



Outcome of Surgical Treatment of Spontaneous Spinal Epidural Abscesses for a 10-year Period

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Abstract

Introduction: Spinal epidural abscess is uncommon but potentially debilitating infection. Delay in early diagnosis may be associated with increased morbidity and mortality despite recent advances in medicine.

Aim: To present the clinical course and outcome of treatment of spontaneous spinal epidural abscesses.

Materials and methods: Thirty-four patients (20 men and 14 women) with clinical, neuroimaging and/or histological data for spinal epidural abscess were treated at the Clinic of Neurosurgery at St George University Hospital, Plovdiv, Bulgaria, for the period 2009-2018.

Results: The average age of patients was 62 years (21-76 years) and the ratio of men to women was 1.4:1. All patients (100%) presented with vertebralgia, 13 patients (38.2%) had additional radiculalgia, and 10 patients (29.4%) presented with sensory or motor deficit. The duration of complaints varied from 4 to 180 days. At hospital admission, only 9 patients (26.4%) had intact neurological status. The most common localization of the spinal epidural abscess was in the lumbar and lumbosacral area (52.9%), concomitant spondylodiscitis was present in 31 patients (91.2%). Twenty-four patients (70.6%) underwent emergency surgery within 24 hours, and the rest had planned surgery. Decompressive interlaminotomy or hemilaminectomy was performed in 9 patients (26.5%). The remaining 25 patients (73.5%) underwent laminectomy, in 15 patients (44.1%) it was combined with posterior pedicle screw fixation. After the treatment, 23 patients (67.6%) had a good outcome, the remaining 11 (32.4%) had a poor outcome, and 3 patients died (8.8%).

Conclusion: In patients with spinal epidural abscess, emergency surgery is the treatment method of choice. It allows decompression of neural structures, correction of the spinal deformity, segmental stabilization and rapid mobilization of patients.

Keywords

primary, secondary, spinal epidural abscess, surgery, spondylodiscitis

INTRODUCTION

The spinal epidural abscess (SEA) was first described by G. B. Morgagni in Venice in 1761. This rare but serious infectious disease has an incidence rate of 0.2 to 2.8 cases per 10,000 hospital admissions per year, with a tendency

to increase due to population aging, increased surgical activity, and intravenous drug use.¹⁻³ Nowadays, despite the advances of modern medicine and the pharmaceutical industry, the outcome can still be poor or even fatal, with mortality rates remaining relatively high ranging from 15% to 23%.^{1,4}

Spontaneous or (unrelated to medical manipulations, surgery or spinal injuries) SEAs have an incidence rate of 0.8 cases per 100,000 people. They are classified as primary (PSEA) or secondary spinal epidural abscesses (SSAE). The PSEAs result from hematogenous dissemination from an infectious focus elsewhere in the body, directly into the spinal epidural space, whereas the SSAEs are caused by adjacent spontaneous spondylitis or paravertebral abscess.⁵⁻⁸

Risk factors for the onset of SEA are suppressed immunity, due to acquired immune deficiency syndrome (AIDS) or immunosuppressive therapy after organ transplantation, diabetes mellitus, alcohol addiction, neoplastic and systemic inflammatory diseases.²

AIM

The aim of this study was to examine the epidemiology, risk factors, etiology, clinical manifestation, localization, paraclinical studies, surgical treatment, and outcome in spontaneous SEAs in order to facilitate early diagnosis and adequate treatment.

MATERIALS AND METHODS

We conducted a retrospective analysis of 34 patients (20 males and 14 females), between 21 and 76 years of age [57.647±13.172 CI 95% (53.048-62.246), median 62, $p=0.0286$], with spontaneous SEA, treated between 2009 and 2018 at the Clinic of Neurosurgery in St George University Hospital, Plovdiv, Bulgaria. All patients were preoperatively diagnosed by magnetic resonance imaging (MRI) and/or computed tomography (CT). The diagnosis was confirmed during the surgery. The patients' case histories, clinical presentation, paraclinic, imaging, and operative protocols were investigated. Attention was paid to the initial symptoms, clinical presentation at admission, concomitant diseases, localization and number of segments affected, laboratory parameters, microbiological results, timing and type of surgical intervention. Fever was considered important when the axial temperature was $\geq 37.8^{\circ}\text{C}$. The severity of pain was evaluated using the Denis scale, the degree of myelopathy was assessed by the Frankel scale, and the degree of disability - by the modified Rankin Scale (mRS). The stage of the disease in each patient at admission was retrospectively classified according to the Heuser criteria.⁹ Stage I - presence of vertebralgia only, stage II - vertebralgia and radiculopathy, stage III - motor and sensory deficits and pelvic reservoir dysfunction, and stage IV - paralysis. Regarding the blood tests, attention was paid to the leukocyte count, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) level. All collected data were analyzed to evaluate the possible correlation with the disease outcome and to determine their prognostic value. The outcome of the disease was evaluated on a 5-point scale suggested by Kumar and Hunter, as follows: 1. Complete

recovery of the neurological deficit; 2. Ability for self-care without pelvic-reservoir disorders; 3. Self-care with support with or without sphincter disorders; 4. Quadriplegia/ paraplegia or severe quadriplegia/paraparesis keeping the patient to bed; 5. Death.

For the purposes of the statistical analysis, Grades 1 and 2 were grouped as a 'good outcome' and grades 3-5 as a 'poor outcome'.¹⁰ A chi-squared test was used to compare categorical data, a non-parametric Mann-Whitney U test was used to compare variables, grouped in rank scales, and a t-test - for normally distributed data. The bilateral significance level was set at $p < 0.05$.

RESULTS

The current study established that the incidence of SEA

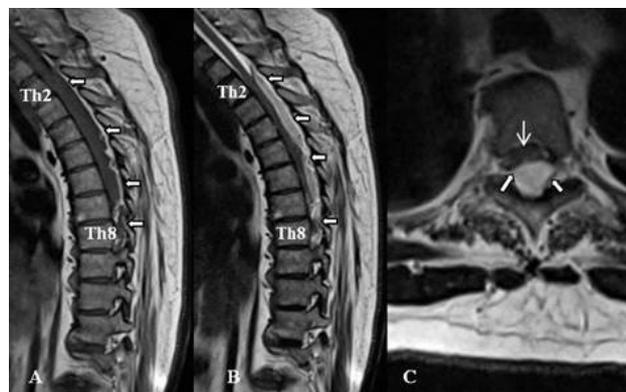


Fig. 1. A patient with PSEA on the level of T2–T8. A) Sagittal T1 MRI shows an isodense lesion at the level of T2–T8 (arrows); B) Sagittal T2 MRI demonstrates epidural abscess in the affected segments (arrows); C) Axial T2 MRI shows the dorsal localization of the abscess (black and white arrows) which compresses the spinal cord (white arrow).



Fig. 2. A patient with spontaneous spondylodiscitis and SSEA at the level of L4–L5. A) Sagittal T1 MRI shows spondylololitis and ventrally located paravertebral abscess (arrow) and epidural abscess (white arrow); B) Sagittal T2 MRI visualizes ventrally located spinal epidural abscess (arrow).

was 0.005% or 0.5 per 10,000 hospitalizations, while based on the number of surgically treated patients it was calculated to be 0.3% or 3 per 1,000 hospitalizations.

Only 3 patients (8.8%) from our series were diagnosed with primary SEAs because the infection was restricted only to the spinal epidural space (Fig. 1). The remaining 31 (91.2%) were classified as secondary SEAs due to the presence of adjacent spondylodiscitis with or without a paravertebral abscess (Fig. 2).

The demographics and clinical data for the patients are presented in Table 1.

In all patients the disease debuted with vertebralgia, in

13 patients (38.2%) experienced radiculopathy symptoms and 10 patients (29.4%) suffered from sensory or motor deficit. The period from the onset of disease to its diagnosis ranged from 4 to 180 days [mean – 49.85±47.846; CI 95% (33.149-66.557), p<0.0001].

Upon admission, only 2 patients (5.9%) were in stage I, 6 patients (17.6%) – in stage II, 20 patients (58.8%) – in stage III, and 6 patients (17.6%) in stage IV with central paraplegia/quadruplegia. Pelvic reservoir dysfunction was present in 15 patients (44.1%), and in 13 patients (38.2%) the axial temperature was ≥37.8°C.

In 6 patients (17.6%), the leukocyte count was normal, while in the rest it was slightly increased – with an aver-

Table 1. Basic demographic and clinical data of patients with SEA

Parameter	Number of patients (%)
Average age (years)	62 (21-76)
Ratio Male/Female	20/14 (58.8:41.2)
Concomitant diseases:	
Diabetes mellitus	9 (26.5)
Liver disease	2 (5.9)
Kidney failure	1 (2.9)
Oncologic disease	1 (2.9)
Arterial hypertension	14 (41.2)
Bronchopneumonia	1 (2.9)
Inflammatory diseases	4 (11.8)
Tuberculosis	4 (11.8)
Clinical presentation at admission:	
Stage I	2 (5.9)
Stage II	6 (17.6)
Stage III	20 (59.9)
Stage IV	6 (17.6)
Laboratory results:	
Leucocyte count (×10 ⁹ /l)	13.65 (11.967-15.333)
Erythrocyte sedimentation rate (ESR; mm/h)	79.67 (70.023-88.33)
C-reactive protein (CRP; mg/l)	104.79 (84.257-125.33)
Time from disease onset to diagnosis (days):	49.85 (33.149-66.557)
Localization of SEA:	
Cervical	2 (5.9)
Thoracic	13 (38.2)
Thoraco-lumbar	2 (2.9)
Lumbar	16 (47.1)
Lumbosacral	2 (5.9)
Distribution of the epidural abscess (segments):	2 (2-7)
Type of the spontaneous SEA:	
Primary	3 (8.8)
Secondary (associated with spondylodiscitis)	31 (91.2)
Isolated microbiological agent:	
<i>Staphylococcus aureus</i>	12 (35.3)
<i>Coagulase-negative staphylococci</i>	3 (8.8)
<i>Escherichia coli</i>	1/2.9
<i>Pseudomonas aeruginosa</i>	1/2.9
<i>Mycobacterium tuberculosis</i>	4/11.8
None isolated	13/38.3

age of $13.2 \times 10^9/l$ (4.50-24.86) (Table 1). In all patients, the ESR was significantly increased – with an average of 84.50 mm/h (ranging from 10 to 120) (Table 1). Only one patient had normal CRP but he was previously treated for bronchopneumonia. In all other patients, it was significantly increased – with an average of 97.5 mg/l (ranging from 10 to 267) (Table 1).

The most common localization of SEA in our series was in the lumbar and lumbosacral regions – 18 patients (53%), followed by thoracic – 13 patients (38.2%). Primary SEAs were equally distributed between the cervical, thoracic and lumbar regions. In 25 patients (73.5%) two levels were affected, in 6 patients (17.6%) – three levels, and the other three patients – 5, 6 and 7 levels were affected, respectively [mean – 2.5 ± 1.187 ; CI 95% – (2.086–2.91; median – 2 (2–7)] (Table 1).

Only 3 patients (8.8%) had positive serological tests. The causative agent of SEA from the extracted materials during surgery (bone, disc, and pus) was isolated in 21 patients (61.8%) (Table 1). *Staphylococcus aureus* and *Coagulase-negative staphylococci* were the most common agents that caused SEA in our group – 100% of primary and 38.7% of secondary SEA. The second most frequent were the cases caused by *Mycobacterium tuberculosis* (11.8%). The microbiological study did not isolate the causative agent in 13 patients (38.3%).

Arterial hypertension and diabetes mellitus were the most common concomitant diseases in 14 (41.2%) and 9 (26.5%) patients, respectively. Other concomitant diseases were inflammatory diseases and tuberculosis in 4 patients each (11.8%), liver disease in 2 patients (5.9%), kidney failure, lung failure and cancer in one patient each.

In 18 patients (52.9%), the cause of the spinal infection remained unknown. In the remaining 16 patients (47.1%), the cause was uncertain, except for 4 patients with proven tuberculosis and 6 patients with inflammatory diseases with an identical microbiological agent.

In 24 patients (70.6%), emergency surgery was performed within 24 hours due to an impaired functional status (Karnofsky 30–40), severe pain (Denis P4/5 and P5/5), and a pronounced and/or rapidly progressing neurological deficit.

In all operated patients, we used a posterior or a posterolateral operative access. The purpose of the surgical treatment was to achieve decompression of neural structures, removal of necrotic tissue, and evacuation of the epidural abscess or granulation tissue. In 9 patients (26.5%), in whom the clinical picture was lumbar radiculopathy alone, debridement and decompression of the affected nerve and cauda equina were performed by interlaminotomy on one or more levels. In cases with pronounced narrowing of the spinal canal and compression of medulla spinalis or cauda equina from the present epidural abscess, we performed a hemi- or laminectomy. We performed this intervention in 25 patients (75.8%). In these cases, in order to avoid instability of the affected segments, a posterior pedicle screw fixation was also performed in 15 patients (45.6%) (Fig. 3).

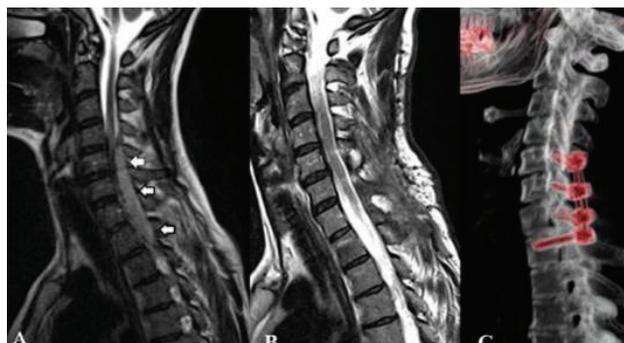


Fig. 3. A patient with primary SEA at the level of C5–Th2. A) Preoperative sagittal T2 MRI visualizes left posterolateral purulent collection from C5 to T2 (arrows); B) Postoperative sagittal T2 MRI demonstrates evacuation of the abscess and decompression of the spinal cord; C) CT 3D reconstruction shows the performed posterior screw fixation.

The remaining 9 patients refused instrumentation.

The antibiotic therapy was administered in accordance with the results from the microbiological examination and when they were sterile, an intravenous administration of a combination of broad-spectrum antibiotics for 14 days was prescribed, followed by oral antibiotic administration for 4–6 weeks.

The average hospital stay of patients ranged from 8 to 97 days [mean – 32.225 ± 19.15 ; CI 95% (25.203–39.249); median 27, $p > 0.10$].

Good outcome was achieved in 23 patients (67.6%), while the remaining 11 (32.4%) had poor outcome. Three patients died (8.8%) due to uncontrolled sepsis, multiple organ failure ($n=2$) or brainstem ischemic stroke. The statistical analysis found that the patients' functional status at admission ($p=0.023$), degree of disability ($p=0.021$), number of segments affected ($p=0.041$), average CRP values ($p=0.039$), and time to surgery ($p=0.010$) significantly influenced postoperative outcome (Table 2).

DISCUSSION

Spinal epidural abscess can occur in any age group, but it is more common in patients between 50 and 70 years of age and in males.^{4,11} In our series, the 50–70 age group was the largest (79.4%), confirming that it is the most vulnerable age. Although significantly smaller, the group of patients under 50 (20.6%) indicates that the young patients can also be affected by this devastating disease. The distribution of males and females in our series (58.8%:41.2%) is in line with the findings of two extensive meta-analyses by Reihnsaus et al. and Arko et al.^{4,12} Unlike Chen et al., our analysis found no significant importance of age for treatment outcomes ($p=0.646$).¹³

According to the literature, one of the most common risk factors for the occurrence of SEA is diabetes mellitus, with a frequency ranging from 15.4% to 35.6%.^{7,8,13,14} Diabetes mellitus was present in 9 of our patients (26.5%), but

Table 2. Analysis of the outcome of disease in patients with SEA

	Good result (n=23)	Poor result (n=11)	p value
Mean age (years)	63 (21-76)	62 (39-70)	0.646
Gender			
Male	13 (56.5%)	7 (63.6%)	0.698
Female	10 (43.5%)	4 (36.4%)	
Type of the spinal epidural abscess			
Primary	1 (4.3%)	2 (18.2%)	0.318
Secondary	22 (95.7%)	9 (81.8%)	
Time from onset of disease to diagnosis (days)	55 (35.23-75.90)	37.91 (4.61-71.20)	0.322
Diabetes mellitus	5 (21.7%)	4 (36.4%)	0.373
Neurological deficit			
Stages I – II	7 (30.4%)	1 (9%)	0.190
Stages III – V	16 (69.6%)	10 (91%)	
Febrility	9 (39.1%)	4 (36,4%)	1,000
Functional stage (Karnofsky)	50.43±14.295	39.09±9.439	
30 – 40 points	9 (39%)	7 (63.4%)	0.023*
50 – 70 points	14 (61%)	4 (36.6%)	
Severity of pain (Denis)			
P 2	0	1 (9%)	
P 3	5 (21.7%)	0	0.212
P 4	16 (69.6%)	9 (82%)	
P 5	2 (8.7%)	1 (9%)	
Disability grade (mRS)			
Grade 2	5 (8.7%)	0	
Grade 3	5 (27.8%)	1 (9%)	0.021*
Grade 4	9 (39.1%)	5 (45.5%)	
Grade 5	4 (17.4%)	5 (45.5%)	
Myelopathy stage (Frankel; n=16)			
A	0	2 (28.6%)	
B	2 (22.2%)	2 (28.6%)	0.052
C	2 (22.2%)	2 (28.6%)	
D	4 (44.4%)	1 (14.2%)	
E	1 (11.1%)	0	
Localization			
Cervical	1 (4.3%)	1 (9%)	
Thoracic	8 (34.8%)	5 (45.5%)	0.391
Thoraco-lumbar	0	1 (9%)	
Lumbar	13 (56.6%)	3 (27.2%)	
Lumbosacral	1 (4.3%)	1 (9%)	
Number of affected segments			
2 segments	20 (87%)	5 (45.5%)	0.041*
>2 segments (3-7)	3 (13%)	6 (54.5%)	
Leucocyte count (average value; ×10 ⁹ /l)	12,9 (4.5-24.86)	14.7 (8.79-22.00)	0.075
ESR (average value; mm/h)	83 (23-120)	86 (10-116)	0.657
CRP (average value; mm/l)	88 (10-267)	105 (67-240)	0.039*
Infectious agent			
<i>Staphylococcus aureus</i>	7 (30.4%)	5 (45.5%)	
<i>Mycobacterium tuberculosis</i>	3 (13%)	1 (9%)	
<i>Coagulase-negative staphylococci</i>	3 (13%)	0	0.686
<i>Escherichia coli</i>	1 (4.3%)	0	
<i>Pseudomonas aeruginosa</i>	1 (4.3%)	0	
None isolated	8 (34.8%)	5 (45.5%)	
Timing of surgery			
Surgery within 24 hours	13 (56.5%)	11 (100%)	0.010*
Surgery from 24 hours to 72 hours	10 (43.5%)	0	
Hospital stay (days)	27 (15.93-38.62)	32 (23.47-41.13)	0.484

*p < 0.05

unlike the findings of Chen et al., it was not significant for the outcome of treatment.¹³

Tang et al. reported that the duration of symptoms before hospitalization varies from 1 to 180 days, but most authors consider it to be in the range of 1 day to 2 months.^{2,15,16} The delay in diagnosis is due to the lack of specific initial symptoms that resemble degenerative disease, inconsistent presence of fever and attempting conservative treatment without imaging diagnostics.¹⁷ This leads to the progression of SSEA and neurological deficit, as found in 26 of our patients (75.6%), as well as impairment of their functional status and degree of disability. The latter two indicators have a statistically significant effect on treatment outcomes ($p=0.023$ and $p=0.021$).

The time between symptom onset and diagnosis in our patients ranged from 4 to 180 days, with an average of 30 days [mean – 49.853 ± 47.845 ; CI 95% (33.149-66.557); $p < 0.0001$]. It is noteworthy that for the three patients with PSEA, this period was significantly shorter – 4, 7, and 12 days, respectively, due to the faster development of a neurological deficit from the directly developing infection into the spinal epidural space.

The classical triad of vertebralgia, temperature $\geq 38^\circ\text{C}$ and a progressive neurological deficit is often associated with SEA.⁸ Unfortunately, it is present in the clinical presentation in 33-40% of the cases, which is confirmed by the 38.2% we found, contributing to the delay of diagnosis.^{8,14}

Our study confirms that MRI is the diagnostic tool of choice for suspected SEAs.²⁻⁴ It allows complete visualization of the spine, neural structures and infectious lesions in all of its anatomical compartments (vertebrae, paravertebral and epidural space). In PSEA, there is no involvement of bony and paravertebral structures. The abscess is mainly localized in the dorsal epidural space, due to the wider posterior spinal epidural space and venous plexus in this area, which is confirmed by our results.^{6,11} In SSEA, in addition to a purulent collection, located predominantly ventrally, the classical MRI findings for spondylodiscitis are typical (low signal from the affected vertebral bodies and destruction of their end plates in T1 sequence, and in T2 sequence – high signal from the affected body and disk).¹⁸ During the progression of the disease, the infection spreads throughout the spinal epidural space, both in the affected segments and in the vertical direction, due to the lack of anatomic resistance.^{13,14,18} An increase in the number of affected segments shows a statistically significant negative effect on the postoperative outcome ($p=0.41$).

There is no consensus on the most common localization of SEAs. In the study of Khan et al., PSEAs are located equally in the cervical, thoracic and lumbar spine, whereas in the study of Ptaszynski et al. they are more common in the lumbosacral spine (66.6%).^{6,7} The anatomical distribution of PSEAs in our group overlaps the findings of Khan et al.⁶ In the meta-analysis by Arko et al., out of a total of 1,099 patients with a SEA, the involvement of the lumbar spine was in 48%, and of the thoracic – in 31%, which is similar to our findings of the localization of SSEA – 48.5%

in the lumbar spine and 38.7% in the thoracic spine.¹² Our analysis showed that the localization of SEA did not significantly affect treatment outcomes ($p=0.391$).

The world literature lacks randomized multicenter studies of the results of the different types of SEA treatments, therefore there is no consensus on the therapeutic strategy. In two meta-analyses for the period 1954-1997 and for the period after the year 1999, the advantage of the surgical methods in combination with the administration of antibiotics was found, in 89% and 60%, respectively.^{4,12}

Most authors accept that emergency surgical intervention is needed to avoid or eliminate debilitating neurological deficit, immediately after the diagnosis of SEA, which in our study is significantly related to postoperative results ($p=0.010$).^{12,19}

Like most authors, we also used posterior operative approaches that allowed good decompression and debridement of infected structures. To prevent future instability, we also used instrumentation with titanium implants, which did not increase the recurrence of infection.²⁰

Our study confirmed that the most common cause of SEA is *Staphylococcus aureus*, although our findings (30.4%) are significantly less than those reported in literature (63.6%-66.4%).^{4,12} The type of infectious agent did not affect the outcome of treatment ($p=0.686$). The high percentage of patients (34.8%) in whom no causative agent was isolated, in our opinion was due to the chronic phase of the infection in our patients, as well as the inadequate collection of material and relatively long transportation times.

The major problem with SEA is not the treatment but the early diagnosis prior to development of severe neurological symptoms.⁴ The duration and severity of the neurological deficit in SEAs complicate the prognosis.^{4,18} About 1/3 of the surviving patients have an unfavourable neurological status, which is primarily due to incorrect or delayed diagnosis.^{2,3,21} Our study makes no exception to this – 32.5% of our patients had poor outcome, which was not significantly correlated to the time to diagnosis ($p=0.322$), and with the stage of the disease ($p=0.190$).

CONCLUSION

A large proportion of patients with SEA do not receive early diagnosis and timely treatment due to the nonspecific initial clinical symptoms. Clinicians need to suspect the disease in patients with vertebral pain in all segments of the spine, with or without history of fever or febrile episodes, with paraclinical data of leukocytosis, accelerated ESR and increased C-reactive protein, especially in people suffering from diabetes mellitus or other concomitant diseases. Magnetic resonance imaging is essential for the early diagnosis, before progression of irreversible neurological deficit. The surgical treatment in these cases allows maximal recovery with minimal hospital stay. In cases with instability of the affected segments, spinal instrumentation provides the necessary stabilization and avoids prolonged immobilization.

Important prognostic factors for the treatment outcome are timely surgery, average CRP values, functional status and degree of disability upon admission, and the number of affected segments by the SEA.

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Результат хирургического лечения спонтанных спинальных эпидуральных абсцессов в течение десяти лет

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Резюме

Введение: Спинальный эпидуральный абсцесс является редким, но потенциально инвалидирующим инфекционным заболеванием. Задержка ранней диагностики может быть чревата повышенной заболеваемостью и смертностью, несмотря на последние достижения в области медицины.

Цель: Представить клиническое течение и результаты лечения спонтанных спинальных эпидуральных абсцессов.

Материалы и методы: Тридцать четыре пациента (20 мужчин и 14 женщин) с клиническими, нейровизуальными и / или гистологическими данными по поводу спинального эпидурального абсцесса прошли курс лечения в клинике нейрохирургии при Университетской больнице „Св. Георги“, г. Пловдив, Болгария в период 2009-2018 г.

Результаты: Средний возраст пациентов составил 62 года (21–76 лет), а соотношение мужчин и женщин составило 1.4: 1. Все пациенты (100%) имели вертебралгию, 13 (38.2%) пациентов также имели радикулалгию, а 10 пациентов (29.4%) имели сенсорный или моторный дефицит. Продолжительность жалоб варьировала от 4 до 180 дней. При госпитализации только 9 пациентов (26.4%) имели неврологический невредимый статус. Наиболее распространённая локализация спинального эпидурального абсцесса была в поясничном и пояснично-крестцовом отделах (52.9%), сопутствующий спондилодисцит был обнаружен у 31 пациента (91.2%). Двадцать четыре пациента (70.6%) перенесли экстренную операцию в течение 24 часов, а остальные перенесли плановую операцию. Декомпрессивная интерламинэктомия и хемиламинэктомия были выполнены у 9 пациентов (26.5%). У остальных 25 пациентов (73.5%) была проведена ламинэктомия, а у 15 пациентов (44.1%) она сочеталась с фиксацией заднего педикулярного винта. После лечения у 23 пациентов (67.6%) были хорошие результаты, у остальных 11 (32.4%) были плохие результаты, а 3 пациента умерли (8.8%).

Заключение: У пациентов со спинальным эпидуральным абсцессом экстренная операция является предпочтительным методом лечения. Это позволяет декомпрессии нервных структур, коррекции деформации позвоночника, сегментарную стабилизацию и скорую мобилизацию пациентов.

Ключевые слова

первичный, вторичный, спинальный эпидуральный абсцесс, хирургия, спондилодисцит
