Merve Kaplan https://orcid.org/0000-0001-5063-0922
Serpil Erol https://orcid.org/0000-0001-5655-3665
Nurgül Ceran https://orcid.org/0000-0002-6886-6266
Asuman İnan https://orcid.org/0000-0002-6182-1262
Seniha Şenbayrak https://orcid.org/0000-0002-4983-6613
Cansu Aşık https://orcid.org/0009-0000-5705-6767

RESEARCH ARTICLE / ARAŞTIRMA
DOI: 10.4274/mjima.galenos.2025.25438.21
Mediterr J Infect Microb Antimicrob 2026;15:25536.2
Erişim: http://dx.doi.org/10.4274/mjima.galenos.2025.25536.2

Pyogenic Spondylodiscitis: A 9-year Analysis

Kaplan et al. Clinical Insights into Pyogenic Spondylodiscitis

Merve Kaplan[1], Serpil Erol[2], Nurgül Ceran[2], Asuman İnan[2], Seniha Şenbayrak[2], Cansu Aşık[2]

[1]Kırklareli Training and Research Hospital, Department of Infectious Diseases and Clinical Microbiology, Kırklareli, Türkiye
[2]University of Health Sciences Türkiye, Haydarpaşa Numune Training and Research Hospital, Department of Infectious Diseases and Clinical Microbiology, İstanbul, Türkiye

Merve Kaplan, MD. Kırklareli Training and Research Hospital, Department of Infectious Diseases and Clinical Microbiology, Kırklareli, Türkiye
merveaykan1@gmail.com
0000-0001-5063-0922

Cite this article as: Kaplan M, Erol S, Ceran N, İnan A, Şenbayrak S, Aşık C. Pyogenic spondylodiscitis: A 9-year analysis. Mediterr J Infect Microb Antimicrob.

16.07.2025
27.10.2025

Epub: 24.11.2025
Published:

Abstract
Introduction: The management of pyogenic spondylodiscitis (PS) remains challenging due to the absence of clear, evidence-based guidelines. This study aimed to assess the clinical characteristics, diagnostic and follow-up challenges, and treatment outcomes of patients with PS.
Materials and Methods: The clinical, laboratory, and radiological data of all patients aged ≥18 years who were hospitalized with PS between January 2015 and June 2024 were retrospectively analyzed.
Results:
Among 25 patients diagnosed with PS, 60% were male, with a mean age of 61 ± 10.6 years (range: 41–78). The most common symptoms were back or neck pain (88%), difficulty walking (24%), and fever (20%). The mean symptom duration was 2 months. The lumbosacral (60%), thoracic (44%), and cervical (12%) regions were the most frequently affected. A total of 84% of patients had at least one comorbidity, and 80% had a predisposing risk factor. Blood cultures were positive in 60% of patients. Among the 23 patients who underwent tissue and/or abscess culture, 43.7% and 30% yielded positive results, respectively. The most frequently isolated pathogen was methicillin-susceptible *Staphylococcus aureus* (MSSA) (48%). Among patients followed with contrast-enhanced magnetic resonance imaging (MRI), 41.2% demonstrated persistent contrast enhancement without significant change. The total treatment duration was 12 ± 4.1 weeks (range: 7–24). Treatment success was achieved in 86.3% of cases, while 3 (13.6%) patients experienced recurrence. In all recurrent cases, *S. aureus* was the causative agent, and paraspinal abscess and bacteremia were present concomitantly. All recurrent cases had received at least 12 weeks of pathogen-targeted therapy.
Conclusion: Hospitalization and invasive procedures appear to be significant risk factors for PS. Obtaining blood and tissue/abscess cultures before initiating antimicrobial therapy enhances the likelihood of pathogen identification. Despite adequate treatment, MRI findings may persist without complete radiological resolution. Close monitoring is warranted for potential recurrence when *S. aureus* is the causative pathogen, especially in the presence of abscess or bacteremia.
Keywords: Pyogenic spondylodiscitis, vertebrae, *Staphylococcus aureus*, recurrence

Anahtar Kelimeler: Pyojenik spondilodiskit, vertebra, *Staphylococcus aureus*, nüks

Introduction

Spondylodiscitis is an infection of the spinal column caused by various pathogens, potentially involving the vertebral body, intervertebral discs, spinal canal, and paravertebral structures[1]. The etiology may be pyogenic (bacterial), granulomatous (tuberculous, brucellar, or fungal), or, rarely, parasitic; however, the majority of cases are bacterial in origin[1–3]. Pathogens may reach the vertebrae through hematogenous dissemination, direct inoculation (most commonly during spinal surgery), or contiguous spread from adjacent structures. A distant focus of infection is identified in about half of the cases, and infective endocarditis accompanies approximately 12% of them[3].
Spondylodiscitis accounts for 0.15%–7% of all osteomyelitis cases[1,2,4]. In Western countries, its annual incidence ranges from 0.4 to 2.4 per 100,000 population[5]. It is 1.5–3 times more common in males and occurs across all age groups, with a higher prevalence among individuals aged 50–70 years[1,2,4,6].
The incidence of spondylodiscitis has shown a concerning rise over the past two decades. This trend is attributed to increased life expectancy, the presence of comorbidities, greater use of invasive procedures and immunosuppressive therapies, expanding indications for spinal surgery, a growing vulnerable population, and advancements in diagnostic methods[2,6–8].
The clinical spectrum of the disease ranges from mild to rapidly progressive, potentially leading to severe morbidity and mortality, including vertebral collapse, permanent neurological deficits, and even death. Its nonspecific early symptoms often result in diagnostic delays of 30 to 90 days[6]. Early identification of the causative pathogen and prompt initiation of targeted antimicrobial therapy are

therefore crucial[9]. However, diagnosis, follow-up, and treatment remain challenging due to the limited availability of evidence-based management guidelines. This study aimed to evaluate the clinical characteristics and challenges associated with microbiological and radiological assessments during diagnosis and follow-up, as well as the treatment outcomes of pyogenic spondylodiscitis (PS).

Materials and Methods

This study was designed as a single-center retrospective cohort study conducted at a tertiary care facility in Türkiye. Data were retrospectively collected from the hospital information system and patient records for all patients aged ≥ 18 years who were hospitalized with a diagnosis of PS between January 2015 and June 2024. Patients with tuberculos or brucellar spondylodiscitis were excluded.

The diagnosis of spondylodiscitis was based on typical clinical findings, characteristic changes on magnetic resonance imaging (MRI), computed tomography (CT), positron emission tomography–CT (PET–CT), and microbiological evidence of infection.

Demographic, clinical, microbiological, and radiological data of the patients were retrospectively reviewed. Microorganism identification and antimicrobial susceptibility testing (AST) were performed using fully automated systems (VITEK2 Compact, bioMérieux, France, and VITEK MS, bioMérieux, France). The AST results were interpreted according to the recommendations of the European Committee on AST.

The durations of intravenous and oral treatments were recorded. All patients received a total treatment duration of at least 6 weeks. Therapy was extended in patients with inadequate clinical or laboratory response or those with insufficient source control. Owing to the retrospective design of the study, the frequency of follow-up imaging was not standardized. Therefore, radiology reports obtained at the initiation and completion of therapy were compared for all patients.

Treatment success was defined as the absence of clinical or laboratory deterioration during a one-year follow-up. Patients who demonstrated clinical, laboratory, or radiological worsening after completion of therapy were classified as recurrent cases.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics 26 (IBM SPSS, USA). The normality of parameter distribution was assessed using the Shapiro–Wilk test. Descriptive statistics were calculated for numerical data, including median, mean, and standard deviation values.

Data collection was conducted with the approval of the University of Health Sciences Türkiye, Haydarpaşa Numune Training and Research Hospital (approval number: 711/06/2024, dated: 05.06.2024).

Results

Between January 2015 and June 2024, 25 patients were diagnosed with PS. Of these, 15 (60%) were male and 10 (40%) were female, with a mean age of 61 ± 10.6 years (range: 41–78). At least one chronic disease was present in 21 (84%) patients. The most common comorbidities were diabetes mellitus in 14 (56%), hypertension in 12 (48%), hyperlipidemia in eight (32%), and chronic kidney failure in six (24%) patients (Table 1).

The most frequent presenting symptoms were back or neck pain in 22 (88%) patients, difficulty walking in six (24%), fever in five (20%), leg weakness in two (8%), incontinence in two (8%), weight loss in two (8%), night sweats in two (8%), and numbness in one (4%) at admission. The mean duration of symptoms before diagnosis was 2 months (range: 1 week–6 months). Motor deficit was detected in 11 (44%) patients, and a cardiac murmur in one (4%). No abnormal physical findings were observed in 13 (52%) patients. Pretreatment laboratory findings showed a mean white blood cell (WBC) count of 9,132 ± 3,986 cells/mm³ (range: 1,780–19,690), C-reactive protein (CRP) level of 116 ± 92 mg/L (range: 3–317), and erythrocyte sedimentation rate (ESR) of 72 ± 22 mm/h (range: 26–104). By the end of treatment, the mean ESR had decreased to 29 ± 18.7 mm/h (range: 2–83) (Table 2). In recurrent cases, initial WBC counts were 7,700–15,300 and 19,690 cells/mm³, the CRP levels were 10–190 and 29 mg/L, and the ESR values were 76–63 and 95 mm/h, respectively. At the end of treatment, WBC counts decreased to 4,890–8,170 and 8,120 cells/mm³, the CRP levels to 0.4–4 mg/L, and the ESR values to 23–36 and 29 mm/h, respectively.

Discitis was detected in 20 (80%) patients, paravertebral soft tissue involvement in 21 (84%), and abscess formation in 12 (48%). The most frequently affected regions were the lumbosacral (60%), thoracic (44%), and cervical (12%) spine.

As potential risk factors, 13 (52%) patients had a hospital admission within the past 3 months, and four (16%) had a history of intensive care unit stay. Three patients developed infection following vertebral surgery; two had undergone endoscopic retrograde cholangiopancreatography (ERCP), one had a catheter-related infection, and three were on hemodialysis. No risk factors were identified in 5 (20%) patients (Table 1).

Blood cultures were obtained before the initiation of antibiotic therapy in all patients, and 23 (92%) underwent tissue or abscess culture. Blood cultures were positive in 15 (60%) patients. Tissue cultures were obtained from 16 patients, with positive results in seven (43.7%). Abscess cultures showed bacterial growth in three of 10 (30%) patients. In seven (77.7%) of the tissue culture–negative cases and six (85.7%) of the abscess culture–negative cases, samples were collected after the initiation of empirical antibiotic therapy. No organism was isolated from any culture in 5 (20%) patients, who were treated empirically (Table 3).

The most frequently isolated pathogen was *Staphylococcus aureus*, identified in 12 (48%) cases with positive blood or tissue/abscess cultures. All isolates were methicillin-susceptible (MSSA); no methicillin-resistant *S. aureus* (MRSA) was detected. Other identified pathogens included *Pseudomonas aeruginosa, Escherichia coli, Enterococcus faecium, Streptococcus pneumoniae, S. parasanguinis, S. epidermidis, Bacteroides fragilis*, and *Enterobacter cloacae* (each in one case). Blood cultures were positive in 10 (83.3%) of the cases, where *S. aureus* was the causative agent (Table 3).

Complications included spinal cord compression in 11 (44%) patients, vertebral height loss in 10 (40%), and endocarditis in two (8%). The mean duration of intravenous antibiotic therapy was eight weeks (range: 4–24, standard deviation [SD]: 4.2). Oral sequential therapy lasted a mean of five weeks (range: 1–12, SD: 2.4), with a total treatment duration averaging 12 weeks (range: 7–24, SD: 4.1). The recurrent cases received total antibiotic therapy for 13, 12, and 24 weeks, respectively, with intravenous administration for the first 6, 8, and 24 weeks.

A total of 17 (68%) patients were followed with contrast-enhanced MRI, one (4%) with noncontrast MRI, two (8%) with CT, and one (4%) with PET–CT. Follow-up imaging data were unavailable for 4 (16%) patients. At the end of treatment, complete resolution of contrast enhancement was observed in 3 (17.6%) patients, partial regression in seven (41.2%), and no significant change in seven (41.2%). Among the three recurrent cases, regression on MRI was observed in two, while no change was detected in one at the end of treatment.

Of the 22 patients who completed treatment, three (13.6%) developed recurrence, and two (9%) required surgical intervention. Treatment was successful in 19 (86.3%) patients. Treatment outcomes could not be evaluated in 3 patients due to unavailable follow-up data. All recurrent cases were caused by *S. aureus* and were accompanied by bacteremia and paraspinal abscess.

Discussion

The rising incidence of PS over the past 2 decades, along with the complexity of its management and the lack of standardized treatment guidelines, prompted this study to evaluate the clinical and etiological characteristics, diagnostic process, and prognosis of patients treated in our center.

A review of previous studies reported a mean patient age of approximately 60 years and a predominance of male (56%) patients with spondylodiscitis[5]. Our findings are consistent with these reports, with a mean age of 61 years and 60% of patients being male.

The increasing prevalence of spondylodiscitis has been associated with longer life expectancy and the rise in comorbid conditions[3,10,11]. In support of this, 84% of our patients had at least one chronic disease. Furthermore, 52% of the cohort had been hospitalized in the preceding 3 months, indicating that hospitalization is a major risk factor. Catheter-related infections, hemodialysis, and prior spinal

surgeries were common underlying causes, as expected. Notably, two cases of PS caused by gram-negative pathogens following ERCP highlight ERCP as a potential risk factor for gram-negative spondylodiscitis, a relationship described in only a few previous reports[12–14]. In 20% of our cases, no identifiable cause was detected, emphasizing that PS can occur even in patients without apparent risk factors. Consistent with the literature, the lumbosacral region was the most frequently affected site (60%), followed by the thoracic (44%) and cervical (12%) regions[5]. Multilevel involvement was observed in 16% of all cases. Nearly half of the patients presented with concurrent abscess formation, consistent with the 19%–68% range reported in the literature[5,15,16]. Since abscesses can significantly influence both treatment approach and prognosis, screening for additional foci and the early detection of abscess formation are essential steps in clinical evaluation.

Identifying the causative pathogen is critical for ensuring targeted and effective treatment, especially for a disease such as spondylodiscitis, which requires prolonged therapy. Blood cultures yielded a high positivity rate of 60%, underscoring the value of this simple diagnostic tool and reaffirming the importance of obtaining blood cultures before initiating therapy[3]. Positive blood culture rates can reach up to 70% in patients without prior antibiotic exposure[1].

Tissue and abscess cultures are also valuable diagnostic tools. In our study, 44% of tissue cultures and 30% of abscess cultures yielded growth, which aligns with previously reported rates of 43%–78%[3]. The lower positivity rates observed in our study may be attributed to the exclusive use of percutaneous biopsies and the fact that most samples were obtained after empirical antibiotic therapy had begun. Tissue cultures obtained after antimicrobial initiation were negative in 77% of cases, while abscess cultures were negative in 85%. Antibiotic exposure significantly reduces culture positivity rates, and even without prior antibiotic use, biopsy cultures can remain negative in up to 39% of cases[17]. Moreover, CT-guided percutaneous biopsies may yield limited tissue, identifying the pathogen in only about half of cases[1]. Because the procedure is invasive, delays in sampling can also pose challenges in clinical practice. When the causative organism remains unidentified, determining optimal therapy becomes difficult, often necessitating broad-spectrum parenteral antibiotics and prolonged hospital stays. Therefore, obtaining appropriate cultures before initiating therapy is crucial. In nonemergent cases without neurological deficits or sepsis, treatment should be deferred until adequate samples are obtained[9].

The prevalence of *S. aureus* in PS ranges from 20% to 84%, accounting for approximately half of all cases[18]. Consistent with the literature, *S. aureus* was the most common causative pathogen in our study (48%). Methicillin susceptibility among *S. aureus* isolates varies geographically and depends on patient risk factors and disease etiology[6]. Although most community-acquired strains are MSSA, the rising rate of MRSA raises concerns regarding its inclusion in empirical therapy[18]. A review of 14 studies in 2009 reported an MRSA prevalence of 2.6%[19], while more recent studies, particularly from high-income countries, have reported rates as high as 25%–30%[20–22]. In studies conducted in Türkiye, the prevalence ranges from 3.7% to 5.5%[4,23,24], and one study reported a rate of 12.5% in nosocomial cases[25]. Notably, all *S. aureus* strains in our study were MSSA, despite a significant proportion of patients having prior hospitalizations or invasive procedures. This finding suggests that MRSA is not yet a major concern in PS cases in our region and that routine MRSA coverage in empirical therapy may not be necessary for most patients.

Spinal cord compression and vertebral height loss were the most common complications, while 8% of cases had concomitant endocarditis. This finding aligns with prior reports describing endocarditis in up to 12% of PS cases, highlighting the importance of screening for endocarditis in these patients[19].

MRI remains the gold standard for diagnosing spondylodiscitis, although its role in treatment follow-up remains debated[26]. In our study, 68% of patients underwent contrast-enhanced MRI. At the end of treatment, only 17% of patients demonstrated complete resolution of contrast enhancement, while 41% showed no significant change. As shown in previous studies, imaging abnormalities may persist despite clinical and laboratory improvement[26,27].

Treatment was successful in 86.3% of cases; however, 13% of patients experienced recurrence. All recurrent cases were caused by *S. aureus* infections with concurrent paraspinal abscess and bacteremia. *S. aureus* has been identified as an independent risk factor for treatment failure[6,15]. Bacteremia and paraspinal abscess have also been identified in some studies as predictors of recurrence and treatment failure[7,20,21]. One study reported that patients with bacteremia required longer treatment durations (> 8 weeks)[28], while another showed a significant decrease in recurrence among patients treated for more than eight weeks[22]. In our study, recurrent cases received at least 12 weeks of treatment, including a minimum of six weeks of intravenous therapy targeting the causative agent. Despite the prolonged duration, recurrence still occurred. Furthermore, in these patients, WBC, CRP, and ESR values normalized by the end of treatment, and two patients demonstrated regression on contrast-enhanced MRI. However, neither laboratory nor imaging findings were reliable predictors of relapse. Therefore, close monitoring of patients with *S. aureus* infections, particularly those with bacteremia and paraspinal abscess formation, is essential to minimize recurrence.

Study Limitations

This study has several limitations that should be considered when interpreting the findings. As a retrospective, single-center study with a relatively small sample size, the generalizability of the results is limited, and the statistical power may be insufficient to detect less common associations or outcomes. The analysis relied on hospital records, which may have lacked uniformity or completeness, particularly in documenting clinical symptoms and follow-up details. Moreover, follow-up imaging was not standardized in terms of timing or modality (MRI, CT, or PET–CT), introducing potential variability in the evaluation of radiological treatment response. Owing to the retrospective nature of the study, treatment decisions—including antibiotic duration and follow-up strategies—were not standardized and could have influenced treatment outcomes and recurrence rates.

Conclusion

In conclusion, recent hospitalization and invasive procedures remain significant risk factors for the development of PS. Obtaining blood, tissue, or abscess cultures before initiating antibiotic therapy substantially increases the likelihood of identifying the causative pathogen; at the very least, blood cultures should be obtained as a simple yet valuable diagnostic step before treatment. Despite appropriate therapy, MRI abnormalities may persist and should not be used in isolation to determine treatment success. *S. aureus* continues to be the most frequently isolated pathogen. While methicillin resistance did not emerge as a concern in this cohort, all recurrent cases involved *S. aureus* infections accompanied by abscess formation and bacteremia. Therefore, patients with *S. aureus* spondylodiscitis, particularly those with concurrent bacteremia or paraspinal abscess, should be closely monitored for potential recurrence even after completion of therapy.

Ethics

Ethics Committee Approval: Data collection was conducted with the approval of the University of Health Sciences Türkiye, Haydarpaşa Numune Training and Research Hospital (approval number: 711/06/2024, dated: 05.06.2024).

Informed Consent: Not required.

Footnotes

Authorship Contributions

Surgical and Medical Practices: M.K., S.E., N.C., A.İ., S.Ş., C.A., Concept: M.K., S.E., N.C., A.İ., S.Ş., C.A., Design: M.K., S.E., Data Collection or Processing: M.K., C.A., Analysis or Interpretation: M.K., S.E., Literature Search: M.K., S.E., Writing: M.K., S.E., N.C., A.İ., S.Ş., C.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

The study was presented previously in tenth BUHASDER congress as an oral presentation.

References

1. Sobottke R, Seifert H, Fätkenheuer G, Schmidt M, Gossmann A, Eysel P. Current diagnosis and treatment of spondylodiscitis. Dtsch Arztebl Int. 2008;105(10):181–7.
2. Mavrogenis AF, Megaloikonomos PD, Igoumenou VG, Panagopoulos GN, Giannitsioti E, Papadopoulos A, Papagelopoulos PJ. Spondylodiscitis revisited. EFORT Open Rev. 2017;2(11):447–61.
3. Gouliouris T, Aliyu SH, Brown NM. Spondylodiscitis: update on diagnosis and management. J Antimicrob Chemother. 2010 Nov;65 Suppl 3:iii11–24.
4. Mete B, Kurt C, Yilmaz MH, Ertan G, Ozaras R, Mert A, Tabak F, Ozturk R. Vertebral osteomyelitis: eight years' experience of 100 cases. Rheumatol Int. 2012;32(11):3591–7.
5. Gentile L, Benazzo F, De Rosa F, Boriani S, Dallagiacoma G, Franceschetti G, Gaeta M, Cuzzocrea F. A systematic review: characteristics, complications and treatment of spondylodiscitis. Eur Rev Med Pharmacol Sci. 2019;23(2 Suppl):117–28.
6. Marchionni E, Marconi L, Ruinato D, Zamparini E, Gasbarrini A, Viale P. Spondylodiscitis: is really all well defined? Eur Rev Med Pharmacol Sci. 2019;23(2 Suppl):201–9.
7. Herren C, Jung N, Pishnamaz M, Breuninger M, Siewe J, Sobottke R. Spondylodiscitis: Diagnosis and Treatment Options. Dtsch Arztebl Int. 2017;114(51–52):875–82.
8. Turunc T, Demiroglu YZ, Uncu H, Colakoglu S, Arslan H. A comparative analysis of tuberculous, brucellar and pyogenic spontaneous spondylodiscitis patients. J Infect. 2007;55(2):158–63.
9. Berbari EF, Kanj SS, Kowalski TJ, Darouiche RO, Widmer AF, Schmitt SK, Hendershot EF, Holtom PD, Huddleston PM 3rd, Petermann GW, Osmon DR, Infectious Diseases Society of America. 2015 Infectious Diseases Society of America (IDSA) clinical practice guidelines for the diagnosis and treatment of native vertebral osteomyelitis in adults. Clin Infect Dis. 2015 Sep 15;61(6):e26–46.
10. Grammatico L, Baron S, Rusch E, Lepage B, Surer N, Desenclos JC, Besnier JM. Epidemiology of vertebral osteomyelitis (VO) in France: analysis of hospital-discharge data 2002–2003. Epidemiol Infect. 2008;136(5):653–60.
11. Conan Y, Laurent E, Belin Y, Lacasse M, Amelot A, Mulleman D, Rosset P, Bernard L, Grammatico-Guillon L. Large increase of vertebral osteomyelitis in France: a 2010–2019 cross-sectional study. Epidemiol Infect. 2021;149:e227.
12. Köklü S, Koçak E, Akbal E. Air cholangiography for severe hilar obstruction at ERCP. Gastrointest Endosc. 2011;73(6):1326.
13. Mastoraki A, Mastoraki S, Papanikolaou IS, Tsikala-Vafea M, Tsigou V, Lazaris A, Arkadopoulos N. Spondylodiscitis associated with major abdominal surgical intervention: Challenging diagnostic and therapeutic modalities. Indian J Surg Oncol. 2017;8(3):274–8.
14. Katsinelos P, Fasoulas K, Terzoudis S, Chatzimavroudis G, Zavos C, Kountouras J. Spondylodiscitis complicating cholangitis caused by stent occlusion. Gastrointest Endosc. 2011;73(6):1326–8.
15. Bernard L, Dinh A, Ghout I, Simo D, Zeller V, Issartel B, Le Moing V, Belmatoug N, Lesprit P, Bru JP, Therby A, Bouhour D, Dénes E, Debard A, Chirouze C, Fèvre K, Dupon M, Aegerter P, Mulleman D. Antibiotic treatment for 6 weeks versus 12 weeks in patients with pyogenic vertebral osteomyelitis: an open-label, non-inferiority, randomised, controlled trial. Lancet. 2015;385(9971):875–82.
16. Aagaard T, Roed C, Dragsted C, Skinhøj P. Microbiological and therapeutic challenges in infectious spondylodiscitis: a cohort study of 100 cases, 2006–2011. Scand J Infect Dis. 2013;45(6):417–24.
17. Michel SC, Pfirrmann CW, Boos N, Hodler J. CT-guided core biopsy of subchondral bone and intervertebral space in suspected spondylodiskitis. AJR Am J Roentgenol. 2006;186(4):977–80.
18. Fantoni M, Trecarichi EM, Rossi B, Mazzotta V, Di Giacomo G, Nasto LA, Di Meco E, Pola E. Epidemiological and clinical features of pyogenic spondylodiscitis. Eur Rev Med Pharmacol Sci. 2012;16 Suppl 2:2–7.
19. Mylona E, Samarkos M, Kakalou E, Fanourgiakis P, Skoutelis A. Pyogenic vertebral osteomyelitis: a systematic review of clinical characteristics. Semin Arthritis Rheum. 2009;39(1):10–7.
20. Patel AR, Alton TB, Bransford RJ, Lee MJ, Bellabarba CB, Chapman JR. Spinal epidural abscesses: risk factors, medical versus surgical management, a retrospective review of 128 cases. Spine J. 2014;14(2):326–30.
21. Li YD, Wong CB, Tsai TT, Lai PL, Niu CC, Chen LH, Fu TS. Appropriate duration of post-surgical intravenous antibiotic therapy for pyogenic spondylodiscitis. BMC Infect Dis. 2018;18(1):468.
22. Park KH, Cho OH, Lee JH, Park JS, Ryu KN, Park SY, Lee YM, Chong YP, Kim SH, Lee SO, Choi SH, Bae IG, Kim YS, Woo JH, Lee MS. Optimal duration of antibiotic therapy in patients with hematogenous vertebral osteomyelitis at low risk and high risk of recurrence. Clin Infect Dis. 2016;62(10):1262–9.
23. Okay G, Akkoyunlu Y, Bolukcu S, Durdu B, Hakyemez IN, Koc MM. Analysis of infectious spondylodiscitis: 7-years data. Pak J Med Sci. 2018;34(6):1445–51.
24. Kaya S, Kaya S, Kavak S, Comoglu S. A disease that is difficult to diagnose and treat: evaluation of 343 spondylodiscitis cases. J Int Med Res. 2021;49(11):3000605211060197.
25. Taşdemir C. Retrospective examination of patients with infective spondylodiscitis followed in Bursa Uludağ University Medical Faculty Hospital infective diseases clinic and outpatient clinic between 2000–2020. Medical Speciality Thesis. Bursa: Uludağ University Faculty of Medicine, Infectious Diseases and Clinical Microbiology; 2022.
26. Ahn KS, Kang CH, Hong SJ, Kim BH, Shim E. The correlation between follow-up MRI findings and laboratory results in pyogenic spondylodiscitis. BMC Musculoskelet Disord. 2020;21(1):428.
27. Zarrouk V, Feydy A, Sallès F, Dufour V, Guigui P, Redondo A, Fantin B. Imaging does not predict the clinical outcome of bacterial vertebral osteomyelitis. Rheumatology (Oxford). 2007;46(2):292–5.
28. Chae HJ, Kim J, Kim C. Clinical characteristics of spinal epidural abscess accompanied by bacteremia. J Korean Neurosurg Soc. 2021;64(1):88–99.

Table 1. Baseline characteristics of the study patients.

	n (%)		n (%)
Male/female	15 (60)/10 (40)	**Known risk factors**	20 (80)
Age (mean ± SD[§] (min.–max.)	61 ± 10.6 (41–78)	Hospitalization in the last 3 months	13 (52)
Chronic disease	21 (84)	ICU[†] admission in the last 3 months	4 (16)
Diabetes mellitus	14 (56)	Catheter infection	1 (4)
Hyperlipidemia	10 (40)	ERCP[‡]	2 (8)

Hypertension	8 (32)	Spinal procedure	3 (12)
Chronic renal failure	6 (24)	Other invasive procedures and operations	2 (8)
Chronic heart diseases	5 (20)	Hemodialysis	3 (12)
Pulmonary diseases	2 (8)		
Malignancy	1 (4)		

†ICU; ‡ERCP; §SD; min.–max., minimum–maximum.

Table 2. Clinical characteristics and laboratory results.

	n (%)		Mean ± SD‖ (min.-max.)
Localization		**Laboratory results**	
Cervical	3 (12)	Pretreatment WBC§ (cell/mm3)	9,132 ± 3,986 (1,780–19,690)
Thoracal	11 (44)	Pretreatment CRP‡ (mg/L)	116 ± 92 (3–317)
Lumbosacral	15 (60)	Pretreatment ESR§ (mm/h)	72 ± 22 (26–104)
Paraspinal/psoas abscess	12 (40)	End treatment ESR (mm/h)	29 ± 18.7 (2–83)
Complications			
Spinal cord pressure	11 (44)		
Neurodeficit	2 (8)		
Height loss	10 (40)		
Endocarditis	2 (8)		

†WBC; ‡CRP; §ESR; ‖SD.

Table 3. Microbiological tests and results.

	n (%)		n (%)
Blood cultures obtained	25 (100)	**Organisms isolated from all cultures**	
Positive results	15 (60)	MSSA	12 (48)
Abscess and/or tissue culture obtained	23 (92)	*S. epidermidis*	1 (4)
Abscess cultures obtained	10 (40)	*E. faecium*	1 (4)
Positive results	3 (30)	*S. pneumoniae*	1 (4)
Negative results	7 (70)	*S. parasanguinis*	1 (4)
Tissue cultures obtained	16 (64)	*P. aeruginosa*	1 (4)
Positive results	7 (43.7)	*E. coli*	1 (4)
Negative results	9 (57.3)	*E. cloacae*	1 (4)
		B. fragilis	1 (4)