

Hemodiyaliz Hastalarında Spondilodiskitis

Spondylodiscitis in Patients under Haemodialysis

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ÖZ

Amaç: Hemodiyaliz immünyüpresyon yaratmasının yanı sıra hastaların damar girişimlerine ve operatif prosedürlere daha sık maruz kalmaları nedeniyle enfeksiyon riskini arttırmaktadır. Amacımız hemodiyaliz hastalarında spondilodiskitis oranını, olası etkenleri ve hastalığa erken tanı konmasına yardımcı olabilecek parametreleri ortaya koymaktır.

Materyal ve Metot: 2010-2020 tarihleri arasında hemodiyaliz ünitesinde tedavi alan hastalar çalışmaya dahil edildi. Bel ağrısı şikayeti olan hastaların verilerine Mia-Med hasta kayıt sisteminden retrospektif olarak ulaşıldı.

Bulgular: Spondilodiskitis sıklığı %2,3 idi. Diyaliz süresinin uzaması ($p<0,001$), kateter kullanımı ($p=0,005$), diabetes mellitus ($p=0,029$) ve kalp yetmezliği ($p=0,005$) varlığının diskitis riskini arttırdığı saptandı. Spondilodiskitis bulunanlarda lökosit ($p<0,001$), nötrofil lenfosit oranı (NLO) ($p=0,006$), trombosit lenfosit oranı (TLO) ($p=0,001$), sedimentasyon ($p<0,001$) ve C-reaktif protein (CRP) ($p<0,001$) değerleri anlamlı olarak yüksek idi.

Sonuç: Spondilodiskitis komorbiditesi olan, hemodiyaliz süresi uzun, kateter kullanılan ve ileri yaştaki hastalarda daha sık ortaya çıkmaktadır. Hızlı tanı için lökositoz, CRP, sedimentasyon gibi tetkikler kullanılabilir. Ayrıca tam kan tetkik sonuçlarından kolaylıkla hesaplanabilen NLR ve TLR, tanıda kullanılacak parametrelerdir.

Anahtar Kelimeler: Hematolojik parametreler, hemodiyaliz, spondilodiskitis

ABSTRACT

Objective: In addition to causing immunosuppression, hemodialysis may increase the risk of infection, given that the patients are more frequently exposed to vascular interventions and operative procedures. The present study aims to reveal the prevalence of spondylodiscitis in patients on hemodialysis, potential factors, and parameters that may help in the early diagnosis of the disease.

Materials and Methods: Patients who received treatment in the hemodialysis unit between 2010 and 2020 were included in the present study. Data of patients with low back pain were obtained retrospectively from the Mia-Med patient registry system.

Results: The frequency of spondylodiscitis was 2.3%. Findings showed that the prolonged dialysis duration ($p<0.001$), catheter use ($p=0.005$), diabetes mellitus ($p=0.029$), and heart failure ($p=0.005$) increased the risk of discitis. Leukocyte ($p<0.001$), neutrophil-to-lymphocyte ratio (NLR) ($p=0.006$), platelet-to-lymphocyte ratio (PLR) ($p=0.001$), sedimentation ($p<0.001$) and C-reactive protein (CRP) ($p<0.001$) levels were significantly higher in patients with spondylodiscitis.

Conclusion: Spondylodiscitis occurs more prevalently in patients with comorbidity, have long hemodialysis duration, use catheters and in elderly patients. Leukocytosis, CRP, sedimentation can be used for rapid diagnosis. In addition, NLR and TLR, which can be easily calculated from the results of whole blood tests, are parameters that can be used in diagnosis.

Keywords: Hematological parameters, hemodialysis, spondylodiscitis

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INTRODUCTION

Spondylodiscitis is an inflammatory disease that impacts the spine, discs, and paraspinal tissue. In the adult age group, it mainly manifests itself as an infection that develops after discectomy. Albeit it has been argued in the literature that factors, such as trauma, viral infection and low-grade inflammation, are effective in the etiology of spondylodiscitis, the etiological factor that almost everyone agrees on is a bacterial infection.¹ It is considered that the agent spreads from the infection site to the disc by a hematogenous route. Infection typically begins in the adjacent end plate and the disc becomes secondarily infected. Predisposing factors for spondylodiscitis that occurs without surgical procedure to that area include past/current infectious diseases (skin, soft tissue, endocarditis and pneumonia), diabetes mellitus (DM), collagen-vascular diseases, steroid use, intravenous drug use, alcohol addiction, and other recent surgery or surgical interventions.²⁻⁴

Hemodialysis is a frequently used treatment method in patients with chronic renal failure. However, various complications may occur due to hemodialysis. The complication that is expected to occur more frequently in patients on hemodialysis is infection. In addition to conditions, such as uremia, malnutrition, vitamin D deficiency, and hyperparathyroidism, operative procedures, such as a central venous catheter, placement of vascular grafts, and opening of arteriovenous fistulas, may also increase the risk of infection in patients undergoing hemodialysis.⁵

In the study, it was aimed to reveal the rate of spondylodiscitis, potential factors, and parameters that could help in the early diagnosis of the disease in patients receiving hemodialysis treatment in our hospital.

MATERIALS AND METHODS

Ethics Committee Approval: The present study was approved by Düzce University Clinical Research Ethics Committee (Date: 01.02.2021, decision no: 11/2021). All patients who received treatment in the Hemodialysis Unit of the Department of Internal Medicine, Department of Nephrology during the 10-year period between January 2010 and December 2020 were included in this study.

Data of patients with low back pain were obtained retrospectively from the Mia-Med patient registry system. Each patient's age, sex, smoking-alcohol use, duration of hemodialysis, whether there is an additional disease other than the reason for hemodialysis, the way of performing hemodialysis (arteriovenous fistula-catheter), examination findings for low back pain, and the results of the tests were noted down. Of the hemogram tests performed during the period of low back pain, leukocyte, eryth-

rocyte, thrombocyte, and hemoglobin data were recorded. The neutrophil-to-lymphocyte ratio (NLR) was computed by dividing the neutrophil count by the lymphocyte count, while the platelet-to-lymphocyte ratio (PLR) was calculated by dividing the platelet count by the lymphocyte count. Also, the C-reactive protein (CRP)-Sedimentation value was recorded as well. The blood culture results of the patients diagnosed with spondylodiscitis and the vertebral level that developed the disease were noted down. The results of patients with a diagnosis of spondylodiscitis were compared with those without.

Statistical Analysis: The software of SPSS for Windows version 21 was utilized for data analysis. Data were analyzed via Mann-Whitney U test and χ^2 or Fisher's exact tests, where applicable. Continuous variables were presented as mean (SD), median, minimum, and maximum. Model for logistic binary regression analysis using the Ward method and keeping the main discitis variable in the model was used to obtain Odds Ratios for the presence of diabetes, heart failure, catheter, hemogram parameters, NLR, and PLR. The results were considered statistically significant at $p < 0.05$.

RESULTS

Of the 898 dialysis patients, 65 had low back pain (7.2%). Spondylodiscitis was found in 21 of the patients. The prevalence of spondylodiscitis was 2.3% (21/898). The prevalence of spondylodiscitis among those with low back pain was 32.3% (21/65). Complete blood count, CRP, sedimentation, blood culture, and Magnetic Resonance Imaging (MRI) were requested from all patients with low back pain, and these findings were utilized in the diagnosis.

When patients with low back pain were divided into two groups, those with spondylodiscitis ($n=21$) and those without ($n=44$), the mean age of the patients with dysthymia was 69.6 ± 1.2 , and the median age was 70 years. The mean age of those without spondylodiscitis was 69.8 ± 1.2 years, and the median age was 71.5 years, and no significant difference was found between the two groups ($p=0.638$). Of the patients with spondylodiscitis, 61.9% (13/21) were female, and 38.1% (8/21) were male ($p=0.465$). While 27.6% (8/29) of males had spondylodiscitis, 36.1% (13/36) of females had spondylodiscitis, and the difference between the two groups was not significant ($p=0.465$) (Figure 1).

In the group of patients with spondylodiscitis, the localization of infection was found in the lumbar region in 14 (66.6%) patients and the thoracic region in seven (33.33%) patients. The number of patients with the upper-level lumbar region localization was 10 (71.42%). The findings showed that localization was in the lower thoracic region in all patients with

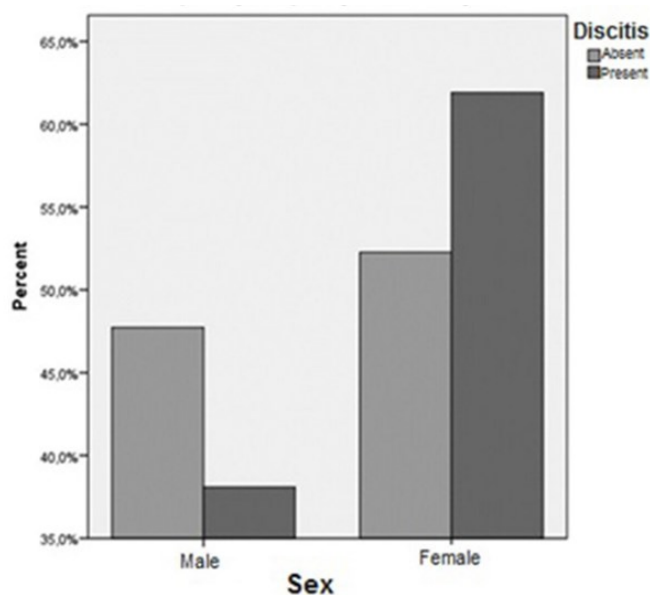


Figure 1. Frequency of spondylodiscitis by sex.

spondylodiscitis located in the thoracic region. It was observed that spondylodiscitis occurred close to the thoracolumbar junction level in 17 (81%) of the patients.

Dialysis duration was 6.3 ± 5.8 years in people with spondylodiscitis, while it was 2.3 ± 2.0 years in people without spondylodiscitis, and the difference was significant ($p < 0.001$). It was revealed that increasing dialysis duration increased the incidence rate of spondylodiscitis (Figure 2).

While dialysis was performed via a catheter in 15 (71.43%) patients with spondylodiscitis, six (28.57%) had arteriovenous (AV) fistulas. The pres-

ence of a catheter significantly increased the rate of spondylodiscitis ($p = 0.005$) (Table 1). In the blood culture results of the patients with discitis, growth was observed in 6 (28.57%) patients, *Staphylococcus aureus* was grown in 5 of these patients, and *Escherichia coli* was grown in 1 patient. The relationship between the presence of diabetes mellitus, the presence of heart failure, smoking, and alcohol use in patients with spondylitis is presented in Table 1. There were no other predisposing factors (soft tissue infection, endocarditis, pneumonia, collagen vascular disease, steroid use, IV drug use, history of surgery) in spondylodiscitis patients.

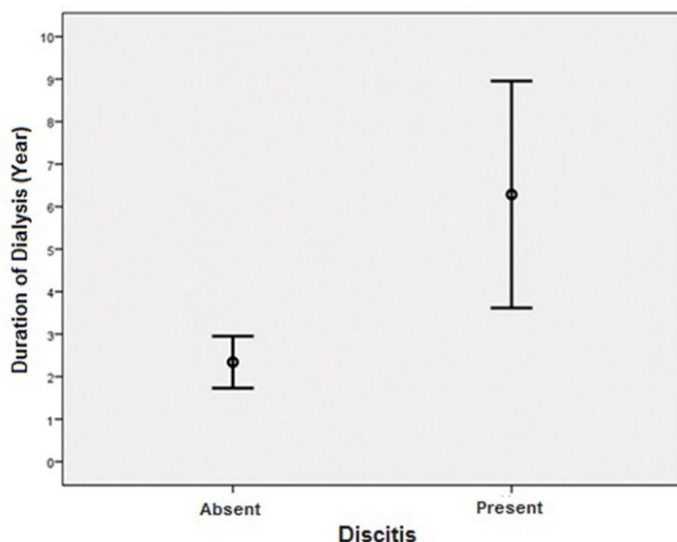


Figure 2. Relationship between duration of dialysis and spondylodiscitis.

Table 1. Potential predisposing factors in patient groups.

	Spondylodiscitis (+) n=21 (%)		Spondylodiscitis (-) n=44 (%)		P
Dialysis technique					
Catheter (n=30)	15	(71.3)	15	(34.1)	0.005
AV Fistula (n=35)	6	(28.57)	29	(65.9)	0.005
Diabetes					
Present	11	(52.38)	11	(25)	0.029
Absent	10	(47.62)	33	(75)	
Heart failure					
Present	12	(57.14)	7	(15.9)	0.001
Absent	9	(42.86)	37	(84.1)	
Smoking					
Present	6	(28.58)	12	(27.3)	0.913
Absent	15	(71.42)	32	(72.7)	
Alcohol use					
Present	1	(4.77)	3	(6.82)	0.747
Absent	20	(95.23)	41	(93.18)	

AV: Arteriovenous

The mean, median leukocytes, NLR, PLR, sedimentation, and CRP values were significantly higher in patients with spondylodiscitis, whereas erythrocyte and hemoglobin values were significantly lower. Difference between the hemogram parameters of patients with and without spondylodiscitis was not significant (Table 2).

DISCUSSION AND CONCLUSION

Spondylodiscitis is defined as an infection of the intervertebral disc and adjacent vertebrae. The age group in which it occurs more prevalently is early childhood and the sixth decade.⁶ Ages of the patients in our study were compatible with the literature. Males are affected twice more than females.⁷ The gender of the patients in our study was not compati-

Table 2. Hematological parameters in the patient groups.

	Spondylodiscitis (+)	Spondylodiscitis (-)	P
Leukocytes (K/uL)			
Mean±SD (Min-max)	13.666 ± 0.93 (7.500-26.900)	7.400 ± 0.39 (4.000-16.400)	<0.001
Erythrocyte (M/uL)			
Mean±SD (Min-max)	3.58 ± 0.13 (2.50 – 4.40)	4.02 ± 0.12 (2.60 – 5.03)	0.018
Platelet (K/uL)			
Mean±SD (Min-max)	212.85 ± 15.53 (81.00-371.00)	199.59 ± 10.18 (111.00-406.00)	0.407
Hemoglobin (g/dL)			
Mean±SD (Min-max)	10.62 ± 0.44 (6.70-13.40)	11.95 ± 0.40 (7.40-15.50)	0.025
NLR			
Mean±SD (Min-max)	7.12 ± 1.81 (0.20-32.00)	3.29 ± 0.65 (0.44-21.80)	0.006
PLR			
Mean±SD (Min-max)	178.50 ± 17.95 (35.20-331.00)	116.70 ± 11.87 (30.60-406.00)	0.001
Sedimentation (mm/h)			
Mean±SD (Min-max)	78.57-7.21 (33-141.00)	28.45 ± 2.50 (11.00-87.00)	<0.001
CRP (mg/L)			
Mean±SD (Min-max)	16.08 ± 1.67 (4.50-32.90)	4.97 ± 1.14 (0.16-39.00)	<0.001

NLR: neutrophil-to-lymphocyte ratio; PLR: platelet-to-lymphocyte ratio; CRP: C-reactive protein.

ble with the literature. There were more female patients. Spondylodiscitis is most common in the lumbar region (58-68%), followed by thoracic (27-30%) and cervical vertebrae (5-11%).^{4,5,8} In our study, the mean age of the patients was 69.6 ± 1.2 years, which corresponds to the expected age range. However, although it was expected to occur mostly in males, 61.9% (13/21) of our spondylodiscitis patients were females, although the difference between the two groups was not significant. We are of the opinion that this difference may be due to hemodialysis and other predisposing factors. Concerning vertebral localization, infection was detected in the lumbar region in 66.6% of our patients and the thoracic region in 33.33%, which is consistent with the literature.

Hemodialysis applications have remarkably increased the survival time of patients with kidney failure thanks to improved materials and advanced techniques in recent years. Moreover, hemodialysis patients have a cumulative risk of infection since they are frequently exposed to vascular interventions and operative procedures, such as internal shunts, vascular grafts, and being in an immunologically dangerous condition.⁹ Bacteremia is a common complication among hemodialysis patients and often develops due to the use of contaminated vascular instruments.^{5,10} In our study, dialysis duration was significantly higher in patients diagnosed with spondylodiscitis than the patients without spondylodiscitis, and an increase in dialysis duration increased the incidence rate of spondylodiscitis.

It has been revealed that the most common pathogen detected in infectious spondylodiscitis is *S. aureus* (20-84%).^{11,12} In their study, Lu et al.⁴ detected the incidence of *S. aureus* at a rate of 38.9% and they underscored that this was associated with a low rate of positive culture. In our study, the most common causative agent was *S. aureus*, consistent with the literature. However, our culture positivity rate was remarkably low, which is consistent with Lu et al.⁴'s study.

Although the frequent occurrence of spondylodiscitis in hemodialysis patients is associated with bacteremia, the suppressed immunity of these patients, their advanced age, and comorbidities, such as DM increase the incidence of spondylodiscitis.^{5,10} Furthermore, when examined concerning factors that may predispose to bacteremia, as well as the presence of catheter/fistula, presence of additional disease, and cigarette-alcohol use, the prolongation of the dialysis period, the use of catheters, and the presence of concomitant DM and heart failure increase the risk.^{5,8,13,14} Lu et al.⁴, in their study of 18 patients, reported that 50% of the patients had diabetes, 55.6% had hypertension, and 55.6% had coro-

nary heart disease. In the same study, 27.8% of the patients used fistula, 22.2% used arteriovenous graft, 44.4% used catheter, and 5.6% femoral double lumen. Likewise, in our study, diabetes was 52.38%, heart disease was 57.14%, and the rate of those with both diseases was 38.09%. Besides, the rate of patients using a catheter was 71.43%. The incidence rate of spondylodiscitis was increasing with the use of a catheter.

The fact that spondylodiscitis is more common in the thoracolumbar region results in a late diagnosis of the disease and a higher mortality and morbidity rate.¹⁰ High leukocyte, CRP, and sedimentation values, among the blood tests required for rapid diagnosis, are emphasized in all studies.^{12,15} In our study, NLR and PLR values of the patients were also calculated, considering that parameters, such as sedimentation and CRP, that would accelerate the diagnosis of spondylodiscitis in patients with low back pain, and parameters that can be easily calculated from complete blood count, could reduce the delay in diagnosis.

NLR and PLR are described as markers of systemic inflammation used in inflammatory diseases and malignancies.¹⁶⁻¹⁸ It has not been studied before in patients diagnosed with spondylodiscitis, but it has been studied in many diseases along with infection markers CRP and sedimentation. In our study, NLR and TLR values were significantly higher in spondylodiscitis patients, as were leukocyte, sedimentation, and CRP values.

Regarding the limitations of the present study, the data used in this study are single-centered. The data involves data for outpatients and does not involve treatment and follow-up data.

In conclusion, spondylodiscitis is a devastating condition that occurs more prevalently in hemodialysis patients due to predisposing factors. Affected patients are often patients with multiple comorbidities, long hemodialysis duration, catheter use, and advanced age. A history of low back pain, increased CRP, positive blood cultures, and characteristic MRI findings are safe findings for the diagnosis of leukocytosis. Moreover, concerning rapid diagnosis, NLR and TLR, which are easily calculated from the results of complete blood count, are parameters that can be used in the diagnosis before blood culture and MRI examination results, which require more time, in addition to routine and known tests, such as leukocytosis, CRP, and sedimentation.

Ethics Committee Approval: Our study was approved by the Düzce University, Clinical Research Ethics Committee (Date: 01/02/2021, decision no: 2021/11).

Conflict of Interest: No conflict of interest was

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