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REVIEW

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Spondylodiscitis. Assessment, diagnosis and treatment

Espondilodiscitis. Evaluación, diagnóstico y tratamiento

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Abstract

Spondylodiscitis is a pathology with increasing incidence at the world level, secondary to the increase in life expectancy, higher prevalence of diseases like diabetes that can present immunosuppression to the patients besides the increasing number of procedures in the spine also present a risk of develop spondylodiscitis; therefore, the correct clinical assessment, the use of diagnostic tools in a protocolized manner, multidisciplinary management and appropriate treatment by the doctor specialized in spine surgery have a positive impact. Based on the diversity of management protocols and diagnosis, it was decided to carry out a narrative review of the literature in the databases Google academic, PubMed, with Mesh terms: discitis, spine, postoperative infection, spondylodiscitis, spondylodiscitis management algorithm; contributing in this way to the decision making from the doctor of first contact to the physician specialist in spine. We suggest the use of an algorithm based on the experience of our center supported with the review of available literature and at present, in order to make decisions in patients who present this pathology in specific.

Keywords: Discitis, spine, postoperative infection, spondylodiscitis, spondylodiscitis management algorithm.

Resumen

La espondilodiscitis es una patología con una incidencia creciente en el ámbito mundial, secundaria al aumento de la esperanza de vida, mayor prevalencia de enfermedades como la diabetes que pueden presentar inmunosupresión a los pacientes, además de que el creciente número de procedimientos en la columna vertebral también presentan un riesgo de desarrollar espondilodiscitis; por ello, la correcta valoración clínica, uso de herramientas diagnósticas de forma protocolizada, manejo multidisciplinar y el tratamiento adecuado por parte del médico especialista en cirugía de la columna vertebral tienen un impacto positivo. Con base en la diversidad de protocolos de manejo y diagnóstico, se decidió realizar una revisión narrativa de la literatura en las bases de datos Google académico, PubMed, con los términos Mesh: discitis, columna vertebral, infección postoperatoria, espondilodiscitis, algoritmo de manejo de la espondilodiscitis; contribuyendo así a la toma de decisiones desde el médico de primer contacto hasta el médico especialista en columna vertebral. Sugerimos el uso de un algoritmo basado en la experiencia de nuestro centro apoyado en la revisión de la literatura disponible y en la actualidad, para tomar decisiones sobre los pacientes que presentan esta patología en concreto.

Palabras clave: *Discitis, columna vertebral, infección postoperatoria, espondilodiscitis, algoritmo de manejo de la espondilodiscitis.*

Introduction

Spondylodiscitis is an infectious process that mainly affects the disc and vertebral bodies but can involve all posterolateral and perineural structures;[1] the most frequent location is the lumbar region (60%), followed by the thoracic region (30%) and cervical region (10%); it affects a vertebral only one segment in (65%), involvement of multiple continuous levels (20%) and non-continuous levels (10%).[2,3]

It represents 2-7% of musculoskeletal infections, with peaks of incidence in children under 20 years and patients between 50 and 70 years, with predominance in males,[4] this disease has an increased incidence

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associated with longer life expectancy, greater number of surgical interventions in the spine, use of intravenous drugs,[2] as well as, studies have shown that chronic kidney disease and diabetes mellitus are the main comorbidities related to spondylodiscitis.[5-7]

Mortality varies between 2-20% in developed countries and its severity depends on the comorbidities of the patient and the virulence of the etiological pathogen, the pathogens are mainly bacteria and parasites, fungi such as aspergillus and candida, which generate granulomatous infections.[8-10] The most common bacterial were *Staphylococcus aureus* in 80-90% of cases and other rare cases like clostridium perfringens.[11]

Anatomy and pathophysiology

Spinal vascular anatomy is important to understand the mechanism of the pathogen spread. Hematogenous infection is the main cause of inoculation, either by segmental arterial route, which gives rise to metaphyseal and periosteal irrigation of the vertebral body or retrograde by Batson's venous system.[2] This vascular arrangement explains why the necrosis begins in the anterior part of the body that corresponds to the trunks of the segmental arteries. The infection by the Batson's plexus is presented by retrograde infection either by urinary tract infections or pelvic organ infections can spread to the lumbar region.[12-14]

Clinical manifestations

Non-mechanical and progressive pain occurs in more than 90% of cases, followed by fever in 60 and 34% may develop some degree of neurological involvement that can affect the medullar spine or radicular nerves, depending on the vertebral level.[15,16] This infection can be presented with abscesses which are often located at the subdural, epidural, posterior paraspinal or retroperitoneal level with a predominance of iliopsoas muscle, this can lead to early diagnosis and treatment.[17-19]

Imaging studies

The utility of imaging studies is variable depending on the time of evolution of the infection, as well as

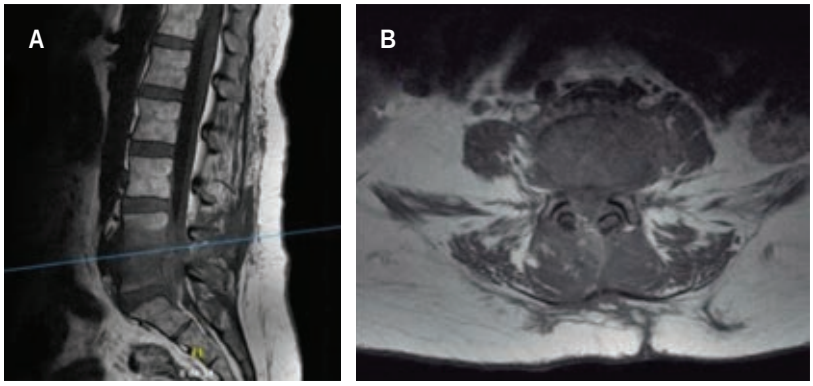

Figure 1:

Nuclear magnetic resonance sequence T1. **A)** Sagittal view. **B)** Axial view. Visualizes hypo intensity in the focus of infection L4-L5.

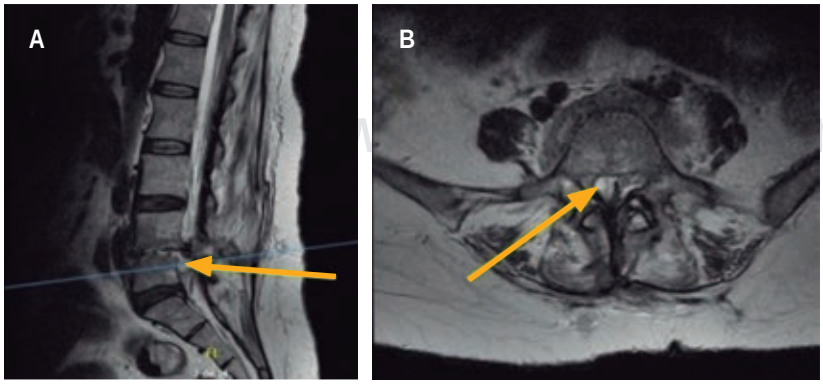

Figure 2:

Nuclear magnetic resonance sequence T2. **A)** Sagittal view, yellow arrow shows hyperintensity in disc with epidural abscess. **B)** Axial view, yellow arrow shows hyperintensity corresponding to epidural abscess L4-L5.

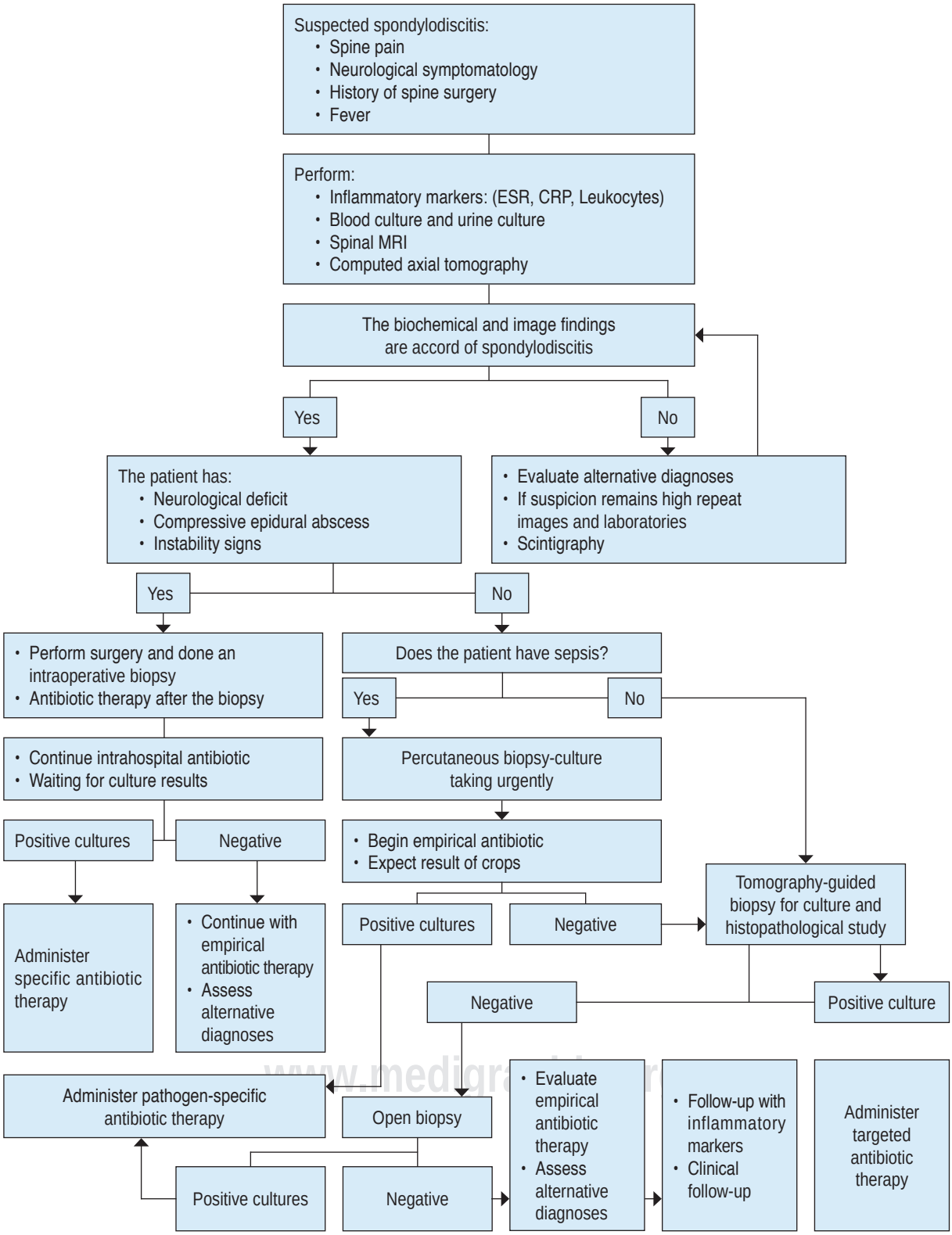

Figure 3: Diagnostic and treatment flowchart for spondylodiscitis.

the affected vertebral segment. The first radiological image is radiography which has a specificity and sensitivity of 58%, because it needs to be affected bone mineralization to show changes. On the other hand computed tomography, which has sensitivity and specificity close to 90% with changes 3-6 weeks after the infection began.[2,20,21] The contrasted magnetic resonance imaging is the ideal diagnostic test because it has greater sensitivity and specificity in the first 2 weeks of the infection with 97 and 93% respectively. Among the characteristic findings of spondylodiscitis, hypo intensity is found in the vertebral bodies in T1 sequence and hyperintensity in the intervertebral bodies in T2 sequence *(Figures 1 and 2)*. The use of contrast medium and the STIR sequence allows to delimit the abscesses and differentiate them even more clearly in instrumented patients *(Figure 3)*.[22,23]

Laboratory tests

In the presence of a spinal infection, the etiological organism and time of onset is important according to laboratory tests. Leukocytosis is a laboratory finding with low specificity and sensitivity. Otherwise, acute phase reactants such as CRP (C-reactive protein) and ESR (Erythrocyte sedimentation rate) are tests with high sensitivity (95%) but very low specificity.[2] Likewise, blood culture seeks to identify the causal pathogen, however, it is only positive in 50-60% of cases.[21] For a correct diagnosis, the taking of a guided percutaneous biopsy with Tomography should be indicated, since it allows greater safety and precision, considering that microorganisms of 14-76% in the first biopsy therefore if the culture is negative a second take is indicated.[24-26] In cases where the identification of the microorganism is essential, an open biopsy can be performed, since it allows better sampling, but greater comorbidities.[27,28]

Complications

Due to the non-specific symptomatology and the lack of expertise of the medical staff, the diagnosis can be made late (more than two months after the infection began) this is associated with greater neurological complications, longer hospital stays and greater need for emergency surgical treatments due to instability and neurological deficit that led us to a negative impact on health systems.[29,30]

Discussion

The relevance of carrying out an adequate anamnesis, physical examination and, and the diagnostic studies that lead us to the early identification of the causal microorganism, will guide us in making decisions for therapeutic management:

1. Conservative management: refers to the use of intravenous specific antibiotic therapy the first six

Table 1: Spondylodiscitis classification scheme.

Classes	Bone destruction	Segmental instability	Epidural abscess	Neurological impairment	Para vertebral involvement
Type A	No	No	No	No	Yes/No
A.1	No	No	No	No	No (simple discitis)
A.2	No	No	No	No	No
A.3	No	No	No	No	Yes
A.4.1-2	No	No	No	No	Yes (muscle abscess)
Type B	Yes	Yes/No	No	No	Yes/No
B.1	Yes	No	No	No	No
B.2	Yes	No	No	No	Yes
B.3.1-2	Yes	Yes	No	No	Yes
Type C	Yes/No	Yes/No	Yes	Yes/No	–
C.1	Yes/No	No	Yes	No	–
C.2	Yes	Yes	Yes	No	–
C.3	Yes	No	Yes	Yes	–
C.4	Yes	Yes	Yes	Yes	–

Retrieved from: Pola E, et al.[31]

weeks[28] with periodic taking of acute phase reactants that suggest infection control, considering that patients with CRP > 2.75 md/dl and ESR > 55 mm/h have a higher risk of treatment failure.[29,30] It can continue six more weeks with oral antibiotic therapy, depending on the microorganism, as well as the data observed in magnetic resonance imaging that suggest control of the infection.[23,30]

2. Surgical management: the decision must be made considering several suggested criteria such as failed conservative therapy, bone destruction, segmental instability, epidural abscess, neurological deterioration, and paravertebral involvement. Based on these criteria, we consider classifying in type A, B, C with which we can orient ourselves in the choice of management alternatives that have shown good results in the short and medium term[31] *(Tables 1 and 2)*.

Conclusion

Spondylodiscitis is a pathology with a tendency to higher incidence and prevalence secondary to multiple factors in today's society, therefore, high suspicion must be had to make an early diagnosis and appropriate treatment individualizing each case, therefore, we suggest an algorithm based on the experience of the authors and the review of the literature carried out, oriented to unify flowchart criteria 1 *(Table 3)*.

Table 2: Treatment algorithm according to «POLA» scheme.

Classes	Treatments of choice
Type A	
A.1	Rigid orthosis immobilization
A.2	Rigid orthosis immobilization or percutaneous stabilization
A.3	Rigid orthosis immobilization or percutaneous stabilization
A.4.1-2	Rigid orthosis immobilization or percutaneous stabilization
Type B	
B.1	Rigid orthosis immobilization or percutaneous stabilization
B.2	Rigid orthosis immobilization or percutaneous stabilization
B.3.1-2	Percutaneous or open stabilization
Type C	
C.1	Rigid orthosis immobilization or percutaneous stabilization with closer clinical-radiological monitoring
C.2	Open debridement and stabilization
C.3	Open debridement and decompression
C.4	Open debridement, decompression and stabilization

Retrieved from: Pola E, et al.[31]

Table 3: Frequent microorganisms and antibiotics suggested in case of suspicion without confirmation of culture and specific antibiogram.

Infectious agent	Antibiotic
Staphylococcus aureus meticilino susceptible	Ceftriaxone Cefazolina Flucoxacilin/oxacilin
Staphylococcus aureus meticilino resistant	Vancomycin Daptomycin
Enterobacteria	Ciprofoxacin Ceftriaxone Meropenem
Streptococcus	Ceftriaxone Penicillin G
Pseudomonas aeruginosa	Cefepime + aminoglucosido Piperacilina-tazobactam + aminoglucosido Meropenem + aminoglucosido Imipenem + aminoglucosido
Anaerobic	Clindamycin Gram negative: metronidazole Gram positive: ceftriaxone
Spore-forming anaerobe clostridium perfringens	Penicillin G Ceftaroline

References

1. Lener S, Hartmann S, Barbagallo GMV, Certo F, Thomé C, Tschugg A. Management of spinal infection: a review of the literature. Acta Neurochir (Wien). 2018; 160 (3): 487-496.
2. Raghavan M, Lazzeri E, Palestro CJ. Imaging of spondylodiscitis. Semin Nucl Med. 2018; 48 (2): 131-147.
3. Hong SH, Choi JY, Lee JW, Kim NR, Choi JA, Kang HS. MR imaging assessment of the spine: infection or an imitation? Radiographics. 2009; 29 (2): 599-612.
4. Boody BS, Jenkins TJ, Maslak J, Hsu WK, Patel AA. Vertebral osteomyelitis and spinal epidural abscess: An evidence-based review. J Spinal Disord Tech. 2015; 28 (6): E316-327.
5. Arnold PM, Baek PN, Bernardi RJ, Luck EA, Larson SJ. Surgical management of nontuberculous thoracic and lumbar vertebral osteomyelitis: report of 33 cases. Surg Neurol. 1997; 47 (6): 551-561.
6. Robinson Y, Tschoeke SK, Finke T, Kayser R, Ertel W, Heyde CE. Successful treatment of spondylodiscitis using titanium cages: a 3-year follow-up of 22 consecutive patients. Acta Orthop. 2008; 79 (5): 660-664.
7. Hempelmann RG, Mater E, Schon R. Septic hematogenous lumbar spondylodiscitis in elderly patients with multiple risk factors: Efficacy of posterior stabilization and interbody fusion with iliac crest bone graft. Eur Spine J. 2010; 19 (10): 1720-1727.
8. Tsantes AG, Papadopoulos DV, Vrioni G, Sioutis S, Sapkas G, Benzakour A, et al. Spinal infections: an update. Microorganisms. 2020; 8 (4): 476.
9. McHenry MC, Easley KA, Locker GA. Vertebral osteomyelitis: long-term outcome for 253 patients from 7 Cleveland-area hospitals. Clin Infect Dis. 2002; 34 (10): 1342-1350.

10. Mann S, Schütze M, Sola S, Piek J. Nonspecific pyogenic spondylodiscitis: clinical manifestations, surgical treatment, and outcome in 24 patients. Neurosurg Focus. 2004; 17 (6): E3.
11. Marroquin-Herrera O, Rosales-Camargo SA, Morales-Sáenz LC, Alvarado-Gomez F. Clostridium perfringens in the spine: A rare cause of post-surgical infection. Surg Neurol Int. 2021; 12: 544.
12. Souza CG de, Gasparetto EL, Marchiori E, Bahia PRV. Pyogenic and tuberculous discitis: magnetic resonance imaging findings for differential diagnosis. Radiol Bras. 2013; 46 (3):
13. Butler JS, Shelly MJ, Timlin M, Powderly WG, O'Byrne JM. Nontuberculous pyogenic spinal infection in adults: a 12-year experience from a tertiary referral center. Spine. 2006; 31 (23): 2695-2700.
14. Sundaram VK, Doshi A. Infections of the spine: a review of clinical and imaging findings. Vol. 45 (8), Applied Radiology. 2016.
15. 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): 10-17.
16. Nickerson EK, Sinha R. Vertebral osteomyelitis in adults: an update. Br Med Bull. 2016; 117 (1): 121-138.
17. Arko L 4th, Quach E, Nguyen V, Chang D, Sukul V, Kim BS. Medical and surgical management of spinal epidural abscess: a systematic review. Neurosurg Focus. 2014; 37 (2): E4.
18. Mückley T, Schütz T, Kirschner M, Potulski M, Hofmann G, Bühren V. Psoas abscess: the spine as a primary source of infection. Spine (Phila Pa 1976). 2003; 28 (6): E106-113.
19. Shields D, Robinson P, Crowley TP. Iliopsoas abscess--a review and update on the literature. Int J Surg. 2012; 10 (9): 466-469.
20. Duarte RM, Vaccaro AR. Spinal infection: state of the art and management algorithm. Eur Spine J. 2013; 22 (12): 2787-2799.
21. Herren C, Jung N, Pishnamaz M, Breuninger M, Siewe J, Sobottke R. Spondylodiscitis: Diagnosis and Treatment Options. Dtsch Arztebl Int. 2017; 114 (51-52): 875-882.
22. An HS, Seldomridge JA. Spinal infections: diagnostic tests and imaging studies: diagnostic tests and imaging studies. Clin Orthop Relat Res. 2006; 444 (NA): 27-33.
23. Berbari EF, Kanj SS, Kowalski TJ, Darouiche RO, Widmer AF, Schmitt SK, et al. 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; 61 (6): 26-46.
24. Gasbarrini A, Boriani L, Salvadori C, Mobarec S, Kreshak J, Nanni C, et al. Biopsy for suspected spondylodiscitis. Eur Rev Med Pharmacol Sci. 2012; 16 Suppl 2: 26-34.
25. De Lucas EM, González Mandly A, Gutiérrez A, Pellón R, Martín-Cuesta L, Izquierdo J, Sánchez E, Ruiz E, Quintana F. CT-guided fine-needle aspiration in vertebral osteomyelitis: true usefulness of a common practice. Clin Rheumatol. 2009; 28 (3): 315-320.
26. Sehn JK, Gilula LA. Percutaneous needle biopsy in diagnosis and identification of causative organisms in cases of suspected vertebral osteomyelitis. Eur J Radiol. 2012; 81 (5): 940-946.
27. Skaf GS, Domloj NT, Fehlings MG, Bouclaous CH, Sabbagh AS, Kanafani ZA, et al. Pyogenic spondylodiscitis: an overview. J Infect Public Health. 2010; 3 (1): 5-16.
28. Bernard L, Dinh A, Ghout I, Simo D, Zeller V, Issartel B, et al. 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): 875-882.
29. D'Agostino C, Scorzolini L, Massetti AP, Carnevalini M, D'Ettorre G, Venditti M, et al. A seven-year prospective study on spondylodiscitis: epidemiological and microbiological features. Infection. 2010; 38 (2): 102-107.
30. Gentile L, Benazzo F, de Rosa F, Boriani S, Dallagiacoma G, Franceschetti G, et al. A systematic review: characteristics, complications and treatment of spondylodiscitis. Eur Rev Med Pharmacol Sci. 2019; 23 (2 Suppl): 117-128.
31. Pola E, Autore G, Formica VM, Pambianco V, Colangelo D, Cauda R, et al. New classification for the treatment of pyogenic spondylodiscitis: validation study on a population of 250 patients with a follow-up of 2 years. Eur Spine J. 2017; 26 (S4): 479-488.

Conflict of interest

The authors express no conflict of interest.