



Original Article

Postoperative comparison of the results from use of antibiotic prophylaxis for one and five days among patients undergoing lumbar arthrodesis[☆]



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ABSTRACT

Objective: To compare the postoperative results from use of antibiotic prophylaxis for one and five days among patients undergoing lumbar arthrodesis at up to three levels.

Methods: Forty-three patients who all underwent lumbar arthrodesis due to degenerative disc disease at one, two or three levels were evaluated. They were divided randomly into two groups: one received antibiotic prophylaxis with cefalotin (1 g) and the other received the same antibiotic for five days. After the surgical intervention, the patients were evaluated at the time of hospital discharge, at the first return to the clinic (two weeks later) and 90 days after the date of the surgery with the surgical wound, with clinical examination of the surgical wound and laboratory tests on both groups.

Results: It was observed that among the patients in the group with one day of antibiotic prophylaxis, 28.6% presented complications in the surgical wound, while in the group with five days, 27.9% presented complications.

Conclusion: This study demonstrates that a single dose of antibiotic prophylaxis is as effective as a regimen of multiple doses in lumbar arthrodesis surgery at up to three levels. Thus, the costs and risks of subjecting patients to hospitalization under a prolonged drug regimen are unjustifiable.

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Comparaç o p s-operat ria dos resultados do uso de antibioticoprofilaxia por um e cinco dias em pacientes submetidos   artrodese lombar

R E S U M O

Palavras-chave:

Antibioticoprofilaxia
Cirurgia coluna vertebral
Cefalosporinas

Objetivo: Comparar os resultados p s-operat rios do uso da antibioticoprofilaxia por um e cinco dias nos pacientes submetidos   artrodese lombar de at  tr s n veis.

M todos: Foram avaliados 43 pacientes, todos submetidos   artrodese lombar devido   doena degenerativa discal com um, dois ou tr s n veis. Divididos de forma randomizada em dois grupos, um grupo recebeu antibioticoprofilaxia com cefalotina 1g e o outro grupo recebeu o mesmo antibi tico por cinco dias. Ap s a intervenao cir rgica, fez-se a avaliaao dos pacientes na data da alta, no primeiro retorno ao ambulat rio, ap s duas semanas, e ap s 90 dias da data do procedimento cir rgico, com exame cl nico da ferida operat ria e exames laboratoriais de ambos os grupos.

Resultados: Observou-se que os pacientes do grupo com um dia de antibioticoprofilaxia, 28,6% apresentaram complicaoes na ferida operat ria e o grupo de cinco dias, 27,9%.

Conclus o: Este estudo demonstra que uma  nica dose de antibioticoprofilaxia   t o eficaz quanto o regime de m ltiplas doses em cirurgias de artrodese lombar at  tr s n veis. N o justifica os custos e riscos de submeter o paciente a internaç o sob regime medicamentoso prolongado.

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Introduction

Low back pain with or without sciatica affects approximately 80% of the world population. Spinal instability, with or without disc disease, is an important etiology of this disease.

In cases of low back pain refractory to conservative treatment, and after careful and accurate diagnosis of vertebral instability, lumbar arthrodesis (which consists of spinal fusion) is indicated.

Although lumbar arthrodesis is a good method for pain relief, it also presents complications; one of the most important is surgical site infection (SSI). Although its incidence is low, its effects are devastating. SSI can lead to economic loss and injury to patients due to several factors, including the need for prolonged use of antimicrobial drugs and secondary surgery, among others. SSI is also highly disadvantageous for physicians from the cost-effectiveness standpoint.¹

The risk factors associated with infection can be divided into those intrinsic to the patient, such as smoking, diabetes, malnutrition, obesity, rheumatoid arthritis, chronic use of corticosteroids, and neoplasms, and extrinsic, such as increased surgical time and high number of professionals in the surgical field.²

Some measures adopted in the intraoperative and immediate postoperative period may help to decrease the rate of postoperative infections. Among them, the maintenance of the aseptic field, attention to hemostasis, devitalized tissue minimization, proper use of drains, and antibiotic prophylaxis are highlighted.²

Antibiotic prophylaxis is the main method to prevent this complication. Its importance and efficiency during surgery are known: a significant reduction in the number of infections is observed in patients who receive it.³

Some studies have shown that a single dose of antibiotic is as effective as multiple-dose prophylaxis. However, this is not universally accepted. This study aimed to compare the postoperative results of patients on antibiotic prophylaxis for one and five days that underwent up to three-level lumbar arthrodesis.

Material and methods

Forty-three patients were assessed through a prospective, randomized study after approval from the institution's Research Ethics Committee (#12039513.9.0000.5065). All patients underwent lumbar fusion due to degenerative disc disease for one, two, or three levels. After surgery, patients were assessed on the day of discharge, at the first outpatient follow-up, after two weeks, and 90 days after surgical procedure, where clinical evaluation of the wound and laboratory tests for both groups were carried out.

Inclusion criteria comprised patients who underwent lumbar arthrodesis in up to three levels due to degenerative diseases and who were followed-up at the orthopedic clinic of this institution. Patients who underwent lumbar arthrodesis for reasons other than degenerative disease, such as tumors or fractures, and those who underwent lumbar arthrodesis for more than three levels were excluded.

After inclusion in the study, patients were assigned a number (one or two) by drawing lots, which defined the group they belonged to. Group 1 received antibiotic prophylaxis with first-generation cephalosporin for one day and Group 2, same antibiotic but for five days.

Results of the clinical assessment of the surgical wound and pre- and postoperative laboratory tests (hemoglobin, hematocrit, white blood cell count, neutrophils, erythrocyte

Table 1 – Percentage of general complications.

Total patients	Infection	Dehiscence	Hyperemia	Cerebrospinal fluid leaks	Seroma	Total
43	1	1	1	1	8	12

sedimentation rate, C-reactive protein) were used for the analysis. The assessment of the surgical wound indicated the true importance of signs such as heat, redness, wound dehiscence, and purulent exudation.

The chi-squared test (χ^2) and binomial tests were used, considering $p < 0.05$ and $n = 1$.

Results

The study comprised 43 patients from November 2012 until April 2014; 22 were female, with mean age of 49.9 years (range 16–76 years). The observed complications were SSI, suture dehiscence, cerebrospinal fluid leaks, and exacerbated hyperemia.

In the present study, SSI rates of 2.3% and general complication rates of 27.8% were observed, as described in Table 1.

The following analysis assessed the relationship between postoperative administration of antibiotics in two different periods: Group 1 (24 h) and Group 2 (five days), as shown in Table 2. In this analysis, “normal” and “altered” conditions were considered. “Normal” represents the group that was in perfect condition after the antibiotic administration period, and “altered,” those who had some type of abnormality, such as one-point dehiscence, infection, cerebrospinal fluid rhinorrhea, hyperemia, and seroma.

The chi-squared test, as shown in Table 3, indicates that the hypothesis of association between antibiotic administration period and condition of the patient after this period was rejected ($p = 0.924$). Thus, there was no association between the fact that the antibiotic was given for either 24 h or five days and patient final status.

However, one question can be raised: was there a difference between the proportions of normal and altered within each antibiotic administration period?

Table 2 – Percentage of complications by group.

	Normal	Altered	
Group			
24 h			
Absolute	15	6	21
Relative	71.4%	28.6%	100.0%
Five days			
Absolute	16	6	22
Relative	72.7%	27.3%	100.0%
Total			
Absolute	31	12	43
Relative	72.1%	27.9%	100.0%

Table 3 – Chi-squared test.

	Value	Significance p
Chi-squared test	0.009	0.924

Binomial tests for these proportions, as show in Table 4, indicate that in the 24-h group, there was no difference between the postoperative conditions, with a significance of 0.078 (>0.05).

For the 24-h group, the difference between the proportions of normal and altered conditions was also not significant, with a significance of 0.052 (>0.05), as shown in Table 5.

These results corroborate the association test carried out a priori and indicate that longer periods of antibiotic use do not contribute to increased rates of “normal” outcome.

However, it must be highlighted that such tests are more reliable when there is a larger number of occurrences for the analyzed categories.

Discussion

As discussed by Meyer et al.,² certain risk factors have been proven to increase the risk of SSI in patients operated for lumbar stenosis. Diabetes mellitus is the most important factor, in addition to advanced age, immunosuppression, smoking, chronic use of corticosteroids, multilevel surgery, obesity, hypertension, and liver cirrhosis. Considering that the overall rate of SSI in spinal surgery is low ($<2\%$),³ the only patient in the study who presented SSI had two risk factors for infection (elderly, hypertensive), corresponding to 1/44 or 2.28% of the sample. Despite the emphasis on drug therapy, prevention of surgical infections goes well beyond antibiotic prophylaxis. No surgeon should underestimate the importance of appropriate preoperative care, following the 1999 Center for Disease Control and Prevention (CDC) SSI prevention guidelines, which recommends a reduction to <24 h of preoperative hospitalization, shaving with trimmer or scissors at <2 h, antibiotic

Table 4 – Binomial test.

	Conditions	n	Observed proportions	Significance p
Groups				
Group 1	Normal	15	0.71	0.078
Group 2	Altered	6	0.29	
Total		21	1.00	
Group = 24 h.				

Table 5 – Difference between the proportions of conditions.

	Conditions	n	Observed proportions	Significance p
Groups				
Group 1	Normal	6	0.27	0.052
Group 2	Altered	16	0.73	
Total		22	1.00	
Group = five days.				

prophylaxis initiated at up to 1 h, antisepsis of the operative field, and duration of antibiotic prophylaxis <24 h.^{3,4}

Although preoperative antibiotic prophylaxis is effective to prevent bacterial infection, prolonged use of antibiotics is not justified. A meta-analysis by Barker⁵ did not identify any additional benefit from multiple-dose regimens. The prolonged use of antibiotics increases the risk of resistance of bacterial strains without benefits.⁶⁻⁸ Furthermore, the current orientation for clean spinal surgery is a single prophylactic dose^{9,10}; if a new dose is added, it should not exceed 24 h postoperative.¹¹⁻¹³

In the present study, a 24-h antibiotic protocol versus 120-h was proposed; the individual health variables of each subject were disregarded, and the incidence of infection was assessed separately. The results presented demonstrated that there was no difference in the incidence of infection within groups, which does not justify the prolonged use of antibiotics.

Other minor complications were observed in the study. Eight injuries had seroma, one had lush hyperemia, one evolved into cerebrospinal fluid fistula, and one had dehiscence of a suture caused by superficial infection. All these minor complications were not included as SSI because they were not deep, i.e., below the limit of muscular fascia.¹³

Conclusion

This study demonstrated that a single dose of antibiotic prophylaxis with first-generation cephalosporin is as effective as a pre- and postoperative multiple-dose regimen in lumbar arthrodesis surgery in up to three levels. The costs and risks of subjecting the patient to hospitalization under medication regimen are not justified.

Conflicts of interest

The authors declare no conflicts of interest.

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