.

Fair: Complete normalization of ESR/CRP, incomplete neurological recovery with useful motor power (>3/5), ambulant, pain status < 5 on VAS, radiological fusion with < 60% correction of deformity.

Poor: Any one or more of the following - Persistently raised ESR/CRP, discharging sinus, incomplete neurological recovery with useless motor power (<3/5), non-ambulant, pain status > 5 on VAS, radiological nonunion, persistent deformity of > 50% of original, implant failure.

Results were excellent in 20, good in 5, fair in one and poor in one patient. Majority of the patients were very satisfied with the surgery and all the patients had full anti-tubercular chemotherapy for one year. The only poor result was a patient who had $C_{4/5}$ caries with quadriparesis not responding to ATD with complete destruction of C_5, deformity of 70 degrees and cord compression. Anterior decompression with corpectomy C_5, C_4 to C_6 and iliac crest bone grafting was done along with fixation from C_4 to C_6 with locking plates and screws. There was an implant failure with screws coming out at C_4 for which a revision front and back surgery had to be performed with refixation and fusion anteriorly from C_3 to C_6 and posteriorly from C_3 to C_7.

The fair result was another patient who had caries D_7 with paraplegia for 4 months prior to surgery, not responding to ATD, gross kyphosis of 60 degrees and with myelomalacic changes in the cord along with compression. He was offered a front and back surgery with anterior debridement, decompression, fusion and posterior fixation and fusion. He had complete radiological fusion with good deformity correction but had incomplete neurological recovery with motor power in the lower limbs of Grade 3/5, and was ambulant on a walker. There was not a single case with infection/wound healing problems/discharging sinus.

Discussion

The issue is to be considered is the efficacy and the absolute/relative indications for the use of instrumentation in operative treatment of caries spine. There still remains considerable debate regarding the use of some form of instrumentation in all patients undergoing decompressive surgery. Instrumentation definitely allows radical decompression without the fear of destabilizing the spine but in single level disease, without much of kyphotic deformity and in adult patients, possibly it is not required, as it has been shown conclusively that only 3-5% of patients treated conservatively progress to kyphosis beyond 60 degrees[6]. Hence we believe that the classification system

proposed by Mehta and Bhojraj[7] is rational and should be followed. Only those patients who have destabilizing anterior decompressive surgery especially in the context of pre-existing kyphosis be fixed anteriorly (cervical/cervicodorsal spine) or posteriorly (thoracic/thoracolumbar/lumbar spine). Those patients in whom the entire surgery can be done posteriorly should be done with bilateral transpedicular/ extracaitory decompression/debridement and instrumentation and fusion. Transpedicular instrumentation is safe and efficacious is correcting deformity and maintaining stability[8,9,10,11]. Combined front and back surgeries have been reported[12, 13,14] and compared[15] but should be considered with strict indications of more than 2 level affections, predominantly anterior compression producing neurodeficit, kyphosis over 40 degrees or in a growing child for mandatory posterior fusion.

For fusion, we have used autologous iliac crest strut/ chip grafts as required but allograft fibula[16] and cages can be safely used.

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