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Operative procedure options in tuberculosis of dorsal spine with neurological deficit

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Experience with surgical procedures like one stage anterior debridement and strut bone grafting alone in 4 patients, two stage anterior debridement and strut bone grafting combined with posterior fixation in 4 patients, a single stage posterior transpedicular decompression combined with fixation in 2 patients and a proposed single stage procedure to meet the local need, consisting of an anterolateral debridement and strut bone grafting combined with posterior fixation carried out in 4 patients so far are presented here. All the patients had tuberculosis of dorsal spine with neurological deficit of various Frankel grades.

INTRODUCTION:

Tuberculosis is still very common in Nepal. An estimate by the National Tuberculosis Control Project state that 1% of the total population is suffering from some form of tuberculosis. There are governmental and non-governmental organizations running tuberculosis control programs. But they deal with the commoner pulmonary form only. The disabling bone and joint tuberculosis is yet to gain national attention.

This is basically an experience of surgically dealing with this more alarming yet common tubercular spondylitis of thoracic vertebrae presenting with neurological deficit. Poor as the nation is besides being geographically difficult because of high mountains, there is always a need for an inexpensive and short cure to cater the largest rural population coming from geographically difficult terrain.

Costotransversectomy described by Menard in 1894, first performed by Haidenhaim, later was modified by Seddon, Roaf et al, Capener to suit their respective purposes.[1] The proposed procedure is a single operation, again a combination and modification of procedures to provide the benefits of traditionally two operations, namely anterior debridement, bone graft and a second posterior stabilization of the spine with internal fixation, thus shortening the operative undertaking and the hospital stay.

METHODOLOGY

This study was done in patients admitted in Bir Hospital for treatment of tuberculosis of dorsal spine from Jan 1993 to Dec. 1994. All the cases of tuberculosis of the spine with neurological deficit included in the study.

Operative Procedure

- Procedure 1. Anterior debridement and strut bone graft: This procedure was described by Hodgsone et al.[2] Through a formal

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thoracotomy the site of disease is approached, debrided thoroughly and a tricortical iliac bone graft is placed in the gap to serve the purpose of a graft as well as a bony strut between the upper and lower vertebrae to correct and maintain the anterior collapse. Four elderly patients underwent this operation. Postoperatively the patients wore corset until the check x rays later showed vertebral body fusion.

- Procedure II: Two stage procedure comprising of procedure I followed couple of weeks later by posterior stabilization with Luque type of rectangle and sublaminar wires through a posterior midline approach. Four young adults underwent this procedure. Post operatively they did not have to wear corsets.

- Procedure III: Posterior transpedicular decompression and internal fixation: Through posterior midline approach the pedicle of the most affected vertebra is exposed and burrowed through to reach the body and then space above and below as necessary to debride and drain the abscess as necessary. Then the cavity thus created is packed with cancellous bone graft from iliac crest. Stabilization of the vertebral column is then carried out with a luque rectangle and sublaminar wires incorporating two vertebrae above and below the site.

- Procedure IV. This is the proposed procedure. It consists of an anterolateral decompression, debridement and strut bone grafting combined with posterior stabilization with a rectangle. This procedure is basically a modification of technique of Roaf et al.[1] An anterolateral approach is made to the dorsal spine from the side consisting of larger abscess or left side in absence of abscess. A curved incision is made few inches proximal to the center of the lesion curving laterally to a point 10 inches and then curving back to the midline few inches below the center. Skin and fasciae are divided then the muscles lateral to the erector spinae along the line of incision. The rib opposite the center is located and medial 4 inches it is removed after reflecting the periosteum and dividing it. The costotransverse ligament is cut, transverse process nibble off and the rib with its head is removed. At that stage the pus usually wells up. Either the superior or the inferior rib is also removed in the similar manner. Intercostal neurovascular bundles are identified. The vessels are ligated and cut. The intercostal nerves are traced upto their exit at the neural foramina. If necessary the intervening pedicle can be removed to decompress the cord as much as necessary till a formal lateral rachotomy state. Bluntly the pleura with the abscess wall is then dissected off the lateral and anterior aspects of the vertebral bodies. Any pleural perforation should be repaired. Through debridement is then carried out. Notches are gouged superiorly and inferiorly on healthy vertebrae to accept a tricortical "T" shaped Iliac cortico-cancellous graft. Maximal correction of the kyphosis is attempted manually while putting the graft.

Next the skin flap with fasciae is reflected till an inch away from the midline on the other side. Paravertebral muscles are then reflected subperiosteally from spinous process and laminae. Interspinous ligaments are removed. Flavotomies are done. Sublaminar wires are passed and the rectangle placed and fixed incorporating two vertebral levels above and two below the affected one. A second look at the anterior graft is taken to check it's integrity. Then both wounds are closed with drains. Finally skin is closed.

Prior to the operation a luque like rectangle is made by bending a Rush nail of sufficient length at our hospital workshop keeping joint of the ends unwelded. Usually a 4mm diameter and at 5mm Rush nail is chosen for thoracic and thoraco-lumbar junction. Then standard 20 gauze SS wires are used for sublaminar wiring.

Table I: Number of patients by type of procedure.

Procedure	No. of Patients
I	4
II	4
III	2
IV	4

Table II: Details of patients with neurological deficit, operative procedure and post-operative outcome.

Case No.	Age	Sex	Lesion level	Neurological DEFICIT	Operative procedure	Neurological recovery	Complicati -ons
1.	60	F	D7-8	Frankel D	I	Complete	None
2.	71	F	D7-8	Frankel C	I	Complete	None
3.	50	M	D7	Frankel D	I	Complete	None
4.	55	M	D9	Frankel D	I	Complete	Kyphotic
5.	27	M	D10-11	Frankel D	II	Complete	None
6.	25	M	D9-10	Frankel D	II	Complete	None
7.	30	M	D8	Frankel D	II	Complete	None
8.	12	M	D6	Frankel C	II	Complete	Graft tilted
9.	24	F	D9	Frankel C	III	Frankel D	None
10.	30	M	D10-11	Frankel C	III	Complete	None
11.	27	M	D8	Frankel D	IV	Complete	None
12.	35	F	D9	Frankel C	IV	Frankel D	Wound dehiscence
13.	40	M	D8-9	Frankel D	IV	Complete	None
14.	32	M	D9-10	Frankel D	IV	Complete	None

Neurological deficit was graded according to Frankel et all. [3]

Kyphosis correction: on an average upto 16 degree and was not considered much as the cosmesis was not the prime factor at the presenting patients

DISCUSSION :

Modern trend in the treatment of tuberculosis of spine is radical surgery. Even in underdeveloped countries those with neurological deficit need to have early surgical treatment to prevent further neurological deterioration and effect some recovery as well if possible

Anterior debridement with strut bone grafting can achieve stable bony fusion with least risk of collapse into kyphosis. The strut bone graft provides some correction of kyphosis and stability against the collapse. Posterior fusion is usually reserved if two or more vertebral bodies are involved or instability is present because of posterior elemental distraction.[1] But we even for paradiscal infection did not carry out posterior fixation on those 2 of the 4 patients and relied on the external immobilization. Partly because of above stated reasons and partly because the patients were elderly and they would not want to stay back for another operation. the anterior approach provides wide access for thorough debridement.

An external corset immobilization was usually required for an average period of three and half months. But in adults and younger age group a second stage operation was carried out 2 to 3 weeks after the anterior procedure to stabilize the spine additionally and to void kyphosis in the long term as well. In children and adolescents specially, growth may retard anteriorly because of infection and attempted fusion. Whereas growth of posterior column occurs normally. This may result ultimately in kyphosis. Hence a posterior fixation and fusion is desirable. But temptation of further attempt at correction of kyphosis during this stage should be resisted. Otherwise, complication can

Illustration: 1
PROCEDURE I
Showing a tri-cortical iliac strut graft put into the cap.

Illustration: 2
PROCEDURE I
Post operatively patient wearing corset.

Transpedicular apprach for decmopression

Illustration : 3 Procedure III Intra-operative photograph

Illustration: 4 PROCEDURE II
Patient showing scar of Thoracotomy & Posterior midline approach.

Illustration: 5 PROCEDURE III
Patient showing a curved scar of the approach.

Illustration: 6
PROCEDURE IV
(The proposed procedure)
Posterior stabilization with a rectangle and sublaminal wires

Showing antero-lateral decompression of spine.

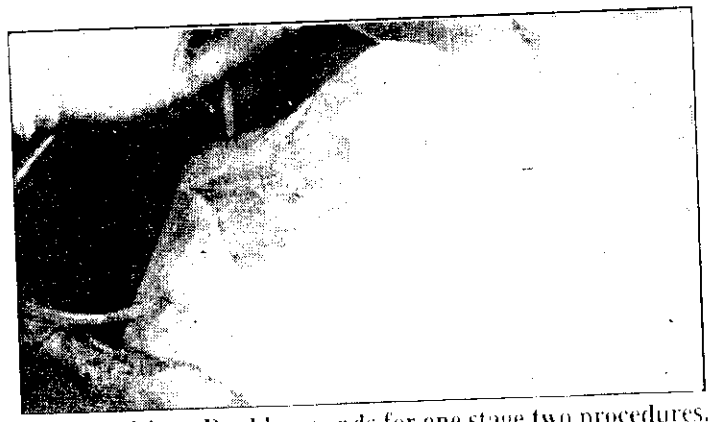

Illustration: 7
Midline wound for fixation

Lateral wound for decompression.

Single Incision. Double wounds for one stage two procedures.

occur. Such an attempt in fact resulted in dislodging of the strut graft in a 14 yrs old boy. He was steadily progressing neurologically after the first stage. But after the second stage his neurological status deteriorated rapidly. Check X-rays showed the strut graft had tilted posteriorly. We had to reexplore the spine through formal thoracotomy when the graft was found displaced and pressing against the spinal cord. This was corrected. Following this he again made rapid neurological recovery.

The procedure II is ideal. But practically it requires two operations and long hospital stay costing the patients and the hospital more. It also results in a longer morbidity. Besides the patients could not be discharged in between and relied to return for the second operation. Most of our patients are from remote villages and are least health conscious.

Posterior single stage transpedicular decompression combined with fixation was achieved through same approach. Technically this was a single stage surgery for the patient. But it was also technically somewhat a blind procedure without an image intensifier. Because the kyphosis correction was minimal. Overall it was not satisfactory to us. However we suppose this procedure could be valuable for circumferential spinal involvement with the infection as reported.[4]

With an aim to effect a single stage cure to our rural patients under our ordinary operating setup and make it cost effective to the already overburdened our hospitals we devised the procedure IV. It is one operation under one anaesthesia though prolonged by 2 to 3 hours extra time for the posterior fixation. After the fixation the situation of the anterior strut graft could also be changed through the first wound before closing. This also allowed the patients to be discharged from hospital early without having a second operation or a corset. Thus it was economical to the hospital and the patients alike. A formal thoracotomy was also not necessary meaning less intensive post operative care minus a chest tube drainage and check chest X-rays for it's removal. Besides the locally made rectangle costs only as much as that of a Rush nail which turns out to be many times cheaper than a standard one.

Minor complications like wound dehiscence at the apex of the curvature was faced in one case. This procedure has the disadvantages of providing less wider access to the spine than through thoracotomy. The scrub nurse has to be careful not to contaminate the implant with the tubercular pus. However, we are pleased with it's cost effectiveness, simplicity while achieving the ultimate objective of a surgical procedure in a T.B. spine with neurological deficit under our circumstances.

This is only an early report. We plan to carry this operation on more patients have a longer follow up to see if it can solve our problem in our circumstances. There have been quite a number of studies at various centers besides the Medical Research trails.[5,6,7,8] The Kalafong procedure[9] seems to be quite a better alternative to our procedure. But that is technically demanding and requires intensive postoperative care. As the authors themselves pointed out quite correctly that the tuberculosis is a variable disease. Hence controlled studies are required for a certain geographic area. This study is also an attempt towards an idea of a single stage surgery. We agree with Louw[10] that the rectangle provides a better 3 point fixation posteriorly than other implants. Hence in all of our patients this form of implant had been used.

CONCLUSION :

In keeping with the prevailing local socio-economical and health service conditions a less sophisticated easy and inexpensive surgical procedure has been developed which also uses a locally made implant. This may not meet the best of it's standard on an international level, but it has worked so far in our local circumstances. It remains to be seen about it's utility in larger number of patients and for longer period of follow up. However we believe that it will have it's utility in other countries as well with our kind of background.

REFERENCE :

1. Hodgson AR, Crenshaw AH. Campbell's Operative Orthopaedics. Vol. 2. 1980. Pp. 2091-2175. The C.V. Mosby Company.
2. Hodgson AR, Stock FE. Anterior spinal fusion : a preliminary communication on the radical treatment of Pott's disease and Pott's paraplegia. Br. J Surg 1956-1957; 44: 266-75.
3. Frankel HL, Hancock DO, Hyslop G, et al. The value of postural reduction in the initial management of closed injuries of the spine with paraplegia and tetraplegia. Paraplegia 1969; 7: 179-92.
4. Medical Research Council. A five-year assessment of controlled trails of in-patient and out-patient treatment and plaster-of-paris jackets for tuberculosis of the spine in children on standard chemotherapy: studies in Kasai and Pusan, Korea. J Bone Joint Surg (BR) 1976; 58-B: 399-411.
5. Medical Research Council. Five-year assessment of controlled trials of ambulatory treatment, debridement and anterior fusion in the management of tuberculosis of the spine : studies in Bulawayo, Rhodesia and in Hong Kong. J Bone Joint Surg (BR) 1978 a; 60-B: 163-77.
6. Medical Research Council. A controlled trial of anterior spinal fusion and debridement in the surgical management of tuberculosis of the spine in patients on standard chemotherapy : a study in two centres in South Africa. Seventh report of the Medical Research Council Working Party on Tuberculosis of the Spine. Tubercle 1978 b; 59: 79-105.
7. Medical Research Council. A ten-year assessment of a controlled trial comparing debridement and anterior spinal fusion in the management of tuberculosis of the spine in patients on standard chemotherapy in Hong Kong. J Bone Joint Surg (BR) 1982; 64-B: 393-8.
8. Travlos J, Tsoi Du G : Spinal Tuberculosis: Beware the posterior elements, Brief reports. J Bone Joint Surg (BR) 1990; 72B: 722-723.
9. Travlos J, Tsoi Du G : Spinal Tuberculosis : Beware the posterior elements, brief reports. J Bone Joint Surg (BR) 1990; 72B: 722-723.
10. Leuw JA. Spinal Tuberculosis with neurological deficit, treatment with anterior vascularized rib grafting posterior osteotomies and fusion. JBJS, 656-693, 72B, 4.1990