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Spontaneous Pyogenic Spinal Epidural Abscess

Spontan Spinal Epidural Abse

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ABSTRACT

AIM: Spontaneous pyogenic spinal epidural abscess (SEA) is a rare condition but might be devastating and fatal. Traditional treatment is surgical decompression and antibiotics. A retrospective study was designed to assess the effect of clinical findings and treatment methods on the outcome.

MATERIAL and METHODS: 14 patients were reviewed (10 male, 4 female, mean age 59.14). Six dorsal, seven ventral and one dorsal with ventral SEA were observed. SEA found in thoracal (5), lumbar (4), cervical (3) regions. One patient showed both cervical and thoracal and one patient showed cervical, thoracal and lumbar involvement. All patients received minimum 3 weeks of I.V., followed by minimum 3 weeks of oral antibiotics. All patients complained of spinal pain. Ten patients presented with fever. Neurological deficit was observed in 9 cases.

RESULTS: A total of 22 interventions was performed. Instrumentation was applied in 5 cases. Full recovery was achieved in 7 patients, significant improvement was observed in 5 patients. The neurological findings did not change in one patient. One mortality and one morbidity were observed.

CONCLUSION: Spontaneous SEA is a rare disease but might result in catastrophic neurological deficits and fatal even with prompt treatment. Therefore, one should always keep SEA in mind if a patient presents with fever, vague and spinal pain.

KEYWORDS: Spinal infection, Spinal epidural abscess, Spondylodiscitis, Spinal instrumentation, Antibiotics, Spinal surgery

ÖZ

AMAÇ: Spinal epidural abseler spinal cerrahi pratiğinin nadir problemlerindendir. İnsidansı yaklaşık 1,2/10.000'dir son yıllarda modern tanı yöntemlerinin daha yaygın kullanımı ile birlikte tanı koymak kolaylaşmıştır. Bu çalışmada kliniğimizde spontan epidural abse nedeniyle tedavi edilen hastalar retrospektif olarak incelenmiştir.

YÖNTEM ve GEREÇ: Toplam 14 hasta spontan spinal abse tanısıyla tedavi edilmiştir. 10 hasta erkek ve 4 hasta bayandır. Ortalama yaş 59,14. 6 hastada dorsal, 7 hastada ventral, 1 hastada hem dorsal hem ventral yerleşimli abse saptanmıştır. 5 hastada torakal, 4 hastada lomber, 3 hastada servikal, 1 hastada servikal ve lomber, 1 hastada ise tüm spinal kolonda tutulum görülmüştür. Tüm hastalar minimum 3 hafta IV ve sonrasında minimum 3 hafta oral antibiyotik tedavisi aldı. Toplam 9 hastada nörolojik muayenelerinde çeşitli bulgular saptandı. Tüm hastalarda spinal ağrı ve 10 hastada ateş yakınması saptandı.

BULGULAR: Toplam 22 girişim yapıldı 5 hastaya enstrumantasyon uygulandı. En sık saptanan mikroorganizma Staphylococcus auerus'du. Tam düzelme 7 hastada görüldü, 5 hastada belirgin düzelme sağlandı. 1 hastada nörolojik fonksiyonlarda iyileşme olmadı. 1 mortalite ve 1 morbidite görüldü.

SONUÇ: Spontan spinal epidural abse ağır morbidite ve hatta mortalite ile sonuçlanabilecek ciddi bir problemdir. Spinal ağrı ve ateş yakınması ile başvuran hastalarda mutlaka akılda tutulması gereken bir hastalıktır. Erken tanı ve müdahale hayat kurtarıcıdır.

ANAHTAR SÖZCÜKLER: Spinal enfeksiyon, Spinal epidural abse, Spondilodiskitis, Spinal enstrumentasyon

INTRODUCTION

Spontaneous spinal epidural abscess (SEA) is an uncommon problem that accounts for 0.2 to 2 per 10.000 hospital admissions (2,15). Recent studies have reported higher rates (4,11,34). Ptaszynski et al found 0.88 cases per 100,000 person-years, in the first report of the population-based incidence of SEA (32). SEA represents a spinal emergency condition and a potentially life-threatening disease that can cause severe neurological deficits by either; a) compression of abscess onto the spinal cord or nerve roots or b) ischemia due to compression. The neurological deficits can be as severe as paralysis.

SEA is usually localized in the thoracal region and closely followed by lumbar involvement. Cervical involvement occurs in less than 15% of epidural abscess cases (7,12,16).

Dorsal location of abscess is observed in almost two thirds of cases probably due to of heametogenous spread, but might be contiguous spread from a paravertebral infection. On the other hand, ventrally located abscess is rare and usually associated with spondylitis and/or discitis (12).

The most common agents responsible for SEA are gram-positive microorganisms (80%) with staphylococcus aureus the most cultured agent. This is followed by gram-negative and anaerobe microorganisms (16).

The study presented here reports the retrospective analysis of the patients with spontaneous SEA since 1997.

MATERIAL and METHODS

We retrospectively reviewed the records and radiologic studies of the patients who were treated for SEA, between January 1997 and October 2009. A total of 32 patients were diagnosed as spinal epidural abscess. 18 patients are eliminated from the study due to they had an overt iatrogenic cause in their close medical history to develop spinal abscess. The remaining 14 patients included to the study.

The four of the patients were female and ten patients were male. The mean age was 59.14 and age range was (49-74).

The demographic and clinical data of the patients is shown on Table I and II.

Six patients (patients no: 1, 2, 4, 8, 9, 11) showed dorsally located SEA (42.9%) and seven patients (patients no: 3, 5, 6, 7, 10, 12, 14) showed ventrally located SEA (50.0%). In one patient (patient no: 13) both ventral (cervical) and dorsal (thoracal) SEA (7.1%) were observed (Figure 1 and Table I).

Five patients (patients no: 1, 2, 4, 7, 12) showed thoracal involvement (35.8%), four patients (patients no: 6, 9, 10, 11) showed lumbar involvement (28.6%), three patients (patients no: 3, 5, 8) showed cervical involvement (21.4%), one patient (patient no: 13) showed both cervical and thoracal involvement (7.1%) (Figure 1, Table I). In one patient (patient no: 14), the involvement of all spinal regions (cervical, thoracal and lumbar) was observed (7.1%)

A total of 8 patients (57.1%, patients no: 2, 3, 5, 6, 7, 12, 13, 14) showed spondylodiscitis in addition to spinal epidural abscess (Table I). Only patient no: 2 showed dorsal SEA with spondylodiscitis (Figure 2, Table I).

In 12 patients the initial treatment method was surgical decompression under general anesthesia (Table II). In one patient (patient no: 11) the drainage of the abscess was performed with 18 no spinal gauge under fluoroscopy. In one patient (patient no: 6) antibiotic therapy was applied as an initial treatment method after CT-guided biopsy. However, in the 3rd week of I.V. antibiotic therapy the patient was operated due to onset of severe neurological deficit (Table I).

Antibiotic therapy was applied according to microbiology culture and antibiogram studies. All patients received minimum 3 weeks of I.V. antibiotics (mean: 6.57) therapy and followed by oral antibiotics for minimum 3 weeks for 12 patients (mean:4.33) (Table III). The application of metallic instrumentation to the spine (totally 5 patients, Table II) was extended the antibiotic treatment to minimum 6 weeks I.V. (mean: 11.0; for 5 patients) and minimum 4 weeks oral (mean:4.0; for 3 patients) (Table III). The antibiotic treatment

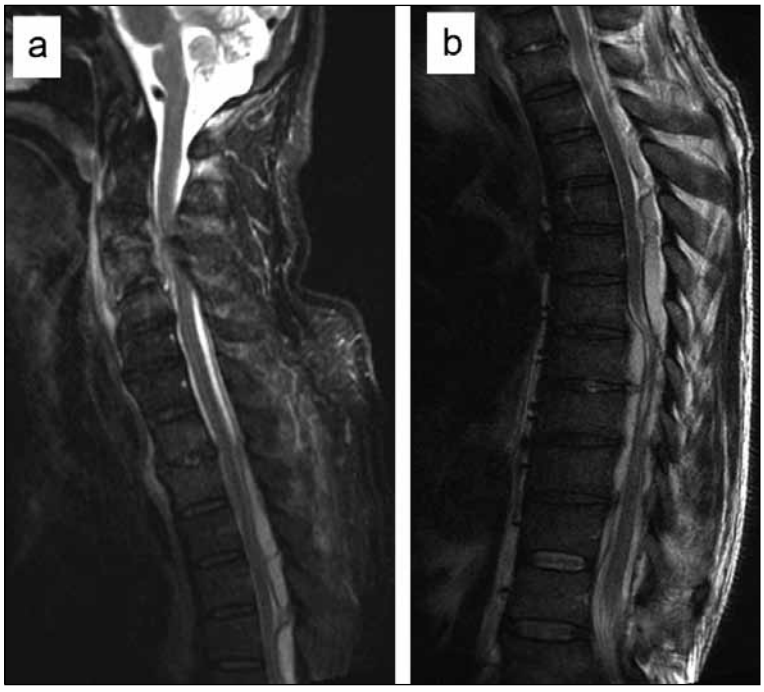

Figure 1: Patient no;13, sagittal T2 -weighted image **A)** shows spondylodiscitis with SEA at C3-5 level. **B)** T4-7 dorsal abscess.

Figure 2: Patient no; 2, sagittal T2-weighted image shows spondylodiscitis with SEA at T8-9 levels and dorsal epidural abscess between T7-9 levels.

Table I: Demographic and Clinical Data of the Patients

Patient No	Age	Sex	Complaints	Neurologic Examination ASIA*	Medical History	MR Findings	Time to Diagnosis (Day)
1	72	M	Back pain Subfebrile fever Difficulty in walking	84	DM	T8-11 Dorsal abscess	9
2	60	M	Back pain Subfebrile fever Difficulty in walking	78	NA	T7-9 Dorsal abscess and T8,9 Spondylodiscitis	6
3	51	M	Neck pain Fever	100	Chronic renal failure	C4-5 Ventral abscess and C4,5 Spondylodiscitis	2
4	65	F	Back pain Fever Difficulty in walking	100	DM	T9-10 Dorsal abscess	3
5	75	M	Difficulty in breathing Fever Motor weakness at extremities	30	DM	C3-6 Ventral abscess C4-5 Spondylodiscitis C3-6 Cervical stenosis	12
6	57	M	Low back pain Subfebrile fever Difficulty in walking	95	NA	L3-4 Spondylodiscitis and Ventral abscess	7
7	49	M	Back pain Subfebrile fever Difficulty in walking	78	Pancreas CA: Surgery (8 months ago) Chemotherapy and radiotherapy (6 months ago)	T3-4 Spondylodiscitis and Ventral abscess	11
8	72	F	Neck pain Weakness at left arm	96	DM	C6-7 Dorsal abscess	19
9	44	M	Back pain Fever	100	DM	L5 dorsal abscess	2
10	67	M	Low back and Right leg pain	88	DM	L1-2ventral abscesses	9
11	68	F	Pain at low back and both legs	70	DM	L2-3 dorsal abscess	4
12	42	M	Back pain Difficulty in walking	70	DM	T8-T9 ventral abscess T8-9 spondylodiscitis	8
13	44	M	Back pain Muscle weakness at arms and legs nausea	74	Ischemic heart disease	C3-C5 ventral abscess, C4-5 Spondylodiscitis Cervical canal stenosis T4-7 dorsal abscess	37
14	62	F	Back pain Muscle weakness at arms and legs nausea Difficulty in walking	80	Ischemic heart disease DM	Cervical, thoracal abscess lumbar vertical abscess L5-S1spondylodiscitis	26

• ***ASIA:*** *American Spinal Injury Association*

period was determined depending on clinical findings and blood analysis (erythrocyte sedimentation rate (ESR), C-reactive protein (CRP)). Improvement in clinical findings and decrease by half of the infection markers (ESR, CRP) is accepted to change I.V. treatment to oral treatment (35).

The patients who showed neurological deficit was placed on a physical therapy and rehabilitation program as soon as possible following surgery.

All patients were followed-up for a minimum of 16 months (mean: 28.0) (Table II).

RESULTS

A total of 22 interventions (including CT-guided biopsy and drainage with fluoroscopy) was performed to 14 patients (Table II). Three operations were performed on patient no:5 in three different sessions. Three operations were performed on patient no: 13 in two different sessions. Two operations were performed on patients no: 2 and 3 in same sessions and two interventions were performed on patients no: 6 and 11 in different sessions. A single procedure was performed on eight patients (patients no: 1, 4, 7, 8, 9, 10, 12 and 14). In 5 patients (patients no: 2, 3, 5, 7, 13), metallic instrumentation was

Table II: Clinical Data of the Patients

Patient No	Surgery (Intervention) 1st	2nd	3rd	Follow-up (months)	Outcome ASIA*
1	T8-T11 total laminectomies and abscess drainage			35	100
2	A)T8-9 corpectomies and cage insertion B)T8-9 total laminectomies, abscess drainage and T6,7,10,11 posterior instrumentation			34	100
3	A)C4-5 corpectomies, abscess drainage and cage insertion B)C3-6 posterior lateral mass fixation			28	100
4	T9-10 total laminectomies and abscess drainage			30	100
5	C3-6 total laminectomies and biopsy	C4-5 corpectomies, abscess drainage and cage insertion	C0-7 posterior sublaminar wire fixation	16	Exitus
6	CT guided transpedicular biopsy	L4 left hemilanotomy and abscess drainage		36	98
7	T3-4 corpectomies, abscess drainage, cage insertion and T2-5 anterior plate fixation			38	90
8	C6-7 left hemilaminectomy and abscess drainage			40	100
9	L5 left hemilaminotomy and abscess drainage			22	100
10	L1 right hemilaminectomy and abscess drainage			21	100
11	Abscess drainage with fluoroscopy	Abscess drainage with fluoroscopy		22	94
12	T8-9 right hemilaminectomies and abscess drainage			20	90
13	C3-5 laminectomies, abscess drainage and C3-5 fixation posterior lateral mass	C4-5 Anterior Microdiscectomy and abscess drainage		22	76
14	L4 right hemilaminectomy and abscess drainage			28	90

* ***ASIA:*** *American Spinal Injury Association*

Table III: Clinical Data of the Patients

Patient No	Fever	Leukocyte	ESR (1 hour)	CRP	Microorganism	Antibiotic Treatment (weeks)	
						I.V.	Oral
1	(+)	16.5	78	181	Staphylococcus xylosus	3	3
2	(+)	9.1	80	150	Staphylococcus aureus	6	4
3	(+)	14.3	36	23	MRSA	6	4
4	(-)	11.4	30	18	Staphylococcus aureus	3	4
5	(+)	7.8	96	344	MRSA	25	-
6	(+)	15.8	48	123	Staphylococcus aureus	5	6
7	(-)	10.2	28	53	MRSA	6	4
8	(+)	13.2	70	115	Streptococcus oralis	3	3
9	(-)	12.2	32	28	Staphylococcus aureus	3	3
10	(-)	12.2	58	46	Staphylococcus aureus	3	3
11	(+)	26.8	74	139	Staphylococcus aureus	4	6
12	(+)	13.0	86	288	Staphylococcus aureus	4	4
13	(+)	12.4	26	59	Staphylococcus aureus	12	-
14	(+)	16.4	110	220	Staphylococcus aureus	9	8
Mean		**16.40**	**60.85**	**127.64**		**6.57**	**4.33***

** 12 patients*

applied to stabilize the spinal column after decompression procedures (Figure 2).

All patients showed signs of infection (elevated ESR rate and CRP levels) in blood samples (Table III). The mean ESR was 60.86 and mean CRP was 127.64. Four patients (patients no: 4, 7, 9, and 10) were admitted to the outpatient clinic with complaints of spinal pain and radicular symptoms, and there was no fever.

Time to diagnosis was 2-31 days (mean: 11.07) (Table I). Twelve patients showed improvement following surgical intervention and appropriate antibiotic therapy. Full recovery achieved in 7 patients (Table II). In one patient (patient no: 13) the neurologic status did not change; only pain relief was achieved. On the other hand, one patient (patient no: 5) died even to multiple surgeries and aggressive antibiotic therapy for 6 months. In one patient (patient no: 13), severe morbidities (acute renal failure, atrial fibrillation, pneumonia, urinary tract infection) were observed in the second postoperative period. The antibiotic treatment for this patient was 12 weeks I.V. both for SEA and developed morbidities. The oral antibiotic after I.V. treatment was given for the morbidities (Table III).

DISCUSSION

Spinal epidural abscess is first reported by Morgagni in 1796 (19,33). In 1948, Huesner described the clinical findings, treatment and outcome of SEA (15). The SEA following spinal surgery or spinal intervention (such as pain procedures) is a well known complication. Recently Grewal et al reported a review article to minimize the risk of anesthetic practice (13).

Most of the patients with SEA is associated with an disease (such as Diabetus Mellitus (DM), AIDS, Chronic renal failure, cancer, cirrhosis) or condition that suppress the immune system (e.g. alcoholism, I.V. drug abuse, trauma).

D.M. is the most common disease as a factor in 18-54% of cases (9,17,30). I.V. drug abuse 7-40% (1,10) and remote infections 7-44% (20,26) are the other common factors that associated with SEA.

Only 10-20% of patients have no predisposing factor (31,38,40).

We observed similar findings; 9 patients (64.2%) had DM, one patient had chronic renal failure and one patient had pancreas carcinoma.

The presenting symptoms are mainly spinal pain and fever. The neurological deficit might develop in hours or even in months due to compressive effect of epidural abscess or ischemia. The exact mechanism of how an epidural abscess causes spinal cord damage is still unclear.

There is not always parallel findings with the size of spinal cord compression and clinical picture (28). Severe neurological deficit with intact subarachnoid space and severe cord compression without neurological deficit have both reported (6). We observed similar findings, for example patient no: 8 admitted with obstructed subarachnoid space and severe spinal cord compression in the MRI study (Figure 3). However, the neurological examination showed only monoparesis due to radiculopathy (Table I). On the other hand, patient no:12 was admitted with severe paraparesis but the MRI study showed intact subarachnoid space (Figure 4). Additionally, the recovery following surgery even in the patients with unobstructed subarachnoid space is slower compared to the patients with significant spinal cord compression due to tumor. Therefore, it is reasonable to explain the mechanism of the spinal cord dysfunction with ischemia due to compression of spinal arteries and/or thrombosis of leptomeningeal vessels (5).

The literature shows that most of the patients present with dorsal thoracal involvement. This is explained by this segment having a relatively larger epidural space and especially the size of Batson's epidural venous plexus is bigger compare to other spinal segments. Batson believed that the microorganism could spread via a valveless low pressure venous system. Therefore, it is thought that these anatomic features allow easy abscess formation (4,38,41).

On the other hand, Wiley and Trueta (41) showed the vascular anatomy of the spine. They reported that Batson's plexus was filled only under high pressure. However, arterial injections were performed easily. Therefore, the authors believed that the mechanism of infection is arterial. Today there is no clear mechanism to explain how the microorganisms metastasize to epidural space.

We observed that involvement of the thoracal region (totally 5 patients) is slightly more than the lumbar (totally 4 patients) or cervical region (totally 3 patients). Thoracal dorsal involvement was observed in only 3 patients (patients no; 1, 2, 4). This finding did not correlate with the literature. The small size of the patient population might be the reason. On the other hand the literature is mostly from the patients with secondary SEA. Data on spontaneous SEA is rare. Therefore, the demographic findings of spontaneous SEA might show differences from secondary SEA.

Early diagnosis significantly decreases the morbidity and mortality rates (23,24,38).

Radiological studies are very important in diagnosis of SEA. Unfortunately, plain radiographs and CT have limited value. The SEA is easily demonstrated with a MR study. There are two basic patterns of enhancement of SEA described. The one with no liquid collection is only granulomatous tissues are observed as a solid mass with homogenous or heterogeneous contrast enhancement suggestive of phlegmonous stage (Figure 5). In the other form, there is a mass with circumferential contrast enhancement within liquid infection (29).

The treatment mostly depends on early surgical decompression and prolonged antibiotic therapy (25,27,34,39,42). On

Figure 3: Patient no;8 Postcontrast sagittal T1 weighted image shows thick enhancement around nonenhancing collection of pus with severe cord compression.

Figure 4: Patient no;12, T2 weighted sagittal MRI shows ventral abscess and spondylodiscitis at thoracal region, with unobstructed subarachnoid space

the other hand, conservative therapy might be applied as the sole management in carefully selected patients (20,22,30). Savage et al reported 83% good or excellent outcome with only medical treatment (36). However, it was concluded that 19% of the medically treated patients showed a severe neurological deterioration while under appropriate antibiotic therapy (22). Our observation supported this finding. Two patients (patients no 13 and 14) showed multiregion SEA involvement (Table I). Surgical intervention was carried out to only one spinal region in both patients (Table II). The treatment of the other affected spinal regions were achieved with antibiotic treatment. On the other hand, patient no: 10 first underwent CT biopsy and then appropriate antibiotic therapy was given. In the 3rd week of I.V. antibiotic therapy, the patient developed severe neurological deficit and immediate surgical intervention was carried out (Table II). Therefore, nonsurgical treatment might be applied to selected patients with close follow-up including neurological examination, control MR studies and laboratory findings.

The most interesting patient of this limited size of spontaneous SEA population was patient no: 11. The patient was under conservative treatment for the last 3 months for low back pain due to severe degenerative changes. She developed a significant increase in low back pain in the last few days. The patient was referred to the pain department for an epidural pain management. No new MRI study was obtained prior to intervention. The diagnosis was achieved after abscess drainage through spinal needle at the epidural space. Therefore one should always keep SEA in mind, particularly in the geriatric population and a recent radiological study is critical before performing any spinal procedure.

The most common microorganism as a cause of spinal epidural abscess is Staphylococcus aureus. We have observed a similar finding as the etiologic agent was Staphylococcus aureus in 9 of 14 (64.2%) patients. Interestingly we observed Methicillin-Resistant Staphylococcus Aureus (MRSA) in 3 patients. MRSA is an uncommon microorganism in patients with SEA. The common clinical finding of these 3 patients (patients no: 3, 6, 9) was a significant morbidity that suppressed the immune system, and having frequent I.V. therapies for their primary diseases (Table I). Therefore it is reasonable to believe that these patients were contaminated with MRSA in the health centers where they receive treatment.

The advances in radiology and treatment strategies significantly decreased the mortality of epidural abscess. In 1926 it was reported that the mortality is 81% (8). Between the years of 1954 and 1980 the mortality rates decreased from 34% to 16% (30). The recent studies reported less then 10% mortality (1,10,14,18,37). However the larger studies that include only the nontuberculous patients showed little higher rates between 13 and 16% (20). Cervical SEA has significantly higher mortality rate 38%, compared to other spinal regions (43). In our study, the only mortality was observed in a patient with cervical SEA (patient no: 5, Table II).

Figure 5: Patient no; 7 spondylodiscitis with anterior SEA postcontrast sagittal T1 weighted image shows homogenous enhancement suggestive of phlegmonous stage.

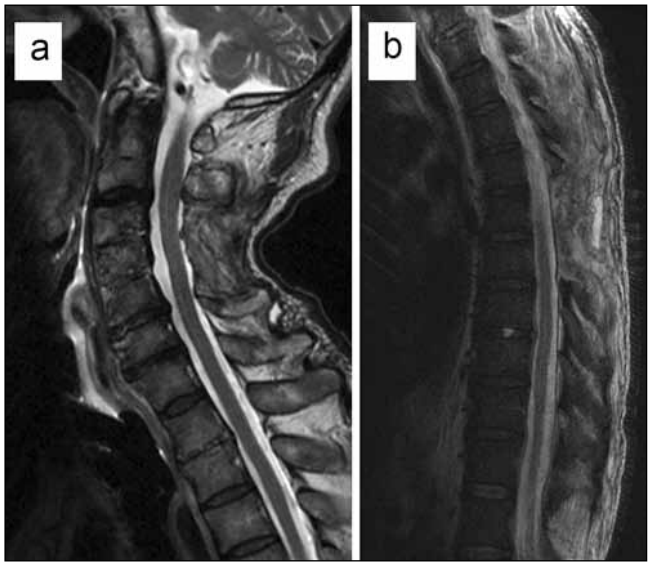

Figure 6: Patient no;13, sagittal T2 weighted **A)** cervical and **B)** thoracal images shows satisfactory radiologic outcome.

The application of foreign body (metallic instrumentation) to an infected site is usually not preferred. However it might be an inevitable in some conditions. We applied metallic instrumentation to 5 patients. Extensive removal of infected tissues was performed before instrumentation. The application of antibiotics were extended in all patients. Treatment of spontaneous SEA was achieved in 4 patients. However, the only mortality was observed in patient no:5 who received metallic instrumentation.

Khama et al (20) reported three factors associated with poor outcome: 1) age, 2) degree of spinal cord compression and

3) duration of symptoms. Kumar and Hunter (21) concluded clinical suspicion, prompt investigation and immediate intervention are the most important factors in outcome of SEA.

We observed full recovery in seven patients (patients no: 1, 2, 3, 4, 8, 9, 10) and four of them (1,2,7,8) showed significant neurological deficit at presentation. In 4 patients (patients no: 6, 11, 12, 14), an improvement in neurological deficits was achieved. The neurological findings did not change in one patient (patient no: 13) despite a long-term rehabilitation program.

Our experience showed that a delay in diagnosis and associated comorbidities can be fatal (patient no: 5) and might decrease the chance of full recovery of neurological deficits even with a satisfactory radiological outcome (patient no: 6, 7, 11, 12, 13, 14) (Figure 6). Therefore, one should always keep SEA in mind if the patient presents with spinal pain with fever. Immediate spinal MR screening is mandatory in cases with additional neurological deficit.

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