**Ulutas Med J** 2019;5(3):209-214
**DOI:** 10.5455/umj.20190719032811

ORIGINAL ARTICLE OPEN ACCESS

# Spinal Epidural Abscess in Patients with Chronic Renal Failure: A Single-Center Experience

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Background: Spinal epidural abscess (SEA) is an uncommon condition that can evolve to severe neurologic deficit or death if the diagnosis is delayed. We noticed an increase in the number of cases of SEA, with the majority in patients with chronic renal failure. The purpose of the study was to investigate the relationship between chronic renal failure (CRF) and spinal epidural abscess (SEA).
Materials and Methods: This retrospective study was conducted with the medical records of CRF patients who were treated for SEA in a single tertiary center. Clinical and demographic characteristics of the patients (age, gender, clinical symptoms, underlying conditions, predisposing factors, level of abscess, causative organisms, preoperative motor status), treatments and outcomes were reviewed retrospectively. Levels of inflammatory markers (white blood cell, C-reactive protein, and erythrocyte sedimentation rate) and albumin were evaluated.
Results: Seven (58.3%) males and five (41.7%) females, with a mean age of 65.7±8.6 years (range, 56 to 82 years) were evaluated in this study. The most common symptoms were back pain and motor weakness. The functional status of 4 patients (33.3%) was unchanged after surgery, while seven patients (58.3%) had functional improvements. Significant improvements were observed regarding blood levels of inflammatory markers and albumin after the treatments.
Conclusion: The present study showed that surgical procedures have an important role in the management of SEA in patients with CRF.
Keywords: Chronic renal failure, spinal epidural abscess, spinal surgery

## Introduction

Although spinal epidural abscess (SEA) is a rare disease, it can lead devastating conditions. Nevertheless, early diagnosis and treatment can provide excellent outcomes. Delayed diagnosis or inadequate treatment can lead to severe long-term disabilities. Neurological deficits due to SEA can be as severe as paralysis (1). SEA is responsible for 0.2–1.2 cases per 10.000 hospital admissions (2,3). Some of the predisposing systemic factors for SEA are obesity, diabetes mellitus, renal diseases, malignancy, HIV infection, intravenous drug abuse, chronic alcoholism, and in-dwelling catheter. There may also be local predisposing factors such as spinal surgery, trauma, catheter placement into the vertebral canal, and

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**Received**: Jul 24, 2019 **Accepted**: Aug 25, 2019
**Published**: Sep 7, 2019

extrathecal injection. However, no predisposing factor can be detected in approximately 20% of patients (4). *Staphylococcus aureus* is the most common agent, present in up to 70% of cases, followed by *Streptococcus* species in approximately 7% of cases (5). The most frequently reported location for SEA is the thoracic region (%50) followed by the lumbar region (%35). Cervical involvement has been reported as <15% in epidural abscess cases (6). Although the classic diagnostic triad is fever, spinal pain, and neurological deficits, in very few patients, all these three findings are presented together. Once paralysis has developed, it may become irreversible within a brief period. Therefore, urgent intervention should be applied if progression of weakness or other neurological findings were found.

Although still uncommon, an increase has been shown in the incidence of SEA over the past 50 years (7). Several previous studies have investigated SEA, but to the best of our knowledge, there has not yet been any detailed study that investigating the relationship between SEA and chronic renal failure (CRF). Therefore, the goal of our study was to examine the clinical and surgical features of SEA in patients with CRF.

## Material and Methods

The study included seven (58.3%) males and five (41.7%) female CRF patients (mean age of 65.7±8.6 years). We retrospectively analyzed the medical records of CRF patients treated for SEA between 2015 and 2017, in a tertiary center. Clinical characteristics (gender, age, symptoms, underlying conditions, predisposing factors, level of the involved spine, causative organisms, preoperative motor status [lower extremity muscle strength], treatment and outcome) were evaluated retrospectively. White blood cell (WBC), albumin (Alb), C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR) levels were also noted from the patients' records. The demographic and clinical characteristics of the individuals are shown in Table-1 and Table-2. The study protocol was approved by the local ethics committee (Date: 25.04.2019, No: 04).

### Statistical analysis

The SPSS v20 (SPSS Inc., Chicago, IL, USA) was used for analysis. The data were determined as the mean and standard deviation, as median or as frequencies when appropriate. The outcomes before and after the treatments were stated by the non-parametric Mann-Whitney U test. A $p<0.05$ was considered as statistically significant.

## Results

### Patient characteristics

Seven (58.3%) males and five (41.7%) females, with a mean age of 65.7±8.6 years (range, 56 to 82 years) were evaluated in this study. In all of the patients, the etiology of CRF was diabetes mellitus. In eight patients (66.7%) who had received hemodialysis, seven had a fistula, and one had a catheter. The mean time from initiation of hemodialysis to the development of SEA was 6.25±2.49 years (range: 2-9 years). The preoperative baseline neurological status of the patients was as below: five patients had paraparesis, three patients had paraplegia, and three patients had quadriplegia. According to the patient records, the functional status of four patients was unchanged after surgery, while seven patients showed a useful improvement. No motor deficit, either before or after surgery, was determined in one patient. The most common symptom was back pain and motor weakness before the surgery. Only 33.3% of the patients had a subjective fever. The overall

Table-1. Clinical characteristics of patients with chronic renal failure who presented with spinal epidural abscess

| # | Age Sex | Dialysis | Cause of CRF | Dialysis duration(yr) | Dialysis access | Comorbid disease | Level of spine | Blood culture | Tissue culture | Preoperative motor status | Outcome | Hospitalization outcome |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 56 M | Yes | DM | 8 | Fistula | | C5-T3 | Negative | - | Tetraplegia | Unchanged | Death (at 3rd mo) |
| 2 | 65 M | Yes | DM | 7 | Fistula | | T6-T8 | Negative | Contaminated | Paraplegia | Improved | Death (at 2nd yr) |
| 3 | 56 M | Yes | DM | 3 | Fistula | Pneumonia | T6-T7 | Negative | - | Paraparesis | Improved | Discharge |
| 4 | 58 F | Yes | DM | 2 | Catheter | | L3-L5 | Negative | *S. aureus* | Paraparesis | Improved | Discharge |
| 5 | 72 M | Yes | DM | 8 | Fistula | | T6-T9 | Negative | Contaminated | Paraplegia | Unchanged | Discharge |
| 6 | 77 M | Yes | DM | 6 | Fistula | | C6-T2 | Negative | - | Tetraplegia | Unchanged | Discharge |
| 7 | 67 F | Yes | DM | 7 | Fistula | CVD | T2-T4 | Negative | *S. aureus* | Paraplegia | Improved | Discharge |
| 8 | 82 M | Yes | DM | 9 | Fistula | CVD | T1-T4 | Contaminated | *S. agalactore* | Tetraplegia | Unchanged | Death (at 1st yr) |
| 9 | 72 F | No | DM | - | - | LDH | L4-L5 | Negative | - | No deficit | No deficit | Discharge |
| 10 | 67 F | No | DM | - | - | Uveitis, Steroid use | T12-L2 | Negative | - | Paraparesis | Improved | Discharge |
| 11 | 59 M | No | DM | - | - | | T10-L1 | Negative | - | Paraparesis | Improved | Discharge |
| 12 | 58 F | No | DM | - | - | | T6-T8 | Contaminated | - | Paraparesis | Improved | Discharge |

Abbreviations: DM, Diabetes Mellitus; CRF, Chronic Renal Failure; CVD, Cerebrovascular Disease; LDH, Lumbar Disc Herniation; mo, month; yr, year

Table-2. Clinical findings, laboratory results and hospitalization outcomes of the patients

| # | Age Sex | Back pain | Fever | Weakness | Risk factors | Initial WBC | Discharge WBC | Initial CRP | Discharge CRP | Initial ESR | Discharge ESR | Initial Albumin | Discharge Albumin | Surgical treatment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 56 M | Yes | No | Yes | | 18300 | 7000 | 133 | 3 | 64 | 18 | 2.5 | 3.98 | AD, DS, TL |
| 2 | 65 M | Yes | No | Yes | | 13000 | 8200 | 189 | 7 | 108 | 24 | 2.4 | 2.9 | AD, DS, TL |
| 3 | 56 M | Yes | Yes | Yes | Pneumonia | 17500 | 7400 | 104 | 2.2 | 102 | 24 | 3 | 3.8 | AD, DS, TL |
| 4 | 58 F | Yes | Yes | Yes | | 15300 | 8600 | 114 | 2 | 89 | 11 | 3.01 | 3.5 | AD, DS, TL |
| 5 | 72 M | Yes | No | Yes | | 14300 | 6800 | 210 | 4 | 156 | 14 | 2,2 | 3.5 | AD, DS, TL |
| 6 | 77 M | Yes | No | Yes | | 13800 | 6700 | 132 | 7 | 126 | 14 | 3.01 | 3.2 | AD, DS, TL |
| 7 | 67 F | Yes | Yes | Yes | | 15300 | 7000 | 112 | 3.4 | 89 | 12 | 2.9 | 3.7 | AD, DS, TL |
| 8 | 82 M | Yes | Yes | Yes | | 21000 | 11000 | 168 | 48 | 125 | 82 | 2.02 | 2.8 | AD, DS, TL |
| 9 | 72 F | Yes | No | No | History of LDS | 14400 | 7460 | 118 | 3 | 112 | 76 | 3.05 | 3.7 | AD, DS, TL, SS |
| 10 | 67 F | Yes | No | Yes | Steroid usage | 14800 | 7270 | 130 | 3.4 | 140 | 14 | 3.3 | 4.08 | AD, DS, TL, SS |
| 11 | 59 M | Yes | No | Yes | History of VS | 15200 | 7100 | 125 | 2 | 96 | 11 | 3.7 | 3.6 | AD, DS, TL |
| 12 | 58 F | Yes | No | Yes | | 14500 | 7000 | 138 | 3.3 | 112 | 12 | 3.03 | 3.66 | AD, DS, TL |

Abbreviations: LDS, Lumbar Disc Surgery; VS, Vertebral Stabilization; AD, Abscess Drainage; DS, Decompression Surgery; TL, Total Laminectomy; SS, Segmental Stabilization

mortality rate was 25% in the first postoperative year, and all three deaths were due to sepsis. Patients' characteristics are shown in Table-1.

### Biochemical analysis

The median white blood cell (WBC) count was 15000/mm$^3$ at the initial evaluation and 7185/mm$^3$ at the last assessment. The median C-reactive protein (CRP) was 131 mg/L at the initial review and 3.35 mg/L at the previous evaluation. The erythrocyte sedimentation rate (ESR) was 110 mm/h at the initial inspection and 14 mm/h at the last review. There were significant differences between the WBC, CRP, and ESR levels before and after treatment (all p=0.002). The mean albumin level was 2.8±0.4 g/dL at the initial evaluation and 3.5±0.3 g/dL at the last review. There was a significant difference between albumin levels before and after treatment (p=0.003). The laboratory test results are shown in Table-2.

Leukocytosis was present in all twelve patients (100%) at baseline and in one patient (8.3%) on discharge. Normal WBC count was shown in eleven patients before discharge. CRP levels were elevated (>5 mg/L) in twelve (100%) patients on admission, and in nine patients, average levels were found on discharge (75%). Elevated ESR levels (>20 mm/h) were found in twelve (100%) patients on admission, and in eight patients (66.7%) normal levels were observed on discharge. Decreased albumin levels (<3.5 g/dL) were found at baseline in eleven (91.6%) patients, and in nine patients (75%) normal albumin levels were observed on discharge.

### Involved level of the spine

The thoracic spine was the most common site of infection (six patients, 50%). Cervicothoracic spine (2 patients, 16.7%), thoracolumbar spine (two patients, 16.7%) and lumbar spine (two patients, 16.7%) involvements were shown in the patients.

### Microbiologic Assessment

Blood cultures were performed in twelve patients, and all the results were negative. Tissue biopsy and cultures were performed in twelve patients. Positive results were recorded in three cases; two of them were determined to be *Staphylococcus aureus*, and one to be *Streptococcus agalactiae*.

### Treatment

All the patients received antibiotic therapy and surgical intervention. Total laminectomy, debridement of the infected spine, and abscess drainage were performed in all cases. Surgeons also performed segmental stabilization as necessary in two patients (cases 9 and 10). One patient (case 11) who had a history of segmental stabilization had a second operation for abscess control.

## Discussion

Spinal epidural abscess is one of the most alarming and difficult clinical situations in CRF. Besides, proper management of this problem can decrease SEA associated morbidities and mortalities. Therefore, in the current study, twelve patients with CRF were evaluated in terms of the effects of the surgical treatment of the SEA (8). Although surgical decompression and IV antibiotic treatment are the basics of SEA treatment, the ideal management remains controversial and long-term use of high dose IV antibiotics can be difficult in patients with CRF due to decreased renal functions. Therefore, CRF patients with SEA undergoing surgery combined with IV antibiotherapy were reviewed in this study. Our study showed that significant improvements in clinical signs such as motor weakness, back pain, and fever and laboratory

findings such as ESR, CRP, ALB, WBC levels were found in the study population after the surgical procedures.

Previous studies have clearly stated some risk factors for SEA such as; diabetes mellitus, alcohol abuse, immunosuppressant drugs, trauma, indwelling vascular devices, and HIV. Besides, the increased risk of SEA has been shown among hemodialysis patients (9,10,11). Also, the findings of the present study showed that all CRF patients with diabetes mellitus could be at increased risk of SEA, and this outcome can be evaluated as CRF patients with diabetes mellitus should be considered for a diagnosis of SEA in respect of their immunosuppressive conditions (8,9). The most seen symptomatic presentations were back pain, motor weakness and subjective fever in the current study. Similarly, previous studies have reported that back pain and motor weakness are the most frequent initial presentation (12,13). Earlier studies on SEA have reported that SEA is located mostly in the lumbar and thoracic spine both for the general population and hemodialysis patients (10). The results of our study are similar to those previous studies.

Laboratory results may provide valuable information for clinicians in terms of diagnosis of SEA and treatment responses. According to our findings, leukocyte, CRP, and ESR levels were increased, and albumin levels were decreased in all the patients. After treatment, WBC returned to normal levels in eleven patients, CRP in nine patients, ESR in 8 patients, and albumin in nine patients. The positive changes in systemic inflammatory responses after the surgical procedures can be evaluated as a proper successful combination of surgery and medical management. In some patients, the administration of IV antibiotics was started before culture sample acquisition. Therefore, the low rate of the microbiological agents from the blood or abscess specimens can be attributed to this.

In the literature, it has been reported that surgical procedures such as; decompression surgery, corpectomy and posterior spinal instrumented fusion, discectomy, laminectomy, laminotomy, and segmental stabilization can be performed due to the features of the problem, and improvements of motor weakness have been shown after SEA surgery (14,15). Similarly, our study has demonstrated significant motor improvements in CRF patients after surgery.

A large percentage of patients with bacterial SEA cannot be diagnosed promptly. Therefore, appropriate and early treatment opportunity may be missed (16). Proper management for SEA includes both antibiotherapy and surgical procedures. Once the diagnosis is established, consultation with the departments of infectious disease and spinal surgery is mandatory (17). Besides, medical management for SEA can fail in some conditions. Previous studies have stated that diabetes mellitus, leukocytosis >12.5, positive blood cultures and CRP>115 are risk factors for failure of medical management (10,18). Patel et al. reported that surgical procedures are more successful for motor improvements than the medical treatments alone in patients with SEA. They also said that early surgical interventions have more effective outcomes than delayed surgeries (10). Our patients had these aforementioned risk factors, so the success of the treatment of SEA management can be attributed to combination of the surgery and IV antibiotherapy.

In conclusion, the present study showed that surgical procedures could play an essential role in the management of SEA patients with CRF.

## Acknowledgments

The author declares that he did not receive any financial support at any stage of this study.

## Conflict of Interests

The author states that he has no conflict of interest.

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### How to cite?

Arsal Acarbas. Spinal Epidural Abscess in Patients with Chronic Renal Failure: A Single-Center Experience. Ulutas Med J.2019;5(3):209-214

DOI: 10.5455/umj.20190719032811