

Case Reports & Case Series

Innovative multi-cage long segment lumbar spine reconstruction for multilevel lumbar tuberculosis

Aftab Younus (Dr)^a, Adrian Kelly (Dr)^{b,*}

^a Department of Orthopedics, Helen Joseph Hospital, University of the Witwatersrand, Johannesburg, South Africa

^b Department of Neurosurgery, Helen Joseph Hospital, University of the Witwatersrand, Johannesburg, South Africa



ABSTRACT

Tuberculosis (TB) is a disease of poverty with a global concentration in sub Saharan Africa. While 10% of extra-pulmonary tuberculosis is skeletal, 50% of this occurs in the spinal column. Multi-level lumbar spinal TB is however a rarity, especially in the HIV negative population. Besides the medical management of this condition which decades ago revolutionized the treatment of these patients, spinal surgeons must today still decide on the best way to manage the challenges of progressive neurology, instability, deformity and the often large cold abscesses that accompany this condition.

We present a young immunocompetent male patient whom presented to our unit complaining of moderate lumbar backache of six months duration with associated progressive lower limb weakness of one week duration. Neurological examination utilizing manual muscle testing revealed a flaccid paraparesis with power 3/5. Our radiological investigations revealed extensive tuberculous destruction of multiple vertebrae of his lumbar spine and a large pre-vertebral lumbar tubercular abscess. The extensive tubercular involvement of his lumbar spine included unstable pathological burst fractures of L1; L2 and L4. Due to his progressive neurology secondary to bony compression he was taken to surgery and an open thoraco-abdominal approach to the lumbar spine was utilized to perform L1; L2 and L4 corpectomies followed by an innovative multi-cage reconstruction and fusion from T12 - L5. Post-operatively the patient had improvement in his symptoms and was discharged two weeks later in a brace, ambulant with a walker, on TB treatment, for out-patient follow-up. At his one year review he was independently ambulant with no progression of his deformity.

In conclusion patients with spinal TB often have profound radiological findings however in our patient multi-level corpectomies and an innovative multi-cage lumbar reconstruction enabled a resolution of his neurological deficit and a restoration of lumbar lordosis.

1. Introduction

Tuberculosis (TB) is a disease of poverty with a global concentration in sub Saharan Africa. While 10% of extra-pulmonary tuberculosis is skeletal, 50% of this occurs in the spinal column. Multi-level lumbar spinal TB is however a rarity, especially in the HIV negative population [1,2]. Besides the medical management of this condition which decades ago revolutionized the treatment of these patients, spinal surgeons must today still decide on the best way to manage the challenges of myelopathy, instability, deformity and the often large cold abscesses that accompany this condition. With regards tuberculosis of the lumbar spine the anterior; anterolateral; thoraco-abdominal; lateral trans-psoas and posterolateral trans-pedicular approaches are well described. We present a young immunocompetent male patient whom presented to our unit acutely paraplegic secondary to tuberculous involvement of almost his entire lumbar spine including unstable pathological burst fractures of L1; L2 and L4 with bony compression of the cauda equina. We successfully managed him by performing multiple level corpectomies and thereafter an innovative multi-cage multi-level lumbar spine reconstruction.

2. Case description

A 37 year old immunocompetent male patient presented to our unit complaining of moderate lumbar backache of six months duration. He also complained of progressive lower limb weakness of one week duration and he was now unable to walk for the preceding 3 days. On further questioning he confirmed that he had been losing weight and suffering from night sweats for several months. He denied having had TB before and had no TB exposure. Clinical examination revealed a healthy young male with no stigmata of immunosuppression. The examination of his lumbar spine revealed no midline tenderness however there was tenderness in the lumbar paraspinal area. Neurological examination utilizing manual muscle testing revealed a flaccid para paresis of 3/5 in the lower limbs bilaterally with absent knee and ankle reflexes. He was tested and found to be HIV negative and had no other medical problems. A chest X ray was performed which excluded obvious pulmonary TB. An MRI scan of his lumbar spine revealed extensive tuberculous destruction of multiple lumbar vertebrae and a large para-vertebral lumbar tubercular abscess. The extensive tubercular involvement of his lumbar spine included unstable pathological

* Corresponding author at: Department of Neurosurgery, Helen Joseph Hospital, Auckland Park, Johannesburg, South Africa.
E-mail address: adriankelly1000@yahoo.co.uk (A. Kelly).

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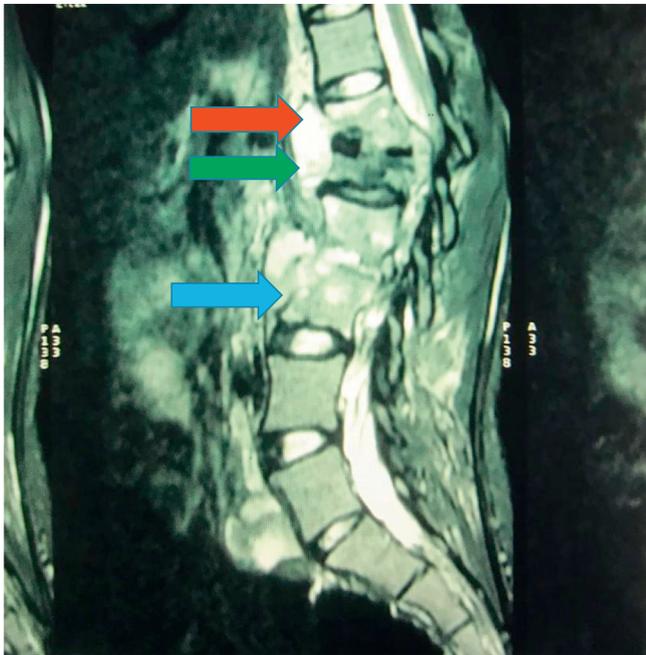


Fig. 1. Pre-operative MRI T2W: showing pathological burst fractures of L1 (red arrow), L2 (green arrow) and L4 (blue arrow) vertebral bodies with bony compression of the cauda equine.

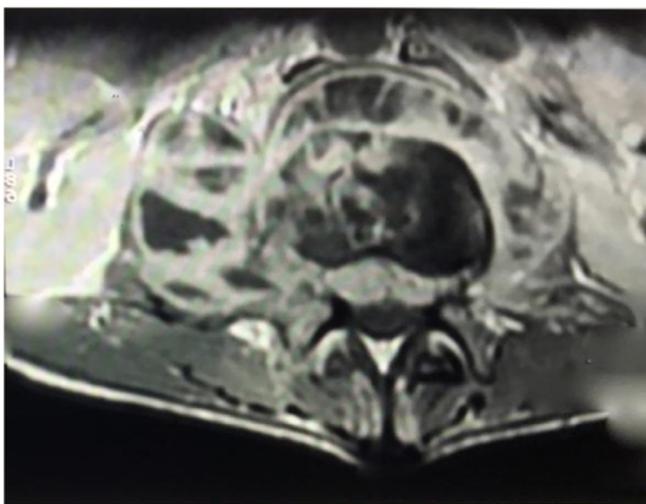


Fig. 2. Pre-operative MRI T1W post contrast axial: showing extensive pre-vertebral and para-vertebral tubercular abscesses.

burst fractures of L1; L2 and L4 with bony compression of the cauda equina [Figs. 1–2].

Due to his progressive neurology secondary to bony compression he was taken for urgent surgery and during the pre-operative planning an open thoraco-abdominal approach to the lumbar spine was decided upon [Fig. 3]. Our skin incision extended from the spinous process of T10 and was directed infero-medially following the 10th intercostal space onto the antero-lateral abdominal wall. The T10 and T11 costochondral junction's were divided to facilitate access to the T12 vertebral body. The left crus of the diaphragm was detached from the L1 vertebral body to allow us access for the L1 corpectomy. During the abdominal part of our approach to the lumbar spine the tense para-vertebral tubercular abscess was encountered which upon being drained provided an additional direct lateral trans-psoas approach to the lumbar spine through which the necessary corpectomies could be performed [Figs. 4–6]. Utilizing this thoraco-abdominal approach and a



Fig. 3. Intra-operative photograph showing patient positioned in the lateral position for a thoraco-abdominal approach to the thoraco-lumbar junction and lumbar spine with the proposed skin incision marked.

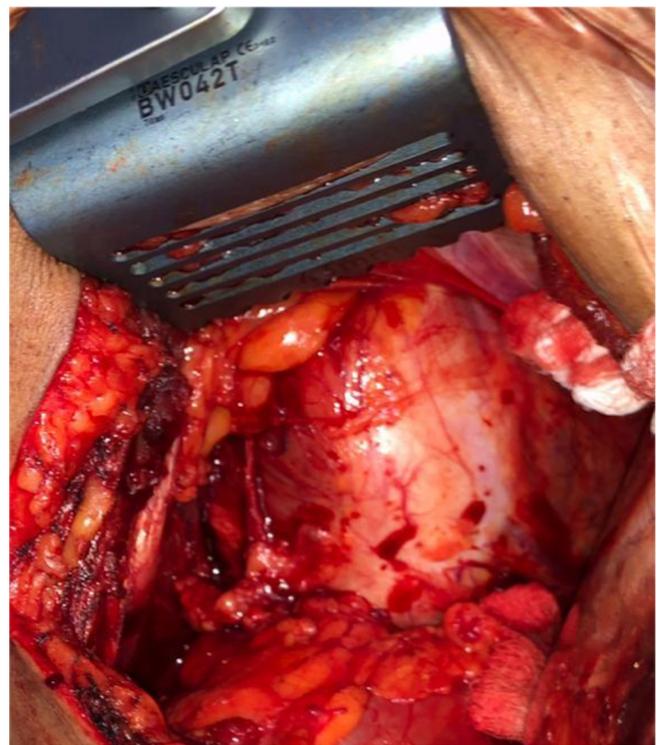


Fig. 4. Intra-operative photograph showing the lumbar paraspinal psoas abscess encountered during the abdominal part of the thoraco-abdominal approach.

trans-psoas lateral corridor provided by the abscess cavity, L1; L2 and L4 corpectomies were performed post fluoroscopic confirmation. The intra-operative finding was that the L3 vertebrae was sclerotic and not involved in the osseo-destructive process which made it available for an innovative multi-cage reconstruction. By placing a single expandable cage to replace the L1 and L2 vertebral bodies, and a second cage to replace the L4 vertebral body, we were able to preserve the L3 vertebral body and in addition utilize its superior and inferior end plates to anchor the inferior foot plate of the superior cage and the superior foot plate of the inferior cage respectively. We augmented this construct with a lateral rod placed antero-laterally to the psoas muscle with vertebral body screws in T12; L3 and L5 and bone graft fusion from T12 - L5 [Fig. 7]. Regarding the bone graft which was used to fill the cages and in addition was placed laterally over the transverse processes from T12-L5 we utilized freeze dried allogenic bone which we mixed with

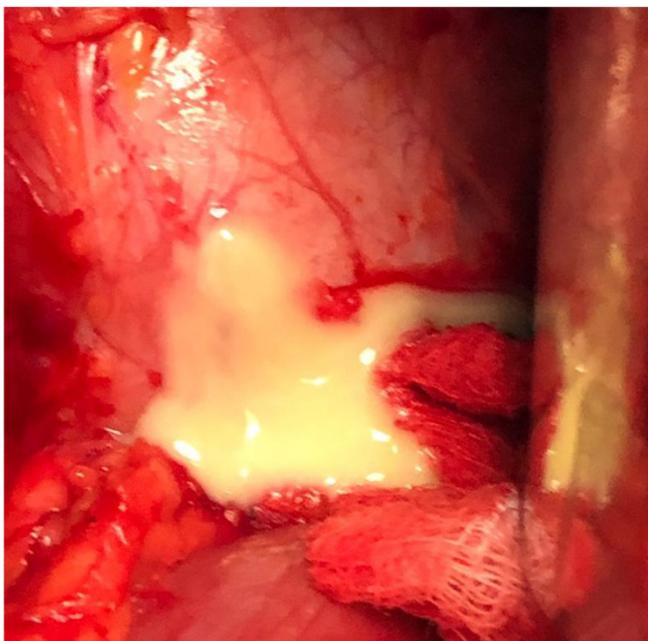


Fig. 5. Intra-operative photograph showing thick tubercular pus draining from the abscess post aspiration.



Fig. 6. Intra-operative photograph showing caseous material draining from the tubercular abscess.

the patient's blood.

Post-operatively the patient had improvement in his symptoms with progressive recovery of his lower limb neurology over several days. The microbiology Zeels Nielsen staining of a smear of the pus and caseous material failed to demonstrate *Mycobacterium tuberculosis* and only on the tuberculosis culture at six weeks post operatively was tuberculosis confirmed and the sensitivity to standard anti-tuberculosis medication established.

The patient had been commenced on standard tuberculosis medication from the time of admission receiving rifampicin 600 mg daily,

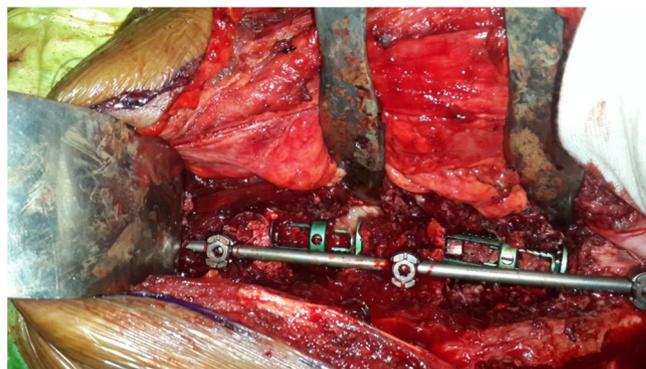


Fig. 7. Intra-operative photograph showing innovative long segment multi-segment lumbar spine reconstruction augmented by a lateral lumbar rod from T12-L5.

isoniazid 300 mg daily, pyrazinamide 1600 mg daily, and ethambutol 1100 mg daily, as well as pyridoxine 20 mg daily, for 18 months. In South Africa this standard cocktail of anti-tuberculous medication is administered in the form of the tablet rifapour with the required dose being achieved by the patient taking four tablets daily. Unlike pulmonary tuberculosis which employs an intensive phase of 2 months with all four drugs being given and then a continuation phase of 4 months with only rifampicin and isoniazid, in spinal tuberculosis the intensive phase is continued for a full 18 months.

At day 14 post-operatively the patient was discharged in a thoracolumbar sacral orthosis brace, ambulant with a walker, on TB treatment, for out-patient follow-up. At his three month review there was no significant progression of his deformity and the brace was discontinued. At his one year review he was independently ambulant with no progression of his deformity [Figs. 8–9]. He continued on his anti-tubercular medical treatment for 18 months.

3. Discussion

Besides the importance of confirming microbial sensitivity requiring a microbiological sample to be obtained in every case, specific challenges for spinal surgeons managing spinal TB concern the challenges of progressive neurology, instability, deformity and the often large cold abscesses that accompany this condition. Here the spinal surgeon must make important decisions on a patient by patient basis to ensure an optimal outcome.

On the subject of myelopathy there is a general consensus that a significant proportion of these patients improve on anti-TB drugs alone and in fact many studies challenge the benefit of surgery in the absence of obvious bony compression. The Medical Research Council Working Party on Tuberculosis of the Spine demonstrated that radical operation or even just surgical debridement offers no statistical benefit in this group compared to anti-TB medication alone. The conclusion from this study was that patients with myelopathy with/without functional impairment most often respond to anti-TB drugs once susceptibility is confirmed [3]. This statement is supported by various other studies where at least 80% of myelopathic patients experienced a complete resolution or complete functional recovery on medical treatment alone [4,5].

On the subject of lumbar tuberculosis neurological complications are uncommon as compared to tuberculous infection of the thoracic spine. In those patients presenting with neurology paraplegia is the most common presenting symptom. Lesions at or above L1 classically present as a myelopathy while below that nerve root symptoms predominate [6]. Surgery for lumbar tuberculosis is reserved for patients presenting with progressive neurology or deformity [7]. Here decompression of neural elements, correction of deformity, and bone grafting should be considered together as the aim of surgery. While autologous

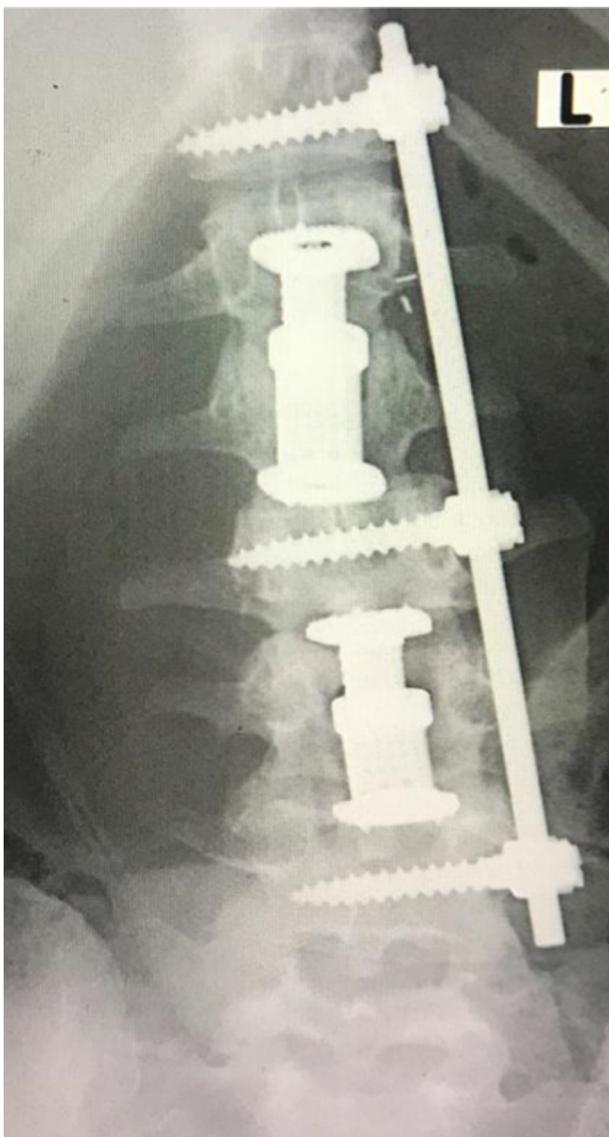


Fig. 8. Follow-up anteroposterior lumbar Xray at one year- showing construct in place with good alignment. Stainless steel liga vascular clips are visible on the left side of the superior cage.

bone grafting utilizing resected rib has traditionally been favored this is discouraged in long segment disease in the lumbar spine due to a high failure rate. A fibular graft or tri-cortical iliac crest graft is noted to offer superior stability and in centers with expertise in performing the procedure a vascularized iliac bone graft supplied by the first or second lumbar segmental vessel is the autologous graft of choice [8].

The benefits of tuberculosis not forming a biofilm on titanium implants enables these to be used for robust support. Long segment gaps are ideal for the utilization of these implants and both mesh and self-expanding cages are being used. These implants are filled with bone graft and thereby become osseo-conductive and osseo-inductive for immediate integrative osteogenesis [9].

The pre-vertebral tuberculous cold abscess is another surgical concern in its own right and again controversy exists as to the benefit of draining these collections. Proponents for intervention argue that antimicrobial penetration into these collections is poor and hence they should be drained. The benefits of intervention include relief of pain by relieving compression on neural tissue, earlier return to normal activities and a higher percentage and quicker bony fusion [10].



Fig. 9. Follow-up lateral lumbar spine Xray at one year- showing construct in place with acceptable degree of lumbar lordosis.

4. Conclusion

Patients with spinal TB often have profound radiological findings and multi-level involvement. While many benefit from a conservative approach progressive neurology secondary to bony compression is an indication for surgery. In our patient we considered the specifics of each involved vertebrae and by performing only the necessary corpectomies and thereafter an innovative multi-cage reconstruction our patient had a resolution of his neurological deficit as well as a restoration of lumbar lordosis.

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Declaration of Competing Interest

None of the authors have any financial nor personal relationships with other people, or organizations, that could inappropriately influence (bias) their work, all within 3 years of the beginning the work submitted.

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