THORACOLUMBAR SPONDYLODISCITIS AND THE SURGICAL APPROACH: A RETROSPECTIVE ANALYSIS

ESPONDILODISCITE TORACOLOMBAR E A ABORDAGEM CIRÚRGICA: UMA ANÁLISE RETROSPECTIVA

ESPONDILODISCITIS TORACOLUMBAR Y EL ENFOQUE QUIRÚRGICO: UN ANÁLISIS RETROSPECTIVO

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ABSTRACT

Objectives: Spondylodiscitis is a rare, late diagnosis disease. In view of the morbidity and mortality associated to the delayed diagnosis and increase of the cases in the last years, this study was carried out in order to evaluate the operated cases and improve the management of these patients.. Methods: Retrospective longitudinal study involving 1440 patients submitted to a surgical procedure in the thoracolumbar spine from January 2015 to March 2017, including 49 cases operated by spondylodiscitis. Results: Results: Severe complications requiring ICU admission (pulmonary or urinary tract sepsis and DVT) were observed in 7 (8.5%) individuals, whose mean hospital stay was 35 days (10-170 days) [p=0.006].Conclusions: Conclusion: A correlation between the number of days hospitalized and the increase in the rate of complications was found. Early surgery by the anterior approach and posterior fixation after 2 weeks is the treatment of choice, with low morbidity and short period of hospitalization. ***Level of Evidence III; Retrospective Study.***

Keywords: Infection; Spine; Discitis.

RESUMO

Objetivos: A espondilodiscite é uma rara doença, de diagnóstico tardio. Em vista da morbimortalidade associada ao atraso diagnóstico e aumento dos casos nos últimos anos, realizou-se este estudo a fim de avaliar os casos operados e aprimorar o manejo destes pacientes. Métodos: Estudo longitudinal retrospectivo, envolvendo 1440 pacientes submetidos a procedimento cirúrgico na coluna toracolombar de Janeiro de 2015 a Março de 2017, com inclusão de 49 casos operados por espondilodiscite. Resultados: As complicações graves com necessidade de UTI (sepse com foco pulmonar ou de vias urinárias e TVP) foram observadas em 7 (8.5%) indivíduos, cuja permanência hospitalar média foi de 35 dias (10-170 dias). [p=0.006]. Conclusão: Houve correlação entre a quantidade de dias internados e o aumento na taxa de complicações. A cirurgia precoce pela abordagem anterior e fixação posterior após duas semanas é o tratamento de escolha, com baixa morbidade e curto período de internamento. ***Nível de Evidência III; Estudo Retrospectivo.***

Descritores: *Infecção; Coluna Vertebral; Discite.*

RESUMEN

Objetivos: La espondilodiscitis es una rara enfermedad, de diagnóstico tardío. En vista de la morbimortalidad asociada al retraso diagnóstico y el aumento de los casos en los últimos años, se realizó este estudio a fin de evaluar los casos operados y mejorar el manejo de estos pacientes. Métodos: Estudio longitudinal retrospectivo, involucrando a 1440 pacientes sometidos a procedimiento quirúrgico en la columna toracolumbar de enero de 2015 a marzo de 2017, con la inclusión de 49 casos operados por espondilodiscitis. Resultados: Las complicaciones graves con necesidad de UTI (sepsia con foco pulmonar o de vías urinarias y TVP) fueron observadas en 7 (8,5%) individuos, cuya permanencia hospitalaria media fue de 35 días (10-170 días) (p = 0,006). Conclusiones: Hubo correlación entre la cantidad de días internados y el aumento en la tasa de complicaciones. La cirugía precoz por el abordaje anterior y fijación posterior después de 2 semanas es el tratamiento de elección, con baja morbilidad y corto período de internamiento. ***Nivel de Evidencia III; Estudio Retrospectivo.***

Descriptores: *Infección; Columna Vertebral; Discitis.*

INTRODUCTION

Spondylodiscitis is a rare disease, comprising from 2 to 7% of the cases of bacterial osteomyelitis[1,2]. The incidence has been increasing and one of the hypotheses pertains to the aging population with chronic and debilitating illnesses from the use of new immunosuppressive therapies, an increase in the use of internal devices, and a growing number of spine surgeries.[3-5]

A delay in diagnosis results in worse outcomes. Many times this delay is due to the non-specific presentation of the symptoms, such as dorsalgia without fever, initially subtle and vague, thus being a diagnostic challenge.[6-10]

Most of the time, the clinical findings together with the imaging examinations arrive at a diagnosis before laboratory confirmation.[11,12] The causative microorganisms are never identified in up to 40% of cases, resulting in great difficulty in selecting the appropriate antibiotic.[13]

This study was coducted at the Hospital do Trabalhador 4406, Bairro Novo Mundo, Curitiba, PR, Brasil. 81050-000.
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The goal with spondylodiscitis is the rapid identification of the disease followed by isolation of the germ and institution of the specific antibiotic therapy, with a favorable clinical outcome. Thus, surgery is reserved for cases where the antibiotic treatment fails, with vertebral instability, progressive deformity, neurological deficit, and epidural abscess.[13] On the other hand, when the pathogen is not identified by means of percutaneous puncture, there is a tendency towards more invasive surgical procedures like debridement from anterior, posterior, or combined (anterior and posterior) approaches.[14,15]

In view of the morbidity associated with a delayed diagnosis in spondylodiscitis and the increase in cases in recent years, we conducted this study in order to better understand the cases treated surgically by the Spine Surgery Group of the Hospital do Trabalhador (Curitiba-Brazil) and to improve the management of individuals with spondylodiscitis.

METHODS

This was a longitudinal, retrospective study in which we evaluated the medical record data of patients who underwent surgical treatment for spondylodiscitis of the thoracolumbar spine at the Hospital do Trabalhador (Curitiba/Brazil), approved by the Institutional Review Board as number 60655316.5.0000.5225. All participants signed the Informed Consent Form.

The data included in the study were age, sex, time between the emergence of symptoms and the diagnosis of spondylodiscitis, complementary examinations used, surgical approach used, length of hospitalization, and length of antibiotic therapy after the proposed treatment. The Visual Analog Scale for pain (VAS) was applied in the preoperative period, on the first day following surgery, and on the day of hospital discharge.

The exclusion factors were individuals lost to follow-up after institution of the treatment, as well as patients with spondylodiscitis in a spinal segment other than the thoracolumbar segment.

The numeric data analysis was performed by means of tables and graphs with the assistance of Microsoft Excel 2016 and Biostat 5.0, using Pearson's linear correlation to analyze the possibility of the comparison of multiple variables. The passive variables of comparison were analyzed using the t-test, considering a value of $p<0.05$ as statistically significant.

RESULTS

During the period from January 2015 to March 2017, 1440 surgical spinal procedures were performed at the Hospital do Trabalhador and the Hospital de Clínicas da Universidade Federal of Paraná. Of these, forty-nine cases (3.4%) were for thoracolumbar spondylodiscitis. Of the sample analyzed, 36 (73.46%) were men and 13 (26.53%) were women. The mean age was 49 years (17 to 75 years). The mean time elapsed between the onset of symptoms and the diagnosis was 81 days (14 to 360 days). The symptoms that led to clinical suspicion were intense dorsalgia restricting gait in 40 cases (81.63%), fever in 22 individuals, weight loss in 6 (12.24%), and neurological deficit in 4 cases (8.16%). Of the patients with neurological deficit, three evolved with total neurological recovery. The mean hospitalization time was 35 days (10 to 170 days). (Table 1)

The most frequently affected level was T12-L1 (18.36%), followed by L3-L4 and L4-L5 (14.28% each). (Figure 1)

The isolated anterior access used for the surgical approach was used in 14 cases (28.57%), the isolated posterior approach in 7 cases (14.28%), and combined anterior and posterior approach was used in 28 cases (57.14%). (Figure 2)

The individuals submitted to double approach surgery (anterior followed by posterior access) remained hospitalized for from two to three weeks between surgical procedures to wait for cultures and clinical-laboratorial improvement with the antibiotic before introducing the posterior implant material. The most frequently encountered germ was Staphylococcus aureus, present in 18 individuals (36.73%), followed by no isolated agent in 14 (28.57%), AARB in four patients (8.16%), and other microorganisms in 13 individuals (26.53%). Of these, four were Pseudomonas aeruginosa, three Streptococcus mitis, two Escherichia coli, one Salmonella, one Proteus mirabilis, one Candida albicans, and one Enterococcus spp. Only four of the Staphylococcus aureus were methicillin-resistant (MRSA). (Figure 3)

Table 1. Stratification of the individuals submitted to surgery for thoracolumbar spondylodiscitis.

Sex	36(73.46%) - Male
	13(26.53%) - Female
Age	49.65 (17-75 years)
Surgical Access	AA – 14 (28.57%)
	PA – 7 (14.28%)
	AA+PA – 28 (57.14%)
Affected levels	T12-L1 – 9 (18.36%)
	L3-L4 – 7 (14.28%)
	L4-L5 – 7 (14.28%)
	T10-T11 – 4 (8.16%)
	L2-L3 – 4 (8.16%)
	T8-T9 – 3 (6.12%)
	L5-S1 – 3 (6.12%)
	T2-T3 – 2 (4.08%)
	T6-T7 – 2 (4.08%)
	T5-T6 T5-T7 T7-T8 T9-T10 T11-T12 L1-L2 Multiple levels – 1 (2.04%)
Microorganism	- Staphylococcus aureus – 18 (36.73%) → 4 MRSA
	- Pseudomonas aeruginosa – 4 (%)
	- Streptococcus mitis – 3 (%)
	- Escherichia coli – 2 (%)
	- Salmonella spp. – 1 (%)
	- Proteus mirabilis – 1 (%)
	- Candida albicans – 1 (%)
	- Enterococcus spp. – 1 (%)
	- AARB – 4 (8.16%)
	- No agent identified – 14 (28.57%)
Diagnosis time (in days)	81.04 (14-360 days)
Hospitalization time (in days)	35.08 (10-170 days)
Symptoms	- Intense pain restricting gait – 40 (81.63%)
	- Fever – 22 (44.89%)
	- Weight loss – 6 (12.24%)
	- Neurological deficit – 4 (8.16%)
Serious postoperative complications	- Sepsis from urinary infection – 2 (4.08%) → 1 sepsis and death
	- Pneumonia – 4 (8.16%) → 2 had sepsis and death
	- DVP – 1 (2.04%) → good evolution with treatment
Total	49

Source: Electronic medical records – Hospital do Trabalhador da UFPR.

The antibiotic was targeted to the specific isolated agent and lasted an average of six weeks (two weeks intravenously and four weeks orally). The antibiotic used was determined by the hospital infection committee. The duration of the intravenous antibiotic also was dependent on clinical and laboratorial improvements, which were observed by the absence of fever or other systemic complications, improved pain as measured by the visual analog scale (VAS), and normalization of the leukogram and CRP. Oxacillin 2g/day (divided into 4 daily intakes) was the principal antibiotic of choice when the germ identified was Staphylococcus aureus. On average, the oxacillin was maintained for two weeks intravenously and at discharge from the hospital ciprofloxacin 1g/day (divided into two intakes) taken orally for four weeks was prescribed. In cultures positive for MRSA Staphylococcus, the main option was meropenem 1.5g/day (divided into three intakes) and the alternative schemes (when there was no response) were polymyxin B 15000 at 25000UI/kg/day (adjusted on a case by case basis) or polymyxin B and linezolid (the latter in a daily dose of 1200mg divided into two intakes for 14 days) and at time of discharge from the hospital ciprofloxacin 1g/day (divided into two intakes) taken orally for eight weeks. When no microorganism was identified, the

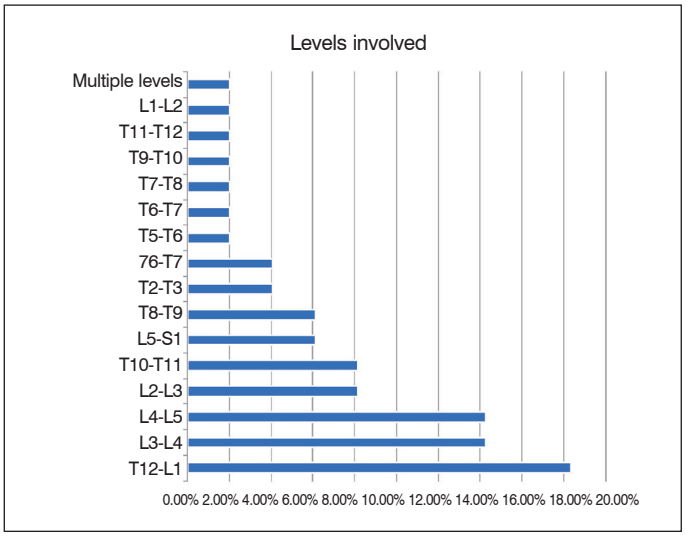

Figure 1. Levels most affected by spondylodiscitis (in %).

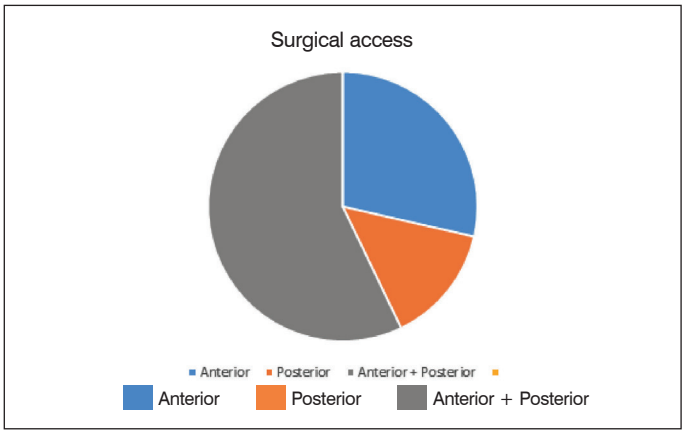

Figure 2. Access path used for the surgical approach in spondylodiscitis.

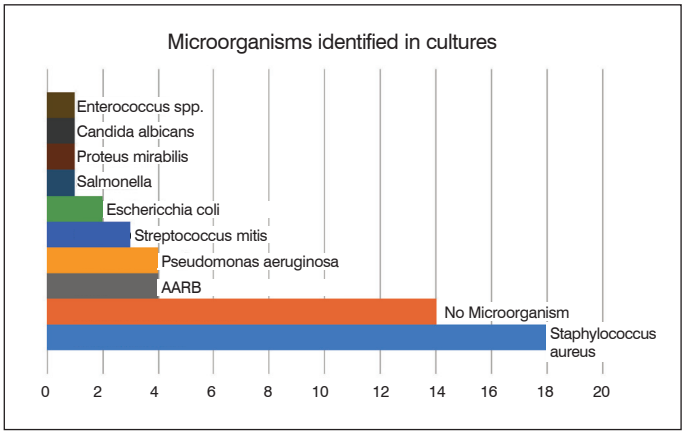

Figure 3. Microorganisms identified in the cultures of the surgical material.

orientation of the hospital infection committee was the empirical use of intravenous oxacillin for two weeks (or until clinical and laboratorial improvement), followed by ciprofloxacin taken orally for four weeks, based on coverage for the most common pathogens. When clinical conditions were compatible with tuberculosis, but without a positive culture, the use of intravenous ceftriaxone (2g/day divided into two applications for 14 days) was recommended combined with the RIPE regimen (rifampicin 150mg, isoniazid 75mg, pyrazinamide 400mg, and ethambutol 275mg) for two months, followed by the RI regimen (rifampicin 150mg + isoniazid 75mg) for four months. Most of the other germs were treated with intravenous ciprofloxacin 800mg/day (divided into two intakes) and clindamycin 1800mg/day (divided into three intakes) for two weeks, followed by ciprofloxacin 1 g/day (divided into 2 intakes) taken orally for four weeks. Another option used when there was rapid progression of infection with septicemia was intravenous vancomycin for two weeks, followed by oral sulfamethoxazole and trimethoprim for four weeks, especially since these were patients who had been discharged from the intensive care unit (ICU), because the latter antibiotic combination offers coverage for most of the microorganisms that cause respiratory and urinary tract infections (treated extensively in the ICU). Additionally, the sulfamethoxazole and trimethoprim combination is very effective when there are infected bedsores, acting in large part on soft tissue infections resulting from manipulation of the surgical wound in the hospital environment.[16]

Of the 49 individuals with thoracolumbar spondylodiscitis indicated for surgery, 40 (81.63%) had intense preoperative dorsalgia, with scores higher than 7 on the visual analog scale (VAS), while nine (18.36%) had moderate dorsalgia, with pain rated between 3 and 7 on the VAS. On the first postoperative day there was a reduction in these values, which was maintained in the evaluation prior to hospital discharge, as shown in Figure 4.

Seven complications (28.57%) were observed, including 2 sepses of urinary focus (1 progressing to death), 4 cases of pneumonia (2 progressing to sepsis and death), and 1 case of deep vein thrombosis (DVT) that responded well to specific clinical treatment. When we applied Pearson's correlation for multivariate analysis, we observed a correlation between the number of days in the hospital and the increase in complications rate (p=0.0064). (Figure 5)

DISCUSSION

The increasing incidence of spondylodiscitis in recent years is a worldwide phenomenon, as described in the studies by Meguro[17] and Principi,[18] possibly due to the increase in life expectancy of patients with debilitating chronic diseases, the growth of immunosuppressive therapies, the greater use of implant materials, and the increasing number of spinal surgeries. In our case series, 3.4% of the 1440 surgical procedures analyzed were indicated for spondylodiscitis, which is extremely significant when we consider that the worldwide incidence of spondylodiscitis is 1/250,000 inhabitants per year.[18]

When there is a surgical indication for spondylodiscitis and it is performed early, the risk of mortality drops to less than 5%.[18,19] In our study, the mortality rate was 6.12%. However, the mean time between the onset of symptoms and the diagnosis was 81 days. This delay, as well as the delay in recognizing surgical cases and referring them to the tertiary service specialized in spinal surgery may explain the discrepancy with the global average. In contrast, the literature shows that conservative treatment for spondylodiscitis is associated with mortality rates of 17%.[19]

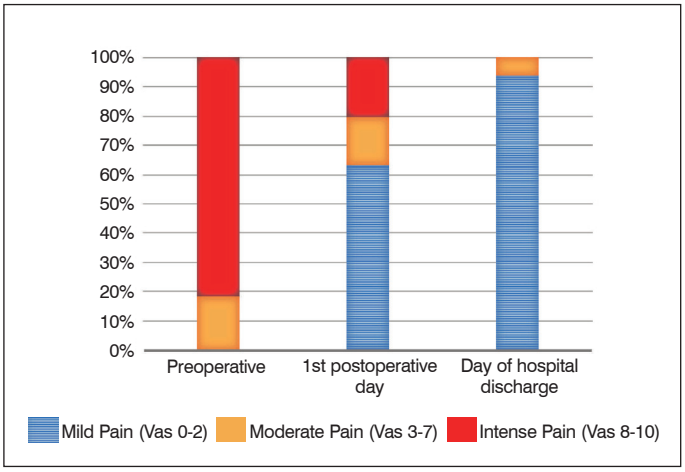

Figure 4. Dorsalgia according to the visual analog scale (VAS).

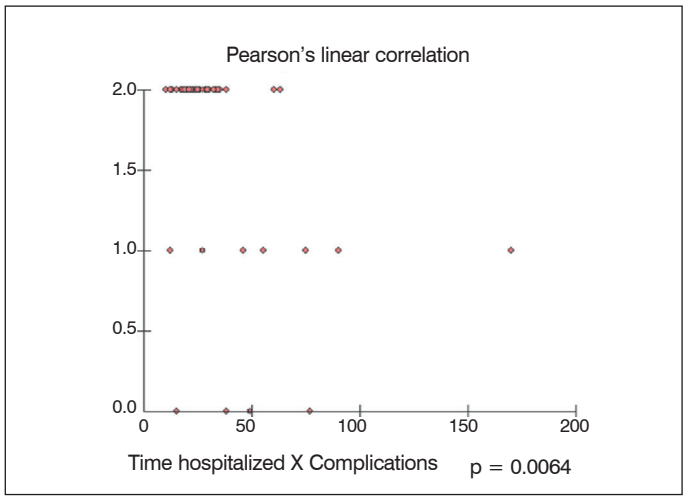

Figure 5. Multivariate analysis showing the association between the increase in the complication rate and the number of days of hospitalization.

The long hospitalization period is associated with a high complication rate, mainly associated with the manipulation of the respiratory and urinary tracts in an intensive care setting. There are also other complications related to immobility, such as deep vein thrombosis and pressure sores.[9] In our study, there were 2 cases (4.08%) of sepsis with a urinary focus and 4 cases (8.16%) of pneumonia with sepsis. Although rare, these serious complications led to the death of 4 individuals (8.16%).

A literature review conducted by Kasliwal[19] raised the question of the impact of biofilm in spinal instrumentation, especially for Staphylococcus aureus, coagulase negative Staphylococcus, and Propionibacterium. Infections of the operative wound following spinal surgery usually occur in the first 2 weeks after the surgery and, in the presence of an implant, there is the possibility of the formation of biofilm, making antibiotic effectiveness difficult. For this reason, the authors emphasize the importance of performing spinal instrumentation after this period, when a double approach (anterior and posterior) is necessary. In our case series, corroborating with the literature, we preferentially opted for surgery in two phases, with posterior instrumentation being performed 2 weeks after the first procedure in most cases of spondylodiscitis requiring a double approach (discectomy and debridement followed by posterior instrumentation). This need arises mainly from the tropism of Staphylococcus aureus from the implant in the formation of biofilm, and as reported, this microorganism was the principle pathogen present in the cases of spondylodiscitis in our study. On the other hand, the same literature review of the use of vancomycin in the surgical wound at the end of the surgery, a conduct already used in the daily practice of the authors, reported a decrease in the incidence of biofilm.

Antimicrobial treatment should not be started until the organism is identified except when clinical circumstances demand the use of antibiotics, such as, for example, in patients with severe neutropenia or sepsis. Haaker[20] conducted a study with individuals submitted to percutaneous biopsy of the disc and observed positivity in the cultures of the disc material 80% of the time. In cases where antibiotics were used prior to the biopsy, this value drops to 48%. In our study, we opted for an early surgical approach since, in this way, besides permitting a large amount of material to be collected for the culture, it allows debridement to be performed. Additionally, we avoided performing an additional invasive procedure (the biopsy prior to the definitive surgery) and we were not dependent on the result of the biopsy to perform the debridement, preventing the worsening of the clinical profile in this period.

CONCLUSION

The frequently late diagnosis of spondylodiscitis is associated with serious complications and a long hospitalization.

The recommendation of the authors of this study is an early surgical approach, preferably via anterior access, followed in two weeks by posterior approach fixation. Until the germ in the culture of the surgical material is identified, we recommend intravenous oxacillin 2g/day (divided into 4 intakes). Should the culture be negative, this antibiotic should be continued for 2 weeks or until there is clinical and laboratorial improvement, followed at discharge from the hospital by ciprofloxacin 1g/day (divided into 2 intakes) taken orally for 4 weeks.

All authors declare no potential conflict of interest related to this article.

CONTRIBUTION OF THE AUTHORS: Each author made significant individual contributions to this manuscript. XSG (0000-0002-9636-9165)*, ALK (0000-0002-0132-6083)*, and ETB (0000-0002-4096-642X)* were the main contributors to the writing of the manuscript. XSG, ALK, PGS (0000-0002-8326-4823)* and MLB (0000-0002-2903-8550)* performed the surgeries. ETB, ALK, and PGS followed-up with patients and collected clinical data from the medical records together with XSG and MLB, who evaluated the statistical analysis data. ETB, XSG, and ALK conducted the bibliographical research, manuscript review, and contributed with the intellectual concept of the study. *ORCID (Open Researcher and Contributor ID).

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