

THE EFFECT OF CHRONIC KIDNEY DISEASE IN PATIENTS WITH SPONTANEOUS SPONDYLODISCITIS

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ABSTRACT

Objective: Spontaneous spondylodiscitis is a rare but serious infectious disease of the vertebral column that can lead to permanent neurological deficits. We investigated the differences during follow-up of this pathology, which is more common in patients undergoing hemodialysis (HD) treatment for chronic kidney disease (CKD), compared with the general population.

Materials and Methods: The data of patients who were treated for spontaneous spondylodiscitis between 2016-2021 at the Başkent University Department of Neurosurgery were used retrospectively. The patients were divided into 2 groups according to the diagnosis of CKD. Demographic data of the patients, biochemical values at the time of diagnosis (C-reactive protein, sedimentation, leukocyte, lymphocyte), microbiological and pathological examination results, and treatment method (surgical, medical) applied after diagnosis was obtained from the medical records. The effects of CKD presence and treatment methods on patient survival were investigated.

Results: Of the 49 patients included in the study, 57.1% were female and the mean age was 66 years. Twenty-four of the patients were chronic HD patients. The microbiological examination of the samples taken determined that the causative pathogen could be produced in the cultures of 21 (42.8%) patients. According to the results of the pathological examination, signs of infection were detected in 24 (48.9%) patients. It was determined that 27 of the patients were operated. There was a central venous catheter in 20 of the patients. There was no statistically significant difference in survival between the groups that were operated on for instability and those that were not operated on. However, chronic renal failure and the presence of central venous catheters increased mortality statistically significantly.

Conclusion: In the presence of back pain in chronic HD patients, spondylodiscitis should be suspected and diagnosed at an early stage, even if there is no fever or high infection parameters. Finally, great emphasis on disinfection procedures and aseptic techniques in patients with central venous catheters protected from these serious infectious complications.

Keywords: Spondylodiscitis, kidney failure, hemodialysis

INTRODUCTION

Spinal infections are a disease characterized by delays in diagnosis and treatment due to their silent clinics. Neurological deficits, sepsis, and even mortality may develop due to delays in treatment. Its incidence has increased recently. Parallel to the newly developed antibiotics, the development of resistance in microorganisms and the fact that stabilization techniques have become more sophisticated day by day have made it mandatory for professionals interested in this subject to keep their knowledge up-to-date⁽¹⁾.

In spontaneous spondylodiscitis, the causative microorganisms reach the vertebrae and intervertebral disks by bacteremia, retrograde infection from the urinary tract, and direct invasion from adjacent tissues. The incidence of vertebral osteomyelitis is estimated to be 2.4/100,000 on average. Its incidence increased with age. While it is 0.3/100,000 in the population under the age of 18, it increased to 6.5/100,000 in the population over the age of 70⁽²⁾. Hemodialysis (HD) patients have additional

risk factors compared with the normal population. These are repeated vascular interventions, the presence of a long-term catheter, and contamination of the dialysis water treatment system. The features and clinical course of spontaneous spondylodiscitis in patients with HD patients may differ from those in the general population⁽²⁾.

Case studies of spontaneous spondylodiscitis in patients with HD patients can be found in the literature. However, the outcomes of patients are not well defined^(3,4). This study determines the prognostic factors of spontaneous spondylodiscitis, its clinical course, and its effect on survival in patients with HD patients.

MATERIALS AND METHODS

This study was approved by the Başkent University Institutional Review Board (project no: KA22/190) and supported by the Başkent University Research Fund. For the study, the data of patients who were treated for spontaneous spondylodiscitis

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between 2016-2021 at the Başkent University Department of Neurosurgery were used retrospectively. The patients were divided into 2 groups according to the diagnosis of chronic kidney disease (CKD). Demographic data of the patients, biochemical values at the time of diagnosis [C-reactive protein (CRP), sedimentation, leukocyte, lymphocyte], microbiological and pathological examination results, and treatment method (surgical, medical) applied after diagnosis was obtained from the medical records. The effects of CKD presence and treatment methods on patient survival were investigated.

Statistical Analysis

As descriptive statistics in the study, frequency (n) and percentage (%) values are given in the evaluation of categorical variables. The Shapiro-Wilk normality test was used for the conformity of the numerical variables to the normal distribution, and the median (minimum-maximum) values were given as the descriptive statistics for the variables whose normal distribution assumption was provided, for those whose mean ± standard deviation was not normally distributed. Student t-test, Mann-Whitney U test, and Welch t-test were used to examine the differences between groups in terms of numerical variables. The Pearson chi-square test and Fisher's Exact test were used to examine the relationship between categorical variables. The log-rank test was used to compare survival times according to the status of being operated, the presence of corticotropin releasing factor, and the status of receiving antibiotic treatment. Type I error probability was taken as $\alpha=0.05$ in all hypothesis tests, and the Statistical Package Social Science v25.0 package program was used for statistical evaluations.

RESULTS

Of the 49 patients included in the study, 57.1% were female and the mean age was 66 years. Twenty-four of the patients were chronic HD patients. It was determined that 35 of the patients had infected vertebrae in the lumbar region, 8 in the thoracic region, 3 in the thoracolumbar junction, and 3 in the cervical region (Table 1). The microbiological examination of the samples taken determined that the causative pathogen could be produced in the cultures of 21 (42.8%) patients. *Staphylococcus aureus* (*S. aureus*) (n=10, 47.6%) was found to be the most common agent. Other causative microorganisms detected are *Staphylococcus epidermidis* (n=6, 28.5%), *pseudomonas* (n=2, 9.5%), coagulase-negative *Staphylococcus* (n=2, 9.5%), and *Staphylococcus lugdenesis* (n=1, 4.7%) was found (Table 2). According to the results of the pathological examination, signs of infection were detected in 24 (48.9%) patients. It was determined that 27 of the patients were operated on. The management of a total of 49 patients with spontaneous spondylodiscitis is shown in Table 3. There was a central venous catheter in 20 of the patients (Table 1). The mortality rate was 22.4% (n=11). According to the statistical analysis performed by comparing the chronic HD patients and the patients without CKD, no significant difference was found

in gender, (p=0.33) age, (p=0.33) and preoperative biochemical parameter values (CRP, sedimentation, leukocyte, lymphocyte) (p=0.33, p=0.055, p=0.73, p=0.73). There was no statistically significant difference in survival between the groups that were operated on for instability and those that were not operated on (p=0.77). However, chronic renal failure and the presence of central venous catheters increased mortality statistically significantly (p=0.002). Pictures of operations performed due to instability developing after spondylodiscitis are shown in Figure 1.

Table 1. Summary of characteristics of patients with spontaneous spondylodiscitis (n=49)

Variable	Value
Mean age in years	66
Sex	
Males	21 (42.9%)
Females	28 (57.1%)
Levels involved vertebra	
Cervical	3 (6.1%)
Thoracic	8 (16.3%)
Thoracolumbar Junction	3 (6.1%)
Lumbar	35 (71.4%)
Management	
Operated + medical treatment	27 (55.1%)
Medical treatment	22 (44.8%)
Central venous catheter	
Yes	20 (40.8%)
No	29 (50.1%)
Chronic kidney disease	
Yes	24 (48.9%)
No	25 (51.02%)
Mortality	
Yes/(operated/non-operated)	11/(6/5)
No	38
Cultures	
(+)	21 (42.8%)
(-)	28 (57.1%)
Pathological examination	
(+)	24 (48.9%)
(-)	25 (51.02%)

Table 2. Microorganism species detected in the microbiological examination

Causative organism	
<i>S. aureus</i>	10 (47.6%)
<i>Staphylococcus epidermidis</i> (n=6, 28.5%)	6 (28.5%)
<i>Pseudomonas</i> (n=2, 9.5%)	2 (9.5%)
Coagulase-negative <i>Staphylococcus</i> (n=2, 9.5%)	2 (9.5%)
<i>Staphylococcus lugdenesis</i> (n=1, 4.7%)	1 (4.7%)
<i>S. aureus: Staphylococcus aureus</i>	

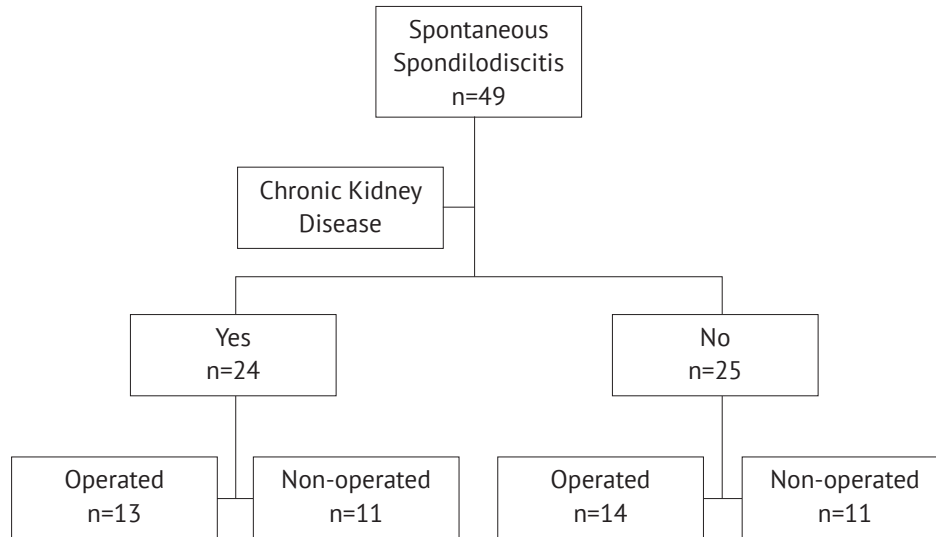


Table 3. Management of a total of 49 patients with spontaneous spondylodiscitis

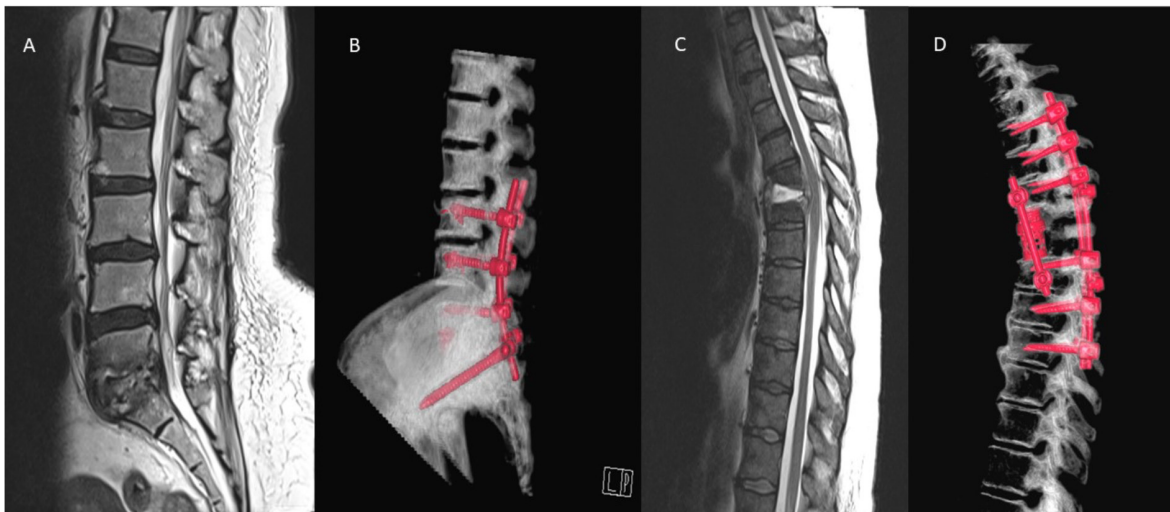


Figure 1. A) Preop MRI image of vertebral defect due to spondylodiscitis in the lumbar region B) Postoperative CT image C) Preop MRI image of vertebral defect due to spondylodiscitis in the thoracic region D) Postoperative CT image
MRI: Magnetic resonance imaging, CT: Computed tomography

DISCUSSION

Spontaneous spondylodiscitis is a rare disease that can be fatal due to low treatment efficacy. It is more common in patients with dialysis patients recently. Frequent vascular interventions and the presence of a central venous catheter pose a risk of bacteremia. The resulting bacteremia involves the pathogen in the intervertebral disks in 50.8% of the cases⁽⁵⁾.

In our study, we investigated the effects of prognostic factors, clinical course, and survival on chronic dialysis patients to compare the results of infectious spondylodiscitis compared with the group without CKD.

Consistent with previous studies, we also found in our study that spondylodiscitis developing in chronic dialysis patients was more mortal than in the group without renal failure⁽⁶⁾. Because of the microbiological examination performed in our

study, 42.8% of the causative microorganisms were shown. The inability to identify the causative microorganism causes difficulty in choosing the right antibiotic therapy. This result was found to be consistent with previous studies^(7,8). Consistent with the literature, we identified *S. aureus* as the most common cause of spondylodiscitis, which is responsible for bacteremia in the HD group. Repeated vascular interventions are the reason for this. Zhang et al.⁽⁹⁾ Although a lower rate of *S. aureus* bacteremia was shown in patients using an arteriovenous fistula, the rate was found to be higher than that in the general population. In our study, we found *S. aureus* to be the most common factor in HD patients with central venous catheters, and we showed that mortality was higher in the catheter group. According to these results, it is important for patients on HD to perform HD with an arteriovenous fistula as soon as possible instead of a central venous catheter for a long time and to comply with antisepsis rules for patient survival. In a study by Lu et al.⁽¹⁰⁾ involving

1,550 HD patients, it was determined that approximately 10% of the patients had a central venous catheter, and the biofilm layer formed on the catheter was responsible for spondylodiscitis. Additionally, spondylodiscitis should be kept in mind in case of new-onset back pain in patients with permanent central venous catheters other than HD patients.

Surgery is the preferred treatment option in cases of epidural abscess compressing the spinal cord or nerve roots, progressive or acute neurological deficit, spinal instability, or deformity. The primary goal of surgical treatment is tissue culture, drainage of the abscess, and debridement of non-viable tissue. Because of the study by Tschöke et al.⁽¹¹⁾, they suggested that debridement and use of appropriate antibiotics according to the results of microbiological examination of the tissue taken could provide the cure. Additionally, long-term bed rest required during antibiotic treatment of patients with impaired vertebral structure to spondylodiscitis causes many complications. In our study, there was no statistically significant difference between the operated and non-operated groups in terms of survival. However, our opinion is that even though there is no difference in mortality, patients who underwent surgery have a good quality of life, even due to early mobilization. We think that the high mortality rate in our study is due to the late diagnosis of spondylodiscitis in patients with HD patients. There are delays in the diagnosis because the infection parameters are higher in the group with chronic disease than in the healthy group, and the fever in the group with indwelling catheters is primarily attributed to the catheter infection. This delay causes more serious damage to the spine. In this group with a comorbid disease, the difficulty of surgical treatment, duration of treatment, and risk of mortality increase due to the delay. Identifying the causative microorganism as soon as possible and early treatment is critical for the prognosis of the infective condition in patients.

Study Limitations

This study has limitations. Cases were reviewed retrospectively so that only associations between spondylodiscitis and mortality could be detected, whereas causal associations could not be clearly identified. Because the prevalence of infectious spondylodiscitis was low, the number of cases was limited, reducing our ability to detect significance in variables. Despite these limitations, the clinical course, prognostic factors for patients with infectious spondylodiscitis were determined.

CONCLUSION

In the presence of back pain in patients with chronic HD patients, spondylodiscitis should be suspected and diagnosed at an early stage, even if there is no fever or high infection parameters.

Finally, great emphasis on disinfection procedures and aseptic techniques in patients with central venous catheters protected from these serious infectious complications.

Ethics

Ethics Committee Approval: This study was approved by the Başkent University Institutional Review Board (project no: KA22/190, date: 12.04.2022)

Informed Consent: Retrospective study.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: F.Ş., E.S., S.A., S.G., C.Y., Concept: F.Ş., E.S., S.A., Design: F.Ş., E.S., Data Collection or Processing: F.Ş., D.U., Analysis or Interpretation: F.Ş., D.U., Literature Search: F.Ş., E.S., S.A., Writing: F.Ş., E.S., S.A.

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