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A prospective study comparing the clinical outcomes of conservative and surgically treated spinal tuberculosis

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Abstract---Introduction: Spinal tuberculosis is a serious form of extra pulmonary tuberculosis which if left untreated can be fatal; neurologic dysfunctions in association with active tuberculosis of spine can be prevented by early diagnosis and prompt treatment. Prompt treatment can reverse paralysis and minimize the potential disability resulting from Pott's paraplegia. A significant dilemma exists as to which line of management a patient needs to be subjected once diagnosed to have spinal tuberculosis. Objective: Assess the functional and neurological outcome of patients treated with different modalities of treatment and attempts to ascertain the best practise for effective management of a case of spinal tuberculosis. Materials and Methods: 22 adult patients diagnosed with spinal TB and treated with either conservative line of management or CT/USG guided pigtail catheter drainage with chemotherapy or surgery combined with chemotherapy, were considered. Patients were followed up until completion of anti-TB treatment. Clinical outcomes were assessed using Visual analogue scale, Oswestry Disability Index and modified McCormick grade. Results: Patients having milder form were treated conservatively using anti-tubercular drugs alone (n=13). Patients with well-established

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abscess and without instability were treated using CT/USG guided pigtail catheter drainage along with antitubercular drugs (n=6). Patients with severe neurological compromise were treated with surgical debridement with fusion techniques (n=3). Patients in all three groups responded well to the treatment they were subjected to. It was observed that various stages of spinal tuberculosis demanded different modalities of treatment. Conclusion: Early surgical intervention or pigtail catheter drainage along with antitubercular treatment when used judiciously allows early mobilisation of patients preventing complications.

Keywords---pott's spine, spinal tuberculosis, antitubercular treatment, pigtail catheter, psoas abscess, EPCD.

Introduction

Tuberculosis (TB) is one of the oldest diseases known to mankind and it continues to be one the leading causes of mortality and morbidity worldwide. [1] TB is broadly classified into Pulmonary and Extra-Pulmonary TB. Although Bone and Joint TB constitutes around 10 % of extrapulmonary tuberculosis, [2] spinal TB accounts for 50% all musculoskeletal TB. [3] Sir Percival Pott first described the disease in 1779.[3] The term "Pott's disease" is synonymously used for tuberculosis infection of spine whereas "Pott's paraplegia" is used to describe paraplegia resulting from Pott's disease. Spinal TB also remains as one the most common cause of non-traumatic paraplegia in most parts of the world. Spinal tuberculosis is a paucibacillary disease with slow growing bacilli, if not treated adequately, may cause serious complications like bone destruction, permanent neurological deficits and spinal deformities. These complications have a grave prognosis, poor quality of life and lower life expectancy. Early diagnosis and prompt treatment are the keys to prevent these complications associated with spinal TB.

Despite modern diagnostic methods, potent anti-tubercular drugs and advances in surgical management of spinal TB, issues regarding appropriate treatment remains controversial. Proposed treatment modalities include antitubercular chemotherapy alone or surgical intervention combined with chemotherapy. However, both the modalities come with various advantages, risks and limitations. Since management of patient with spinal tuberculosis remains a matter of debate in terms of optimal treatment strategy one needs to consider, this study was conducted at a tertiary teaching hospital to evaluate patients undergoing conservative treatment, USG/CT guided aspiration with chemotherapy and surgical combined with chemotherapy treatment modalities. The present study evaluates the relative clinical effectiveness between the above mentioned three types of management in a case of spinal TB. This study aimed to determine the role of different treatment method in managing a case of spinal tuberculosis.

Materials and Methods

After approval of institutional ethical committee this prospective study was carried out in Department of Orthopaedic Surgery in a tertiary care hospital in Mangalore, Karnataka. 22 patients aged more than 18 years suffering from cervical/thoracic/lumbar/sacral infective Spondylodiscitis who were biopsy proven with either PCR positive, GeneXpert positive or culture proven with *mycobacterium tuberculosis* were enrolled in the study. Patients having milder form of disease with minimal paravertebral collection were categorised as "Group A" and treated conservatively using anti-tubercular drugs alone (n=13). Patients with well-established abscess and without spinal instability were categorised into "Group B" and treated using CT/USG guided pigtail catheter drainage along with antitubercular drugs (n=6). Patients with severe neurological compromise were categorised into "Group C" and treated with surgical debridement with fusion techniques (n=3). Upon following up with patients until the completion of anti-TB treatment functional and neurological outcomes were assessed using Visual analogue scale, Oswestry Disability Index[4] and modified McCormick grade[5].

Results

A sample size of 22 patients diagnosed with spinal TB who met the above-mentioned inclusion criteria, were included in the study after obtaining written informed consent. 13 patients who presented with a milder form of the disease were managed with anti-Tuberculosis treatment alone. Remaining 7 patients needed intervention either in the form of USG/CT guided pigtail drainage of the paravertebral collection or a surgical debridement and fusion technique along with anti-TB treatment. In our study, majority of patients were males [15 (68.2%) patients] and rest 7 (31.8%) were females. Both conservative group A and pigtail group B showed male predominance with 76.9% and 66.7% respectively . However, surgical group C showed female predominance with 66.7% patients being female. The mean age of this study group was 39.05±13.247 years (range 19-60 years). Among 22 patients, 11 (50%) patients had history of other forms of tuberculosis, majorly pulmonary tuberculosis. The duration of symptoms ranged from 15 days to 12 months with a mean duration of 2.32months.

All 22 patients presented with pain as their predominant symptom. The next commonest presenting symptom was weight loss, which was seen in 9 patients of group A, 4 patients from group B and 3 patients from group C. This was followed by weakness in the limbs which was seen in 7 patients from group A, 2 and 3 patients from group B and group C respectively. Among 22, 17 patients were found to have motor and sensory deficits. However, autonomic involvement in the form of bowel and bladder involvement was observed exclusively in surgical group C amounting to 66.7%. 17 patients had two level vertebral involvement, 4 patients had single vertebral involvement and one patient had multiple level involvement. However, the predominant vertebral involvement was seen in thoracic and lumbar vertebra accounting to 7 patients each, followed by cervical vertebra in 4 patients.

On MRI, all patients in surgical group C had features of cord compression, disc space narrowing, paravertebral collection, vertebral body destruction and collapse. Paravertebral collection was observed in all 6 patients of pigtail catheter

group B. Vertebral body destruction was seen among 11 patients in group A and 2 patients from group B. Due to loss of follow-up of one patient from group A, the outcomes were assessed among a total of 21 patients. The functional and neurological outcomes were assessed using Visual analogue scale, Oswestry Disability Index[4] and modified McCormick grade[5] recorded at the time of initiation of treatment and after completion of the treatment. All patients showed good functional and neurological improvement irrespective of the treatment they were subjected to.

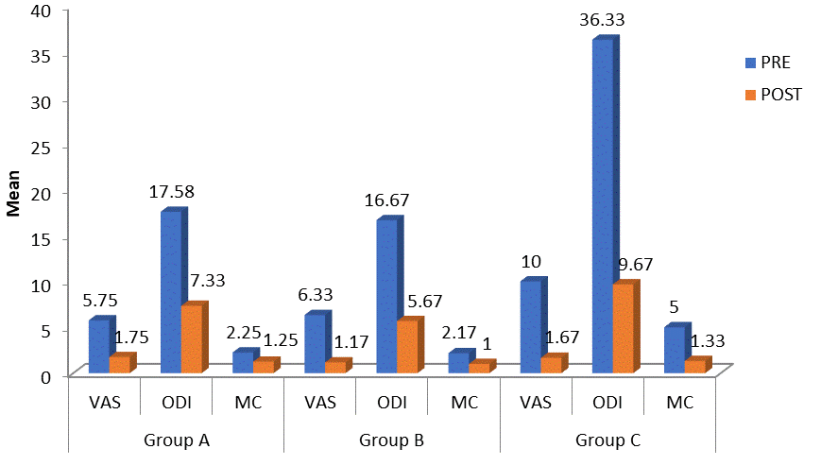
VAS scores		Zero	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten
Group A (Conservative) (n=12)	Pre Rx	0	0	0	0	4	1	4	0	3	0	0
	Post Rx	1	5	4	0	2	0	0	0	0	0	0
Group B (Pigtail) (n=6)	Pre Rx	0	0	0	1	0	0	2	1	2	0	0
	Post Rx	1	4	0	1	0	0	0	0	0	0	0
Group C (Surgical) (n=3)	Pre Rx	0	0	0	0	0	0	0	0	0	0	3
	Post Rx	1	1	0	0	1	0	0	0	0	0	0

ODI Scores		0-20%	20-40%	40-60%	60-80%	80-100%
Group A (Conservative) (n=12)	Pre Rx	1	7	4	0	0
	Post Rx	9	2	1	0	0
Group B (Pigtail) (n=6)	Pre Rx	1	3	2	0	0
	Post Rx	5	1	0	0	0
Group C (Surgical) (n=3)	Pre Rx	0	0	0	2	1
	Post Rx	2	0	1	0	0

McCormick functional grade		Grade1	Grade2	Grade3	Grade4	Grade5
Group A (Conservative) (n=12)	Pre Rx	3	4	4	1	0
	Post Rx	9	3	0	0	0
Group B (Pigtail) (n=6)	Pre Rx	2	2	1	1	0
	Post Rx	6	0	0	0	0
Group C (Surgical) (n=3)	Pre Rx	0	0	0	0	3
	Post Rx	2	1	0	0	0

	Group A		p-value	Group B		p-value	Group C		p-value
	Mean±SD N=12			Mean±SD N=6			Mean±SD N=3		
	PRE	POST		PRE	POST		PRE	POST	
VAS	5.75±1.603	1.75±1.215	<0.001	6.33±1.862	1.17±0.983	0.002	10.00±0.000	1.67±2.082	0.020
ODI	17.58±6.762	7.33±5.314	<0.001	16.67±8.262	5.67±3.011	0.024	36.33±7.572	9.67±11.547	0.008
MC	2.25±.965	1.25±0.452	<0.001	2.17±1.169	1.00±0.000	0.058	5.00±0.000	1.33±0.577	0.008

On evaluation of outcome assessment scales used in this study among patients of Group A, B and C, all patients had statistically significant outcome on comparing VAS score, ODI score and McCormick functional grades. ($p<0.05$) with an exception of Group B not showing significant difference($p=0.058$) on McCormick functional grade pre- and post-treatment.



outcome assessment summary

Discussion

Among the extrapulmonary TB, Spinal TB is considered a serious form of TB which is associated with high morbidity and mortality if left untreated. Controversies regarding the optimal treatment for patients with spinal TB still exists. Although anti-TB chemotherapy is now the mainstay treatment for spinal TB, it may not be applicable in all situations, especially among patients with impending instability and worsening of deformity and neurologic deficit. For such cases, surgery was considered as the mainstay treatment among few studies[6,7] which were conducted previously. In this prospective study, outcomes of three modalities of treatment opted for our patients have been analysed using preoperative and postoperative VAS and ODI scores. We analysed factors influencing the clinical outcome in patients treated for spinal TB, focussing on the modality of treatment adopted.

Mean age of patients in our study is 39.05±13.247 years with a range 19-60 years which was comparable to an Indian study by Bhojraj et al, [8] on adult lumbar and lumbosacral tuberculosis spondylodiscitis, included 66 patients, with mean age of 40 years and range 19-78 years. The present study showed male predominance

with 15(68.2%) males and 7(31.8%) females. This was comparable to an epidemiological study of spinal tuberculosis by Ramos et al [9], which reported 61% of the patients were males and rest 39% were females. In our study, 11(50%) patients had history of concomitant pulmonary tuberculosis. Dharmalingam et al [10] study showed concomitant pulmonary tuberculosis were recorded in 66.63% patients.

Mean duration of symptoms at the time of presentation is 2.318±2.507 months with 17 (77.27%) patients presenting within 3 months from the onset of symptoms. Similar study by Tuli et al [11] reported 19.3% patients presenting within 3 months. Lumbar and dorsal vertebrae are usual sites of infection. In this study, order of frequency of involvement were dorsal vertebra and lumbar vertebra, having 7 (31.8%) patients each, cervical vertebra in 4 (18.2%) patients, thoracolumbar junction in 3 (13.6%) patients and 1 (4.5%) patient had sacrococcygeal vertebra involvement. This was comparable with the Korean study by Park et al [12] in which 44.8% of patients had disease of the lumbar spine, 31.3% had that of the dorsal spine. In the present study pain is the commonest presenting symptom in all patients. However, 17(77.3%) patients had neurological deficits. Heyes et al [13] reported pain in 95% of the study group and neurological deficits in 47% which was comparable to our study.

In the present study, the average number of vertebrae involved by tuberculosis is 2±0.97 which was closer to the average number of vertebrae involved in a study by Lifeso et al [14] was 2.1 and another study conducted by Hodgson et al [15] was 3. In our study 13(59.1%) of patients were treated conservatively ,6 (27.3%) patients were treated using USG/CT guided drainage along with chemotherapy and rest 3(13.6%) patients underwent surgical intervention which was similar to a study by Alam et al [16] where among 50 patients included in their study 30(60%) were treated conservatively and 20(40%) were opted for surgical treatment. Majority of the patients in our study was managed conservatively (59.1%) which was comparable with the study in the USA conducted by Rezai et al [17] (55% treated conservatively) and Indian study conducted by Bhojraj et al [8] where majority patients (83%) were opted for conservative management.

In our study, patients who were opted for conservatively management showed favourable improvement in VAS, ODI and McCormick grades post treatment. The mean VAS improved from 5.75±1.603 to 1.75±1.215. Mean ODI from 17.58±6.762 to 7.33±5.314, mean McCormick grade from 2.25±.965 to 1.25±0.452. In a study by Bhojraj et al [8] , 83% of patients who underwent conservative management had complete resolution of symptoms, remaining 17% patients who did not respond to conservative treatment were regarded as poor outcome and opted for surgical management. In the present study, all patients had statistically significant outcome following USG/CT guided pigtail catheter drainage treatment management on comparing VAS score and ODI scores pre- and post-operatively ($p<0.05$) On comparing McCormick functional grade pre- and post-treatment, no statistically significant difference was seen. ($p=0.058$). Preoperative and post-operative ODI and VAS was analysed in a study by Zhang et al [18] after CT guided percutaneous catheter drainage and percutaneous catheter infusion chemotherapy. Back pain VAS improved from 6.5 ± 3.0 to 2.4 ± 2.3 and ODI mean from 33.6 ± 12.3 to 8.1 ± 4.6 both of which were statistically significant.

Patients treated with surgical modality of treatment using “Extended Posterior Circumferential Decompression (ECPD)” approach and posterior fixation and fusion showed significant improvement in mean VAS from 10.00±0.000 pre operatively to 1.67±2.082 post operatively with p-value 0.020, mean ODI improved from 36.33±7.572 to 9.67±11.547 and mean McCormick grade showed significant improvement from 5.00±0.000 to 1.33±0.577. Kunakornsawat et al [19] evaluated clinical outcomes, including pain and neurologic status and radiological outcomes of patients treated with extended posterior decompression, posterior fixation and fusion among 50 patients. Mean VAS scores improved from 7.8±1.4 to 1.7±1.3 (p<0.01). Ten patients (20%) had Frankel grade E preoperatively, which was improved to 38 patients (76%) postoperatively. A significant improvement of the kyphotic Cobb angle was observed when compared at the preoperative, early postoperative, and final follow-up period.

Rathinavelu et al [20] studied the clinical, functional and radiological results of patients with tuberculous spondylitis with and without paraplegia, treated surgically using the "Extended Posterior Circumferential Decompression (EPCD)" technique with nine months of anti-tubercular treatment and serial follow-up of 36 months. Disease-healing with bony fusion (interbody fusion) was seen in 97.5% of cases. Average deformity (kyphosis) correction was 54.6% in dorsal spine and 207.3% in lumbar spine. Corresponding loss of correction was 3.6 degrees in dorsal spine and 1.9 degrees in the lumbar spine. Neurological recovery in Frankel B and C paraplegia was 85.7% and 62.5%, respectively. In a study from Mumbai, India by Ramani et al [21] surgical experience and outcome of anterior instrumentation of patients with cervical Tuberculosis were assessed. the improvement in pain postoperatively was assessed by VAS which changed from a pre-operative average of 7 to 2 at follow-up after 4 months and 85% of patients had complete relief of pain. The present study is not a randomized trial, and hence a statistical significance cannot be drawn from it. Deformity assessment and correction was not evaluated due to inadequate sample size in the surgical group. Non-homogeneity of factors such as stage of the disease and different management criteria were among the limitations of the present study.

Conclusion

Spinal tuberculosis is a common health problem with high mortality and morbidity. Our study suggests that there is no difference in the patient outcome irrespective of the treatment modality employed. However, early surgical intervention allows early mobilisation of patients preventing complications.

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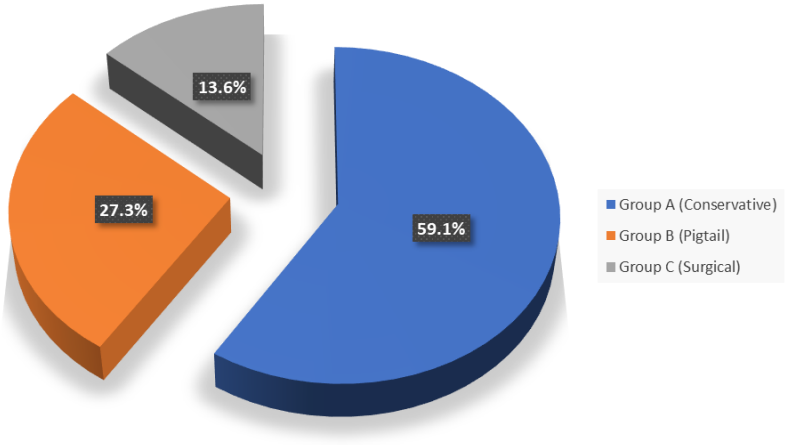
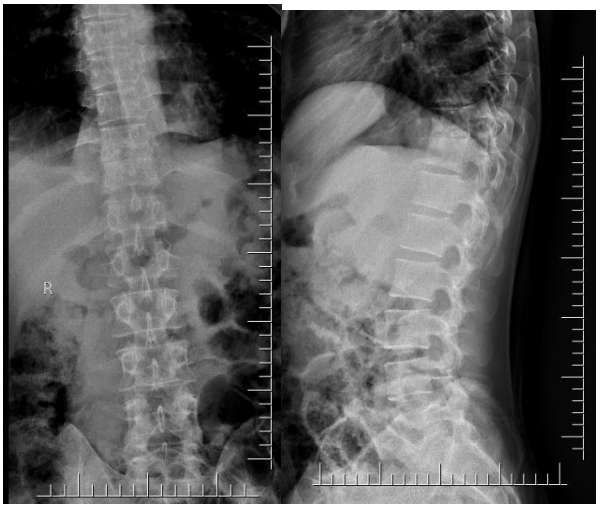
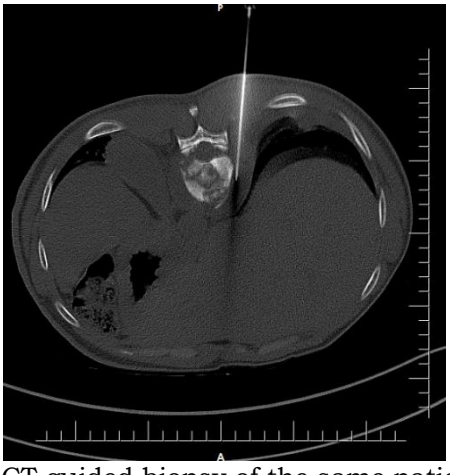


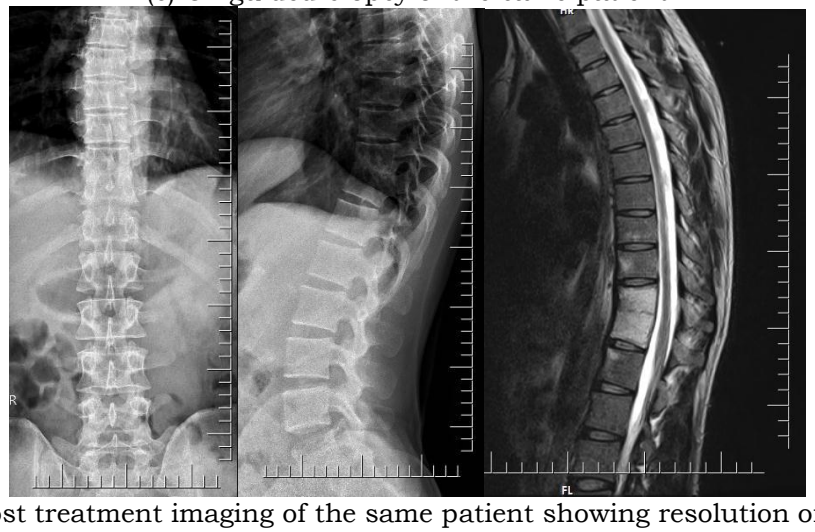
distribution of patients based on treatment



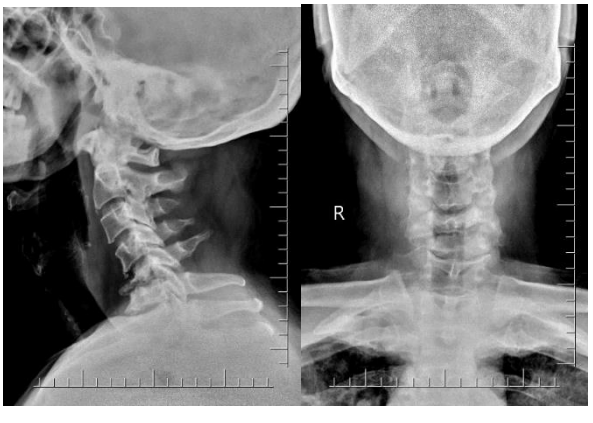
(a,b) Pre-treatment X-rays of a patient who received anti-tubercular treatment alone showing involvement of contiguous vertebral bodies

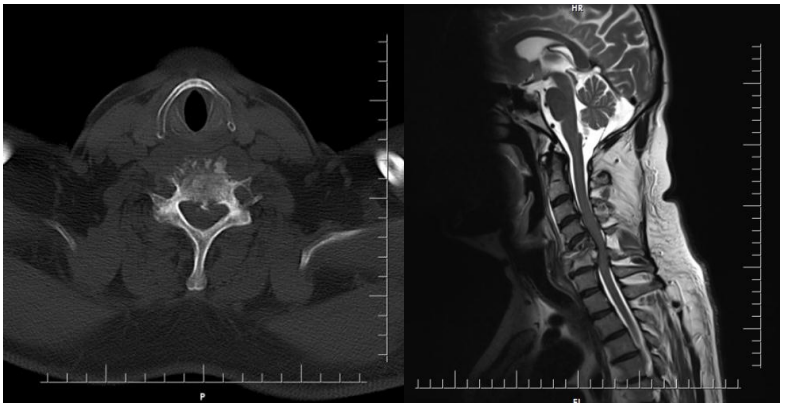


(c) CT guided biopsy of the same patient

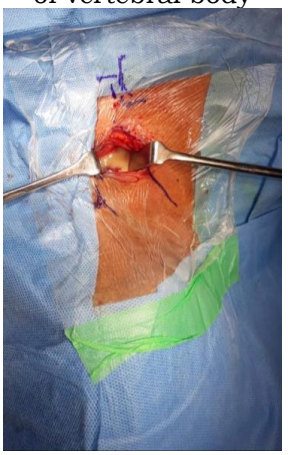


(d,e,f) post treatment imaging of the same patient showing resolution of disease with anti-tubercular treatment alone

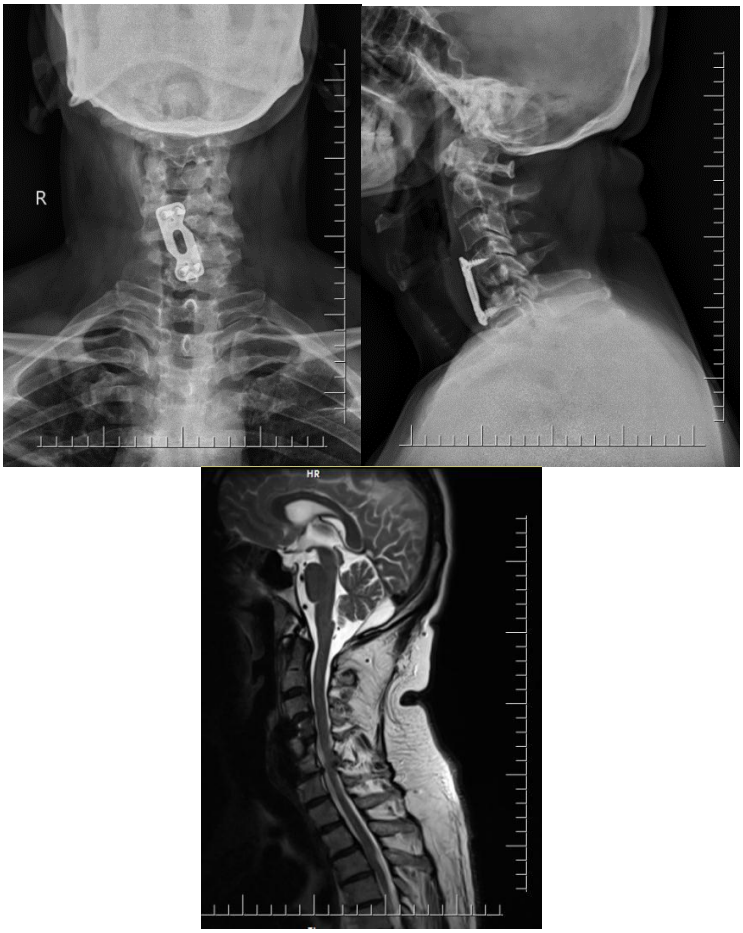




(g,h,I,j)Pre-treatment imaging of a surgically treated patient showing destruction of vertebral body



(k) Intra operative visualisation of paravertebral collection



(l,m,n) Post operative imaging of same patient showing implants in place following anterior fusion