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ACKNOWLEDGEMENTS

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LEVELS OF EVIDENCE FOR PRIMARY RESEARCH QUESTION: Access the following link.

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Levels of Evidence for Primary Research Question[a]

(This chart was adapted from material published by the Centre for Evidence-Based Medicine, Oxford, UK. For more information, please visit www.cebm.net.)

	Types of study			
Level	**Therapeutic Studies Investigating the Results of Treatment**	**Prognostic Studies – Investigating the Effect of a Patient Characteristic on the Outcome of Disease**	**Diagnostic Studies – Investigating a Diagnostic Test**	**Economic and Decision Analyses – Developing an Economic or Decision Model**
I	High quality randomized trial with statistically significant difference or no statistically significant difference but narrow confidence intervals	High quality prospective study[d] (all patients were enrolled at the same point in their disease with ≥80% of enrolled patients)	Testing of previously developed diagnostic criteria on consecutive patients (with universally applied reference ''gold'' standard)	Sensible costs and alternatives; values obtained from many studies; with multiway sensitivity analyses
	Systematic review[b] of Level RCTs (and study results were homogenous[c])	Systematic review[b] of Level I studies	Systematic review[b] of Level I studies	Systematic review[b] of Level I studies
II	Lesser quality RCT (eg, < 80% followup, no blinding, or improper randomization)	Retrospective[f] study	Development of diagnostic criteria on consecutive patients (with universally applied reference ''gold'' standard)	Sensible costs and alternatives; values obtained from limited studies; with multiway sensitivity analyses
	Prospective[d] comparative study[e]	Untreated controls from an RCT	Systematic review[b] of Level II studies	Systematic review[b] of Level II studies
	Systematic review[b] of Level II studies or Level I studies with inconsis tent results	Lesser quality prospective study (eg, patients enrolled at different points in their disease or <80% followup)		
		Systematic review[b] of Level II studies		
III	Case control study[g]	Case control study[g]	Study of non consecutive patients; without consistently applied reference ''gold'' standard	Analyses based on limited alternatives and costs; and poor estimates
	Retrospective[f] comparative study[e]		Systematic review[b] of Level III studies	Systematic review[b] of Level III studies
	Systematic review[b] of Level III studies		Case-control study	
			Poor reference standard	
IV	Case series[h]	Case series		Analyses with no sensitivity analyses
V	Expert opinion	Expert opinion	Expert opinion	Expert opinion

[a] A complete assessment of quality of individual studies requires critical appraisal of all aspects of the study design.
[b] A combination of results from two or more prior studies.
[c] Studies provided consistent results.
[d] Study was started before the first patient enrolled.
[e] Patients treated one way (eg, cemented hip arthroplasty) compared with a group of patients treated in another way (eg, uncemented hip arthroplasty) at the same institution.
[f] The study was started after the first patient enrolled.
[g] Patients identified for the study based on their outcome, called "cases" eg, failed total arthroplasty, are compared with patients who did not have outcome, called ''controls'' eg, successful total hip arthroplasty.
[h] Patients treated one way with no comparison group of patients treated in another way.

SUMMARY

VOLUME 31 – Nº 5 – 2023

SHOULDER AND ELBOW

ASSESSMENT OF THE LEVEL OF SATISFACTION OF PATIENTS SUBMITTED TO LATARJET SURGERY UNDER OUTFIT SYSTEM COMPARED TO HOSPITAL SYSTEM

AVALIAÇÃO DO GRAU DE SATISFAÇÃO DO PACIENTE SUBMETIDO À CIRURGIA DE LATARJET EM REGIME AMBULATORIAL EM COMPARAÇÃO COM O REGIME HOSPITALAR

Leandro Masini Ribeiro, Fillipe Agra de Oliveira Cosme, Paulo Henrique Schmidt Lara, Alberto de Castro Pochini, Benno Ejnisman, Paulo Santoro Belangero

DOI: http://dx.doi.org/10.1590/1413-785220233105e264837

SPINE

EPIDEMIOLOGY OF POST-TRAUMATIC SPINAL CORD INJURY IN A TERTIARY HOSPITAL

EPIDEMIOLOGIA DO LESADO MEDULAR
PÓS-TRAUMÁTICO EM UM HOSPITAL TERCIÁRIO

Vagner Clayton de Paiva, Camilo Velloso Nunes, Caio Villela Antonialli, Pedro Henrique Calegari Moraes, Guilherme Augusto Foizer, Iuri Tomaz de Vasconcelos, Sergio San Juan Dertkigil, Alberto Cliquet Junior, João Batista de Miranda

DOI: http://dx.doi.org/10.1590/1413-785220233105e264492

SPINE SURGERY

ACUTE RADIATING LOW BACK PAIN IMPACT ON ROUTINE AND FUNCTION OF THE BRAZILIAN POPULATION: A CROSS-SECTIONAL STUDY

IMPACTO DA LOMBOCIATALGIA AGUDA NA ROTINA E FUNÇÃO DA POPULAÇÃO BRASILEIRA: UM ESTUDO TRANSVERSAL

Guilherme Henrique Porceban, Alexandre Felipe França Filho, Renato Hiroshi Salvioni Ueta, David Del Curto, Eduardo Barros Puertas, Marcel Jun Sugawara Tamaoki

DOI: http://dx.doi.org/10.1590/1413-785220233105e264492

SPINE SURGERY

THE EFFECTIVENESS OF FORAMINAL ROOT BLOCK IN RELIEVING SCIATIC PAIN DUE TO LUMBAR DISC HERNIATION

A EFICÁCIA DO BLOQUEIO RADICULAR FORAMINAL NO ALÍVIO DA DOR CIÁTICA DEVIDO À HÉRNIA DISCAL LOMBAR

Ângelo Santana Guerra, Marcello Oliveira Barbosa, Matheus Moreno de Oliveira, Rosana Queiroz Coccoli, Angelo Augusto Bongiolo Ganeo, Eduardo José Ferreira Sales

DOI: http://dx.doi.org/10.1590/1413-785220233105e263169

TRAUMA

TIBIOCALCANEAL ARTHRODESIS: A COMPARISON OF ANTERIOR APPROACH AND TRANSFIBULAR APPROACH

ARTRODESE TIBIOCALCANEANA: COMPARAÇÃO ENTRE ABORDAGEM ANTERIOR E A ABORDAGEM TRANSFIBULAR

Abdulrahim Dündar, Deniz Ipek

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DOI: http://dx.doi.org/10.1590/1413-785220233105e266034

IMPLEMENTATION OF OTTAWA ANKLE RULES IN UNIVERSITY HOSPITAL EMERGENCY ROOM: PILOT STUDY

IMPLEMENTAÇÃO DAS REGRAS DE OTTAWA PARA TORNOZELO EM PRONTO-SOCORRO DE HOSPITAL UNIVERSITÁRIO: ESTUDO PILOTO

Sacha Pugliese Schiper[1], *Hugo Maia Rodrigues*[1], *João Eduardo Lima Ernesto Reis*[1], *Mayara Branco e Silva*[1], *Mauro Dinato*[1], *Rodrigo Gonçalves Pagnano*[1]

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ABSTRACT

Ankle injuries are the most common musculoskeletal injuries in emergency rooms and are associated with a great social and economic impact. The need to request additional tests for ankle sprains is based on suspicion of fracture. The Ottawa Ankle Rules (OAR) establish criteria for ordering radiographs to avoid performing unnecessary examinations. Objective: To evaluate the implementation of the Ottawa Rules as a protocol for treating ankle sprains in the emergency department of a university hospital. Methods: This is a retrospective observational study, conducted over a period of three months before and three months after implementation of the protocol. Results: In the first phase, all patients complaining of ankle sprain underwent radiographs. In the second phase, after the application of the OAR, out of 85 patients evaluated, only 58 underwent complementary exams, showing a reduction of 31.8% in the request for imaging exams. There was no significant difference in fracture detection between the two groups (p = 0.476). Conclusion: The OAR can be used as a tool in diagnosing ankle sprains, and their implementation reduced the request for imaging exams. ***Level of Evidence III, Retrospective Comparative Study.***

Keywords: Ankle Sprain. Ankle Fractures. Ankle. Radiography

RESUMO

Os traumatismos de tornozelo são as lesões musculoesqueléticas mais comuns nas salas de emergência e estão associadas a um grande impacto social e econômico. A solicitação de exames complementares para a entorse de tornozelo baseia-se na suspeita de fratura. As Regras de Ottawa para Tornozelo (ROT) estabelecem critérios para a solicitação de radiografias com o intuito de evitar a realização de exames desnecessários. Objetivo: Avaliar a implementação das ROT como protocolo de atendimento das entorses de tornozelo no pronto-socorro de um hospital universitário. Métodos: Estudo observacional retrospectivo que visou comparar a solicitação de radiografias e a presença de fraturas três meses antes e três meses após a implantação do protocolo. Resultados: Na primeira fase, todos os pacientes com queixa de entorse de tornozelo realizaram radiografias. Na segunda fase, após aplicação das ROT, de 85 pacientes avaliados, apenas 58 realizaram exames complementares, apresentando uma redução de 31,8% na solicitação dos exames de imagem. Não houve diferença na detecção de fraturas entre os dois grupos (p = 0,476). Conclusão: As ROT podem ser utilizadas como ferramenta no atendimento das entorses de tornozelo e sua implantação reduziu a solicitação de exames de imagem. ***Nível de Evidência III, Estudo Comparativo Retrospectivo.***

Descritores: *Traumatismos do Tornozelo. Fraturas do Tornozelo. Tornozelo. Radiografia.*

Citation: Schiper SP, Rodrigues HM, Reis JELE, Silva MB, Dinato M, Pagnano RG. Implementation of Ottawa ankle rules in university hospital emergency room: pilot study. Acta Ortop Bras. [online]. 2023;31(5): Page 1 of 4. Available from URL: http://www.scielo.br/aob.

INTRODUCTION

Ankle injuries are the most common musculoskeletal injuries in emergency rooms and are associated with a major social and economic impact.[1] About 40% of all ankle injuries occur during sports.[2] In soccer, basketball, and volleyball athletes, it accounts for about 10% to 15% of all injuries.[3] In the United Kingdom, one in every 10,000 people have this condition and about 5,000 injuries occur per day.[4] In the Netherlands, approximately 520,000 people suffer traumatic ankle injuries every year, of which 200,000 result from sports activity.[5] Even among Brazilian amateur university athletes, a sprained ankle was the most common injury in non-contact exercises.[6]

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

The study was conducted at Hospital de Clinicas, Universidade Estadual de Campinas.
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The management of ankle injuries is a daily routine in emergency departments and, although most patients undergo radiography, an ankle or midfoot fracture occurs in less than 15% of cases.[7] It is estimated that US$500,000,000 is spent annually on ankle radiography in Canada and the United States.[8] Around a third of the total costs spent on sports injuries are due to ankle sprains.[5] The diagnostic investigation of an ankle injury is the result of a semiological survey, a complete physical examination, and, when necessary, complementary resources.[3] In the initial assessment, it is a priority to exclude serious complications, such as fractures that can mimic or even be associated with ligament injuries.[9] In the 1980s, Stiell et al.[10] conducted a pioneering study to develop clinical decision rules for requesting X-rays in acute ankle injuries. The work was conducted in the emergency department of two university hospitals in Canada and, in order to avoid unnecessary radiographs, the Ottawa Ankle Rules (OAR) were developed. The rules consider radiographic examination necessary only when there is pain in specific bone points or Inability to weight-bear at least four steps.[7,10] The OAR are active, validated, and accepted in numerous trauma care centers around the world. Studies have shown that the sensitivity in detecting fractures is approximately 100% for both malleolar and midfoot fractures.[7] The negative predictive value is also 100%, meaning that the use of the protocol has proved useful in excluding the diagnosis of fractures.[11]

Therefore, this study aimed to evaluate the repercussions of the Ottawa Ankle Rules as a care protocol for ankle sprains in the emergency department, considering the number of ankle radiograph requests before and after their implementation, as well as their effectiveness in diagnosing ankle fractures.

METHOD

This is a retrospective observational study that evaluated 98 medical records before protocol implementation over a 3-month period (07/01/2018 to 09/30/2018) and 85 medical records after implementation, also over a 3-month period (10/01/2018 to 12/31/2018). Approved by the Human Research Ethics Committee of our institution and registered in the Plataforma Brasil (CAAE 97588718.1.0000.5404). The evaluated patients met the inclusion criteria established for the study: age over 18, an acute traumatic event that had occurred less than 10 days ago, and no previous care or radiological examinations. Patients with chronic ankle pain after a sprain (more than three weeks), polytraumatized patients, patients with altered level of consciousness, and pregnant women were excluded from the evaluation.

The pre-implementation period was aimed at evaluating patients without the use of AOR. At this point, the patient answered the anamnesis, followed by the physical examination. After undergoing a semiologic evaluation, the examiner requested radiographs for the patients without pre-established standardized criteria. In a second moment, protocol was implemented The entire orthopedics team of the university hospital participated in a training class. The topics covered were applied anatomy, the main ankle injuries, the trauma mechanism of sprains, and the standardization of the Ottawa Rules for ankle sprains, with the aim of standardizing care for the entire emergency department personnel.

The post-implementation period was aimed at evaluating patients with a history of acute ankle sprain under the protocol guidelines. During the initial assessment, a clinical history was taken, a physical examination was conducted, and the need for radiographs was assessed according to the Ottawa Rules (Table 1).

Table 1. Ottawa Ankle Rules (AOR)

Request an ankle radiograph if pain in the malleolar region is associated with any of the following:	Request foot radiograph if pain in the midfoot is associated with any of the following:
A) Pain on bony tenderness over the posterior edge of lateral malleolus (6 cm)	A) Bony tenderness at the base of the fifth metatarsal
B) Pain on bony tenderness over the posterior edge of the medial malleolus (6 cm)	B) Bony tenderness at the navicular bone
C) Inability to weight-bear immediately and after clinical observation	C) Inability to weight-bear immediately and after clinical observation

Patients admitted to the emergency department complaining of an ankle sprain, both in the first and second phases of the study, experienced the same conditions of care and assessment, with all the propaedeutic resources offered by our service. The only difference was that the first group underwent a radiological study, with no defined protocol, whereas the second group only underwent complementary examinations after AOR indication.

The data was analyzed using the free software program R Core Team (2021), version 4.1.1 (2021-10-08). To test the hypothesis of independence between categorical variables, the Chi-square test or Fisher's exact test was used. To test equal distributions for ordinal categorical variables, the Mann-Whitney test was used. The significance level adopted was 5% ($p < 0.05$).

RESULTS

In the cases of patients with ankle sprains evaluated, 98 records (53.5%) correspond to the pre-implementation phase, whereas 85 records (46.5%) refer to the post-implementation phase. The general characteristics of the studied groups, pre- and post-implementation, were compared and found to be statistically similar in terms of sex, age, and laterality (Table 2).

Table 2. Comparative analysis between the groups studied.

Characteristic	General n = 183	PRE n = 98	POST n = 85	p-value
Sex				
Female	97 (53.01%)	52 (53.06%)	45 (52.94%)	1.000*
Male	86 (46.99%)	46 (46.94%)	40 (47.06%)	
Age group				
18-30	79 (43.17%)	42 (42.86%)	37 (43.53%)	0.651**
31-40	47 (25.68%)	22 (22.45%)	25 (29.41%)	
41-50	15 (8.2%)	11 (11.22%)	4 (4.71%)	
51-60	12 (6.56%)	6 (6.12%)	6 (7.06%)	
60+	30 (16.39%)	17 (17.35%)	13 (15.29%)	
Laterality				
RIGHT	100 (54.64%)	53 (54.08%)	47 (55.29%)	0.988*
LEFT	83 (45.36%)	45 (45.92%)	38 (44.71%)	

* Chi-square test; ** Mann-Whitney test.

The first phase of the study found 52 females and 46 males, whereas the second phase found 45 females and 40 males. In both phases, the sex distribution was approximately 53% female patients and 47% male patients out of the total study population.

Furthermore, considering the total of 183 cases evaluated, 43.2% were in the 18-30 age group, 25.7% were 31-40 years old, and 6.5% were 51-60 years old. The highest frequency of ankle sprains was among adults aged 18-40, accounting for 68.9% of cases (Figure 1).

When assessing the laterality of the examinations of patients with sprains, 100 cases (54.6%) and 83 cases (45.4%) of injuries occurred in the right and left ankle, respectively.

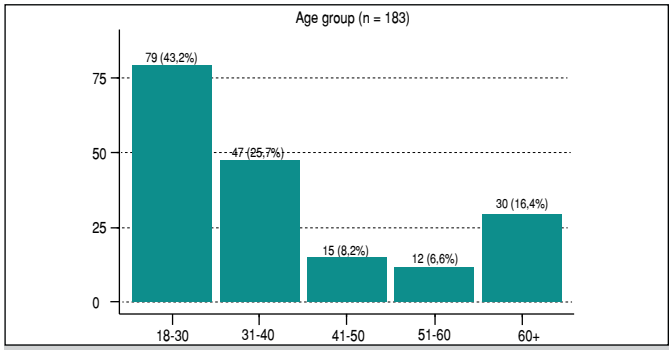

Figure 1. Distribution by age group (in years).

Over the first three months of data collection, out of 98 patients assessed, 11 (11.2%) were diagnosed with a fracture. During the second phase of the study, out of 85 patients, 6 cases of fracture were diagnosed, which represents 7.1% of all the individuals assessed in the group, or 10.3% of the radiographed patients (Figure 2). The association was investigated using the Chi-square test of independence, which found no evidence of an association ($p = 0.476$).

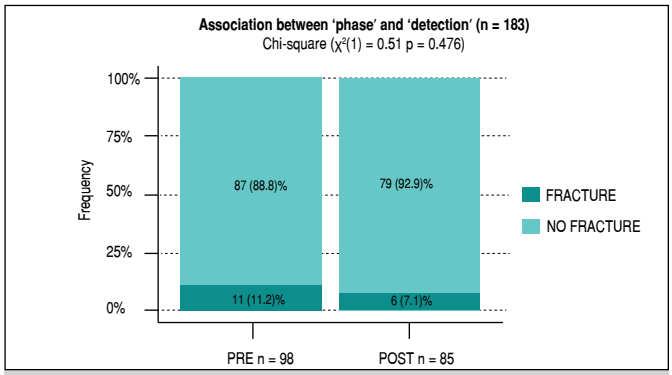

Figure 2. Association between phase and fracture detection.

Regarding reassessments, in the first phase of the study, 15 patients (15%) returned to the service on their own initiative for reassessment due to persistent symptoms after the acute sprain episode. All 15 patients had already undergone radiographs on their first visit, and during the reassessment they underwent a further examination to confirm the diagnosis. However, in this second evaluation, it was observed that two patients (13%) out of 15 had a diagnosis of fracture, which went unnoticed in the first clinical examination, even though imaging tests had been conducted.

In the next phase, a total of five reassessments were conducted (5.8%). In contrast to the first phase, these patients were subjected to the protocol again and were only referred for further tests if they met the necessary AOR criteria. Out of these five patients, two were referred for radiography, but none had a change in their initial diagnosis. In addition, no fractures went unnoticed during the initial assessment.

In both reassessment phases, patients were not re-included in the sample.

At the end of the data collection, an analysis of the information regarding the request for imaging tests was generated. During the first phase, 98 patients were treated, and all (100%) underwent radiographs. During the second phase, after implementation of the AOR, out of the 85 patients evaluated, 58 (68.2%) were indicated for radiographs, which meant an absolute reduction of 31.8% in the number of requests for radiographs (Figure 3).

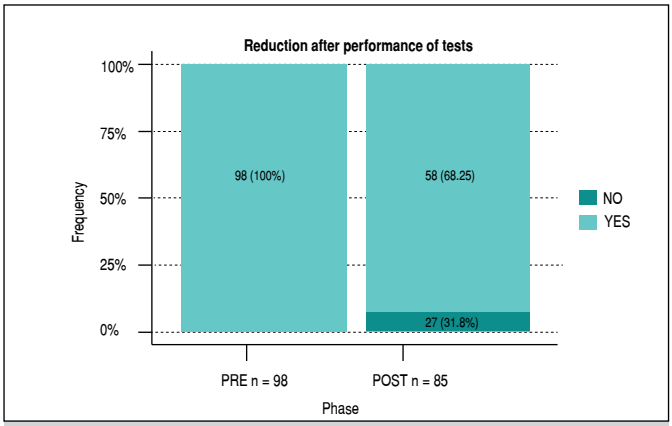

Figure 3. Examinations by phase.

DISCUSSION

The Ottawa Ankle Rules are objective criteria that allow to reduce the subjective component of clinical evaluation, providing specific and standardized indications for the performance of radiographs. The use of these criteria is simple, validated, and present high sensitivity and specificity.[9]

Heyworth[12] states that these rules have transformed the way ankle sprain injuries are assessed. After appropriate training and adequate knowledge, they can be used by various healthcare providers.[12] The reproducibility between examiners is high, which, added to its low cost and time of accomplishment, facilitates the management of ankle sprains. In our study, during the implementation phase, training of the entire orthopedic medical team was performed as recommended. The applicability among peers did not show difficulties, in line with the found data.

In 2003, Bachmann et al.[7] confirmed that the Ottawa Ankle Rules accurately exclude ankle and midfoot fractures and can reduce the number of unnecessary radiographs by 30% to 40%. This showed compliance with our results, which presented a 31.8% reduction in the request for radiographs. Moreover, the patients who were reassessed did not present any change in the initial diagnosis, demonstrating the agreement and accuracy of the OAR protocol.

Before the development of OAR, Stiell et al.[10] found that fewer than 15% of patients who presented to emergency departments with ankle sprains and received radiographs actually had fractures. The implementation of OAR reflects a decrease in hospital expenses since it reduces unnecessary tests, in addition to preventing exposure to ionizing radiation and optimizing the consultation time in the emergency room. Anis et al.[8] highlighted that patients who did not undergo radiographs were discharged from the emergency room 36 minutes before the other patients.

A large sample study in the United States showed a reduction in spending of US$3 million per 100,000 patients annually after 90% of emergency units applied OAR.[13] The potential savings from cutting overall hospital expenses are crucial, especially since public facilities struggle to meet the demands on their limited budgets.

During data collection, it was possible to observe a slight prevalence of females and young adults aged 18 to 30 years. Previous studies have shown a higher incidence of ankle sprains among females. The anatomical, hormonal, and neuromuscular differences between sexes do not necessarily explain the increase in this risk but should be considered for future studies. Moreover, lesions are more prevalent in the active population, especially among adolescents and young adults.[14]

CONCLUSION

This study evidenced the feasibility of implementing the Ottawa Ankle Rules as a care protocol for acute ankle sprains. The data indicated a reduction in the number of radiography requests and the protocol was effective in excluding fractures, with high reproducibility between examiners. The reduction in hospital expenses, less exposure to radiation, and optimization of consultation time in the emergency room ensure that the implementation of the OAR protocol is an appropriate tool for the care of ankle sprains.

AUTHORS' CONTRIBUTIONS: Each author contributed individually and significantly to the development of this article. SPS: protocol preparation, team training, data analysis, manuscript writing; HMR: data analysis, statistical analysis, manuscript writing; JELER: data analysis, statistical analysis; MBS: team training, data analysis; MD: data analysis, revision of the intellectual concept of the article; RGP: preparation of the research project and intellectual concept of the article, revision of the final version of the manuscript.

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OSTEOSYNTHESIS OF A SCAPHOID NECK FRACTURE WITH A CANNULATED COMPRESSION SCREW: EVALUATION OF 52 PATIENTS

OSTEOSSÍNTESE DE FRATURA NO COLO DO ESCAFOIDE COM PARAFUSO CANULADO DE COMPRESSÃO: AVALIAÇÃO DE 52 PACIENTES

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ABSTRACT

Objective: To evaluate the effectiveness of the dorsal fixation technique with a cannulated compression screw (CCS) for transverse scaphoid neck fractures. Methods: A case series study was carried out with patients treated with a CSS between April 2014 and May 2021. The main outcome was the healing of the fracture, verified by radiographic evaluation that used images of the wrist in anteroposterior, lateral, radial deviation, ulnar deviation and oblique views, obtained in the postoperative period. Results: Fifty-two patients aged between 15 and 65 years were analyzed, of which 43 (83%) were male. Of the 52 patients, 19 (36.53%) had a right-hand injury and 33 (63.46%) had a left-hand injury. Results were excellent in 47 patients (90.38%); good in 4 patients (7.69%), with reduced mobility compared to contralateral and poor in 1 patient (1.92%), with failure of consolidation and breakage of the synthesis material. In 51 cases (99%) there was bone consolidation at the end of six months. Conclusion: Osteosynthesis with a cannulated compression screw is a safe, effective and promising method for the treatment of scaphoid neck fractures. ***Level of Evidence IV, Case Series.***

Keywords: Osteosynthesis. Wrist Fractures. Scaphoid Bone.

RESUMO

Objetivo: Avaliar a eficácia da técnica de fixação dorsal com parafuso canulado de compressão (CCS) para fraturas transversas do colo do escafoide. Métodos: Foi realizado um estudo de série de casos com pacientes tratados com CSS entre abril de 2014 e maio de 2021. O desfecho principal foi a consolidação da fratura, verificada por meio da avaliação radiográfica das imagens do punho em anteroposterior, perfil, desvio radial, desvio ulnar e oblíquo obtidas no pós-operatório. Resultados: Foram analisados 52 pacientes com idade entre 15 e 65 anos, sendo 43 (83%) do sexo masculino. Dos 52 pacientes, 19 (36,53%) tinham lesão na mão direita e 33(63,46%) na mão esquerda. Os resultados foram excelentes em 47 dos pacientes (90,38%); bons em quatro (7,69%), com mobilidade reduzida comparada ao membro contralateral; e ruim em um (1,92%), com falha da consolidação e quebra do material de síntese. Em 51 casos (99%) houve consolidação óssea ao final de seis meses. Conclusão: A osteossíntese com parafuso canulado de compressão é um método seguro, eficaz e promissor para o tratamento das fraturas no colo do escafoide. ***Nível de Evidência IV, Série de Casos.***

Descritores: *Osteossíntese. Fraturas do Punho. Osso Escafoide.*

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INTRODUCTION

Scaphoid fractures are the most common carpal fractures and tend to occur in younger, more active individuals. The consolidation of fractures may be challenging due to their particularities and to the vascularization of the scaphoid.[1,2] Scaphoid fractures account for 2% to 7% of all fractures and for 60-70% of carpal injuries.[1,3]

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

The study was conducted at Rede D'Or, Hospital IFOR.
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The most common injury mechanism for scaphoid fractures is falling with an outstretched hand.[2] Delays in diagnosis or inadequate treatment can lead to nonunion, deformity and instability, which develop over five years. If left untreated, scaphoid nonunion can develop into carpal collapse and degenerative arthritis, leading to significant deficiency.[1,2] As these lesions usually occur in young and active patients, the associated morbidity and cost implications of the disability are significant.[1,2]

Successful scaphoid fracture consolidation is not universal and depends on the type of fracture and use of appropriate surgical techniques.[2] The role of the scaphoid within the structure and mechanics of the carpus, including directing and rotating the longitudinal axis of the scaphoid, is an important kinematic component to consider in scaphoid fracture repair.[3] Due to the limited vascular supply, it is important to obtain adequate reduction and cure to avoid complications, including avascular necrosis.[3]

Percutaneous internal fixation of scaphoid fractures allows for a more predictable union, with less morbidity than a treatment with plaster or an open internal fixation. The surgical technique that uses a headless cannulated compression screw, implanted by means of a dorsal percutaneous approach with the aid of fluoroscopy and arthroscopy, is indicated for the correction of acute fractures and presents low complication rates.[4,5] Thus, the present study aimed to analyze the clinical results of 52 cases that used the cannulated compression screw (SCC) in the dorsal fixation technique for scaphoid neck transverse fractures.

METHODS

This is a retrospective case series study conducted in a referral hand surgery hospital in the state of São Paulo. The investigation of the cases occurred through the analysis of medical records of patients submitted to osteosynthesis of transverse scaphoid neck fractures, with cannulated compression screw (CCS), by dorsal approach, in the period from April 1, 2014 to May 31, 2021.

This study was approved by the Research Ethics Committee of the São Luiz Hospital and Maternity, São Paulo, SP and received the opinion number 5,277,168 and CAAE: 564661322.0000.0087.

Inclusion and exclusion criteria

Inclusion criteria were patients of both sexes, with a scaphoid neck fracture classified as B2 by the Herbert and Fischer scale for acute, unstable fractures (< 6 weeks), complete of the neck,[6] patients who underwent the scaphoid osteosynthesis by means of the CCS screw, from April 1, 2014 to May 31, 2021; clinical and radiographic follow-up of at least 6 months after the operation. Patients submitted to any other therapy modality of therapy, data from incomplete medical records and information on any other type of fracture other than the scaphoid were excluded.

Surgical technique of osteosynthesis in the scaphoid neck fracture

All patients were placed in the supine position and submitted to brachial plexus block as anesthesia. The fractures were reduced by making a single horizontal incision on the dorsum of the wrist, distal about 1 cm from Lister's tubercle and approximately 2 cm long. Cautious dissection was performed until the identification of the 3 extensor compartment, dissected and removed for the dorsal opening of the capsule.[7] With the preparation of the surgical site, the identification of the articular surface of the scaphoid proximal pole, the fracture was reduced with the aid of radioscopy and osteosynthesis was made by the passage of 1 guide wire through the long axis of the scaphoid, perpendicular to the fracture trace, allowing for the passage of 1 self-perforating cannulated CCS screw.[8] The capsule and incision were sutured after being cleaned with 0.9% saline, tourniquet loosening and a hemostatic control process, with dressing and placement of a plaster splint, used in the postoperative period for pain control. Patients were discharged 8 hours after the end of the intervention. The plaster splint and the stitches were removed in 2 weeks, and patients then started rehabilitation with the physiotherapy service that followed the established protocol. After 6 weeks, patients were submitted to an evaluation of the degree of satisfaction of the treatment, according to the criteria proposed by Crawford.[9]

Analyzed outcomes

The main outcome observed was the consolidation of the fracture, analyzed through radiographic evaluation using anteroposterior, profile, radial and ulnar deviations and oblique wrist images obtained during the postoperative follow-up, performed in a period of 1 week, 2 weeks, 4, 6, 8, 12, weeks and 6 months. Bone consolidation criteria, for fractures analyzed through radiography, included ones that did not present signs of pseudarthrosis, that is, sclerosis at the extremities of the fracture, presence of a hiatus, absent or hypertrophic bone callus and persistence or enlargement of the fracture trait, after a minimum follow-up period of 6 months, were considered. In addition, the report of the presence of pain was evaluated in all patients.

Statistical analysis

A database was built using the Microsoft Excel program. For the analyses, the statistical package Stata version 13.0 (Stata Corp LP, College Station, TX, USA) was used. All values were presented in percentages and in a pie chart.

RESULTS

In total, 52 patients were screened in the study. Their ages ranged from 15 to 65 years and they underwent surgical treatment for scaphoid fractures. Nine (17%) patients were female and 43 (83%) were male. Of the 52 patients, 19 (36.53%) were injured in the right-hand while 33 (63.46%) were injured in the left-hand. The results obtained were excellent for 47 of the patients (90.38%), good for 4 patients (7.69%), who had reduced mobility compared to contralateral, and poor in 1 patient (1.92%), with consolidation failure and breakage of the synthesis material (Figure 1).

At the end of six months, 37 patients (71.15%) did not report any type of pain and 15 patients (28.85%) had mild pain (Figure 2).

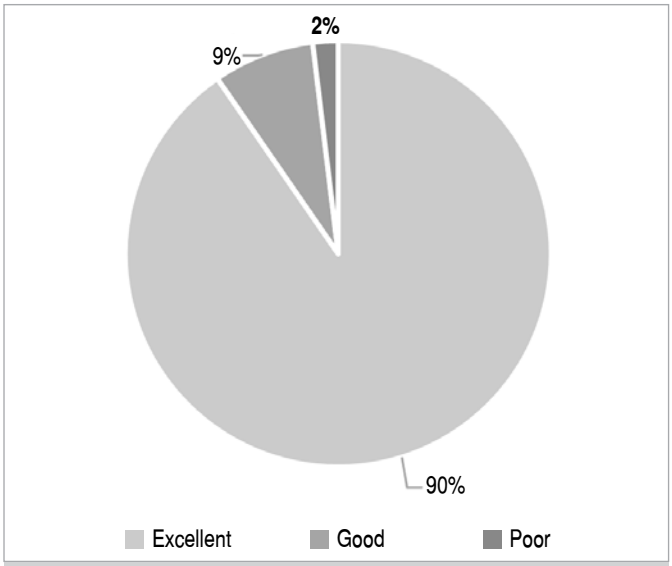

Figure 1. Scaphoid fracture consolidation distribution chart.

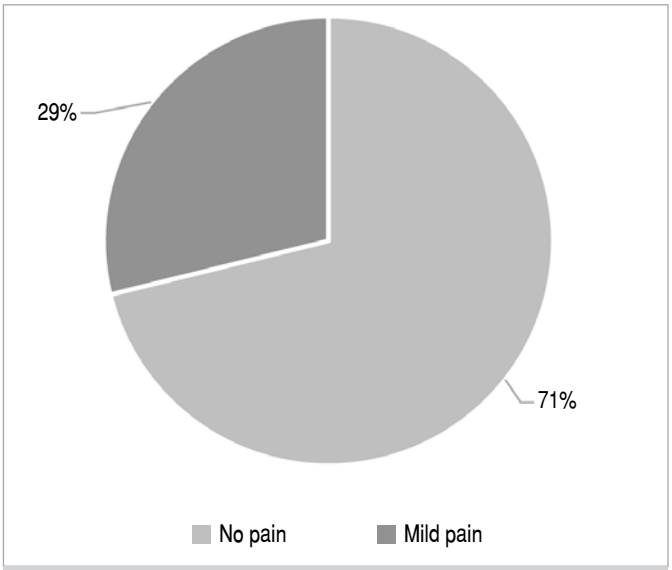

Figure 2. Distribution graph of pain prevalence after six months of surgery.

DISCUSSION

The scaphoid is the largest of the eight carpal bones and anatomically contains the proximal and distal poles with a waist (its mid-portion). The blood supply of the scaphoid is carried out predominantly by the radial artery branches and secondarily by the superficial palmar arch. Because of the retrograde nature of their blood supply, fractures in the scaphoid waist leave the proximal pole at high risk of avascular necrosis.[1]

The use of the surgical technique in which the cannulated compression screw is implanted through a dorsal percutaneous approach is indicated for the correction of acute fractures and delayed unions that are not associated with avascular necrosis or collapse.[4] In this sense, the present study analyzed the clinical results of 52 patients who used the dorsal fixation with cannulated screw (CSS) technique. The results six months after surgical treatment indicated that this technique is a good option for fractures in the scaphoid neck.

The present study also indicated excellent results regarding fracture consolidation after six months of surgery, with no pseudarthrosis reports and good functional results. Folberg et al.,[8] 2004, in a case series of 16 fractures of the middle third of the scaphoid, used percutaneous fixation with a cannulated Herbert screw as surgical treatment. The authors concluded that the percutaneous fixation technique in fractures of the middle third of the scaphoid proved to be an effective alternative, with low morbidity in the treatment of this lesion and no reports of complications throughout and after operations.[8]

In another study, with a retrospective review of medical records of 24 patients undergoing a surgery that involved fixation of non-displaced fractures (< 1 mm) of the scaphoid waist with a dorsal percutaneous cannulated screw, the overall rate of complications was 29%. There was one case of proximal scaphoid pole fracture after the operation. Minor complications included intraoperative equipment breakage – one case involving a screw and another involving a guide wire.[5]

In the percutaneous scaphoid fixation by dorsal route, the use of a limited incision is recommended when fixing the scaphoid internally by the dorsal approach, since there are anatomical structures at risk of injury.[10] Authors indicate that percutaneous fixation is a valuable treatment method for scaphoid fractures, as it allows early wrist movement and high patient satisfaction.[10,11]

The main limitation of the study is its design, a retrospective case report. We point out the need for further studies, including randomized clinical trials with the presence of a control group, to confirm our findings regarding scaphoid neck fracture osteosynthesis with cannulated screws.

CONCLUSION

There was fracture consolidation in 99% of the cases after follow-up and good functional results. Scaphoid neck fracture osteosynthesis with a cannulated compression screw, by the dorsal route, is a safe, effective and promising method for the treatment of scaphoid neck fractures.

AUTHORS' CONTRIBUTIONS: Each author contributed individually and significantly to the development of this article. LBCA, FSI: study design, surgery, data collection, data analysis or interpretation; writing and final approval of the version of the manuscript to be published; VMM, IAPC, ETD, TBCA, LMRR: study design, data collection, data analysis or interpretation; writing and final approval of the version of the manuscript to be published.

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RESECTION OF ANKLE TUMOR LESION AND RECONSTRUCTION WITH THE USE OF ALLOGRAFT

RESSECÇÃO DE LESÃO TUMORAL DO TORNOZELO E RECONSTRUÇÃO COM USO DE ALOENXERTO

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ABSTRACT

Reconstruction of the distal third of the tibia due to resection of a malignant tumor has some hindering factors, such as a thin subcutaneous layer, neurovascular bundles that cross compartments, prolonged operative duration, specific orthopedic material, and a trained multidisciplinary team. Allografting with material from tissue banks is part of this orthopaedic arsenal. Objective: To describe the protocol used at Instituto Nacional de Traumatologia e Ortopedia Jamil Haddad. Methods: Series of six cases subjected to resection with oncologic margins, allograft reconstruction, and use of a retrograde ankle nail as limb-salvage surgery. Three of the six patients were women, the lesions were on average 9.3 cm long, and the average operative duration was 3.25 hours. Results: The main short-term complication (≤ 30 days) was peroneal nerve palsy, while the main long-term complication (> 30 days) was surgical site infection (two cases). Consolidation of the two foci occurred in three patients, and two patients developed asymptomatic pseudoarthrosis of the proximal focus with consolidation of the distal focus. Conclusion: Despite the complications, the proposed surgery gives patients the chance to preserve their limb in the face of immediate radical surgery. ***Level of Evidence IV, Case Series.***

Keywords: Bone Neoplasms. Bone Nails. Tibia. Orthopedic Procedures.

RESUMO

A reconstrução do terço distal da tíbia devido à ressecção de tumor maligno apresenta alguns fatores que dificultam sua realização, como camada subcutânea delgada, feixes neurovasculares que transpassam os compartimentos, tempo cirúrgico prolongado, material ortopédico específico e equipe multidisciplinar treinada. O aloenxerto de banco de tecido faz parte deste arsenal ortopédico. Objetivo: Descrever o protocolo realizado no Instituto Nacional de Traumatologia e Ortopedia Jamil Haddad. Métodos: Série de seis casos submetidos à ressecção com margens oncológicas, reconstrução com aloenxerto e uso de haste retrógrada de tornozelo como cirurgia preservadora do membro. Três dos seis pacientes eram do sexo feminino, as lesões tinham em média 9,3 cm de comprimento e o tempo cirúrgico médio foi de 3,25 horas. Resultados: A principal complicação de curto prazo (≤ 30 dias) foi a paralisia do nervo fibular, enquanto a principal complicação de longo prazo (> 30 dias) foi a infecção do sítio cirúrgico (dois casos). A consolidação dos dois focos ocorreu em três pacientes, e dois pacientes evoluíram para pseudoartrose assintomática do foco proximal com consolidação do foco distal. Conclusão: Apesar das complicações, a cirurgia proposta permite ao paciente a chance de preservar seu membro diante de uma cirurgia radical imediata. ***Nível de Evidência IV, Série de Casos.***

Descritores: *Neoplasias Ósseas. Pinos Ortopédicos. Tíbia. Procedimentos Ortopédicos.*

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INTRODUCTION

Malignant musculoskeletal tumors in the foot and ankle are uncommon and account for about 1% to 5% of all tumor lesions.[1] Most of these lesions derive from muscle tissue and have a benign behavior, while malignant lesions are rare, although often underestimated.[2] A study performed at Universidade de Coimbra showed that 56% of cases of musculoskeletal tumors of the foot and ankle occur in women and 44% in men, aged 15 to 76 years old. Most lesions (78%) were benign. In terms of location, 88% were soft tissue tumors, 12% were bone lesions, and the most frequent histological diagnosis was giant cell tumor.[3] The ratio of benign neoplasms in this region is over 5:1 in relation to malignant neoplasms.[4]

The symptoms of neoplasms of the foot and ankle are diverse and vary depending on the patient's type of lesion. According to the

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The study was conducted at Instituto Nacional de Traumatologia e Ortopedia Jamil Haddad.
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anatomy of the region, little subcutaneous and muscle tissue covers the anteromedial region (mainly), making the lesions easily palpable. Another factor is the proximity of the anatomical compartments of the leg through which the neurovascular bundles that cross the joint pass, causing nonspecific complaints.

The anatomy of the leg has two bones that constitute the bony structure (tibia and fibula) and is divided into three compartments (anterior, lateral, and posterior, which is subdivided into superficial and deep posterior). These compartments include the muscles and neurovascular bundles. The path of these bundles is not linear, and they can pass from one compartment to another. Due to the proximity of compartments, the size of the subcutaneous layer, and the crossing of structures through the compartments, lesions located in the distal portion of the tibia generally present symptoms early and are easy to palpate. Expansive lesions that involve more than one compartment can lead to loss of function and motor/sensory alterations in the nerves of different compartments.[5] The compaction of the compartments in this region and the transposition of neurovascular bundles can make complaints inaccurate. Due to the proximity of anatomical structures, the lesions are generally palpable or symptomatic from the disease onset, facilitating early diagnosis.[5]

Ankle tumors have low incidence and anatomical, clinical, and histological particularities that imply poorly elucidated therapeutic proposals, mostly of surgical nature.[6] Traditionally, transtibial amputation is chosen for malignant lesions, since the main obstacles to limb-salvage surgery are the small amount of soft tissue coverage at the site and the difficulty in obtaining an adequate resection margin.[1] Reconstruction and wide resection surgeries associated or not with arthrodesis and allogeneic or autologous bone graft with vascularized fibula require a trained surgeon for a positive result.[7] The tumor must be resected with an adequate margin, preserving the adjacent tendons and neurovascular structures, which are essential for maintaining limb functionality.

Another therapeutic possibility described in the literature is ankle replacement, although its indication is restricted.[8] However, this procedure is associated with complications such as cement loosening, arthroplasty and muscle failure, which can be avoided by opting for arthrodesis treatment.[9]

This study aims to show the resection of the tibial distal portion with wide margins, reconstruction with an allograft from the tissue bank of Instituto Nacional de Traumatologia e Ortopedia Jamil Haddad (INTO), and the use of a retrograde ankle nail for fixation, evaluating cases subjected to proposed surgery from January 2012 to May 2022.

METHODS

This study was approved by the INTO Research Ethics Committee, under CAAE 56177822.0.000.5273. Six cases of malignant bone tumors in the ankle treated by allograft arthrodesis from January 2012 to May 2022 were evaluated.

Patients with a diagnosis of malignant bone tumor in the ankle with indication for wide surgical resection involving only the distal region of the tibia and its articular face with the talus were included. The exclusion criteria were: (1) benign bone tumors; (2) extensive lesions that affect the vascularization and do not allow limb-salvage surgery; (3) patients who do not agree with the terms of the study; and (4) patients who did not sign the informed consent form.

Data were collected using a physical record and imaging tests (radiography, computed tomography, and nuclear magnetic resonance). The following information was considered: sex, age, operative duration, number of bags transfused in the postoperative period, comorbidities, ASA anesthesia classification, medical evolution, date of hospitalization, date of surgery, date of hospital discharge, surgical description, and anatomopathological reports.

Surgical technique

Preoperative period

To be cleared for surgery, patients are assessed for clinical and soft tissue condition and the distance between the line of the ankle joint and the uninjured area, proximal to the bone lesion, where no imaging scan shows it, is measured in centimeters. This planning is important for the request to reserve the allograft in the tissue bank.

Intraoperative period

For the technique used, patients are placed in the supine position under anesthesia using a pneumatic cuff at 300 mmHg at the limb root to be operated. Surgical access is made in the anteromedial region of the distal portion of the leg, extending proximally to the area to be resected up to the topography of the Chopart joint, with the scar from the previously performed biopsy (Figure 1A).

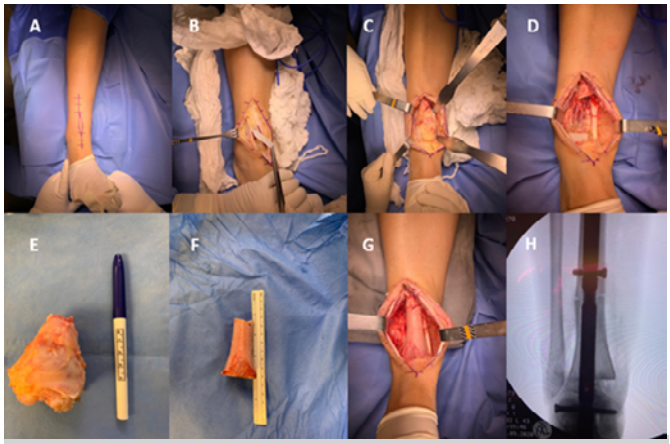

Figure 1. Surgical steps: A) Marked surgical access, covering the biopsy scar; B) Proximity to the peroneal nerve; C) Bone lesion; D) Bone gap after removal of the lesion; E) Bone lesion; F) Prepared allograft; G) Grafted gap; H) Fluoroscopy with synthesis.

Soft tissue dissection follows oncological principles, aiming at wide margins free of tumor lesions (Figures 1B and 1C).

In the intraoperative period, the previously determined distance is measured with an sterile ruler, adding 2 to 4 cm proximally to obtain free surgical margins. Diaphyseal osteotomy of the tibia is performed with an oscillating saw attached to the motor. Subchondral osteotomy of the proximal articular portion of the talus continues, minimizing the risk of pseudoarthrosis. Osteotomy of the distal portion of the ipsilateral fibula is unnecessary (Figure 1D).

The osteotomized specimen removed *en bloc* has its longitudinal measurement estimated and is sent for histopathological analysis in a suitable container with formaldehyde solution.

The bone defect produced is then measured for the suitability and preparation of the allograft to be used. Preference is given to allografts from the distal region of the tibia and the diaphysis of the femur, due to their more compatible diameter and length (Figures 1E and 1F).

The allograft is then placed in the bone defect created and tibiotalocalcaneal arthrodesis is performed with a retrograde ankle nail using an olive guide wire (Figure 1G). The nail is blocked proximal to the allograft (in the patient's tibia), as well as in the hindfoot region (Figure 1H).

At the end, the pneumatic cuff is deflated, hemostasis is checked, and suturing is performed in reverse planes. Patients are released with a pressure dressing.

Postoperative period

Patients are discharged with a removable walking boot and are instructed not to apply any load to the operated limb for six weeks. The use of crutches is therefore recommended.

Outpatient follow-up visits are paid weekly until the surgical stitches are removed. After that, patients are monitored monthly with X-rays to assess bone healing at the healthy bone/allograft interfaces and to maintain systemic screening for bone tumors. With the histopathology report of the anatomical specimen, patients are referred to clinical oncology for appropriate treatment (Figures 2A–2C).

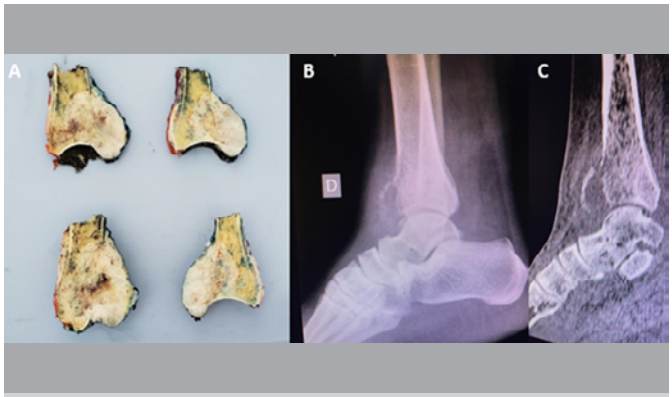

Figure 2. A) Anatomical specimen; B) Lateral X-ray of the ankle; C) Sagittal section of a computed tomography of the ankle.

RESULTS

Out of six patients who underwent the proposed surgery, three were women (50%) with an average age of 21 years. Half of the sample had ASA I anesthetic risk and the other half ASA II. The average hospital stay was 7.8 days, and the average operative duration was 3.25 hours (Table 1).

The lesions varied significantly in size, from 4.2 to 14 cm, with an average of 9.3 cm and different diagnoses (Table 2).

Outpatient follow-up showed neuropraxia of the peroneal nerve within 30 days in two patients who recovered function with specific oral medication. After 30 days, the surgical site became infected in two cases, one of which the patient underwent allograft removal, venous antibiotic therapy, and bone transport. The other patient required a vacuum dressing and intravenous antibiotic therapy to resolve the condition. Consolidation in both foci occurred in three patients within one year of surgery. In two patients, the proximal focus developed pseudoarthrosis, but they remained asymptomatic, and the distal focus consolidated. The last patient required bone transport.

Table 1. Clinical profile of patients undergoing surgery.

Patient	Age	Sex	Side	Comorbidities	ASA	Days hospitalized	Operative duration (hours)
1	45	Female	Right	Asthma/ COPD	II	6	4
2	11	Female	Left	No	II	23	4
3	25	Male	Right	No	II	7	3.5
4	11	Female	Left	No	I	5	4
5	18	Male	Right	No	I	3	2
6	16	Male	Left	No	I	3	2

COPD: chronic obstructive pulmonary disease.

Table 2. Profile of lesions and surgical complications.

Patient	Biopsy	Anatomical specimen	Lesion size (cm)	Complications within 30 days	Complications after 30 days
1	Grade II classic central chondrosarcoma	Grade II classic central osteosarcoma	4.2	Fibular paresthesia	Uneventful
2	Classic central osteosarcoma	Grade II classic central osteosarcoma	5.3	Uneventful	Uneventful
3	Giant cell tumor (GCT) with aneurysmal changes	Fibrohistiocytic proliferation corresponding to residual GCT stroma after Denosumab	8	Uneventful	Surgical site infection
4	Epithelioid hemangioma	Kaposiform hemangioendothelioma	12.5	Deep peroneal and saphenous nerve injury; Skin necrosis	Surgical site infection
5	Classic central osteosarcoma	Classic central chondroblastic osteosarcoma	14	Uneventful	Uneventful
6	Telangiectatic osteosarcoma	Classic central osteosarcoma	12	Uneventful	Asymptomatic pseudoarthrosis of the proximal focus

DISCUSSION

As these pathologies have low incidence in the general population and spread easily to adjacent structures due to their local anatomy, malignant tumors in the ankle are often treated aggressively. The literature shows the absence of an ideal option and controversy. The choice should be based on conditions intrinsic to the patient (age, comorbidities, among others) and the tumor (location, histological type, joint involvement).[10] The technical difficulty of limb-salvage surgery and the need for a wide resection with free margins mean that transtibial amputation is generally preferred as the primary treatment.[11]

Limb-salvage surgery using allografts from tissue banks is still rarely used. Possible factors include difficulty to access the tissue bank, hospital and orthopedist accredited to perform the transplant, lack of experience with allografts, long consolidation process between the allograft and the host bone or specific orthopedic surgical material.

According to Zhao et al.,[11] the medical decision on the type of surgery to be performed is guided by the presence or absence of the necessary infrastructure, the lack of a good response to chemotherapy, and the involvement of the neurovascular bundle. Patients should be aware of the risks and benefits of each surgery, since functionally infrapatellar amputation has similar long-term results, but the bodily, psychological, and aesthetic changes of an amputation can be disturbing factors.

The study by Moore, Halpern, and Schwartz,[12] in line with the study by Fin and Simon, recommend answering four questions: 1) Does survival decrease if limb-salvage surgery is performed? 2) Will the function of the limb be maintained or improved? 3) Are there any psychosocial benefits from the procedure? and 4) What are the immediate and long-term morbidities of limb-salvage surgery?

The bone gap present after surgery to resect the distal third of the tibia (including the articular surface) can be reconstructed using the tibia itself where the tumor was, by freezing or radiation; tibia or fibula allograft with some type of synthesis; autograft using the vascularized or nonvascularized fibula and fixation with a plate and screw; or tibia bone transport.

Moore, Halpern, and Schwartz,[12] in their 2005 study, showed that six out of nine patients who underwent allograft reconstruction required reoperation due to allograft fracture, infection, pseudoarthrosis at the allograft/host bone interface, among other complications. In a similar study, Balsamo, Malinin, and Temple[13] reported complications in nine of the 12 patients, with no cases of infection, but three cases of pseudoarthrosis, two of fractures, two developed into arthrosis, and two with delayed healing.

In 2018, Zhao et al.[14] pointed to complications in six out of 11 patients when using allograft and plate and screw fixation in the group in which the graft was combined with the tibia itself, which had been removed, curetted, and prepared with fibula showed a 14% complication rate. The last group that used the double-strut technique had no complications. In a 2019 article, the same author described the double-strut reconstruction of nine patients with diaphysis of the contralateral fibula, which was fixed with a plate and screws in a specific assembly. One patient had an intraoperative complication with a fracture of the donor's fibula. Postoperatively, the synthesis material failed in one case and the graft/host bone interface failed to consolidate in another.[11]

Hindiskere, Doddarangappa, and Chinder[15] showed in their article, which is not specific to the distal portion of the tibia, the complications in 16 of the 41 cases that underwent liquid nitrogen freezing (four cases of skin necrosis, one of intraoperative fracture, one of neuropaxis, and one of superficial infection, six of which required a second surgery).

Borzunov, Balaev, and Subramanyam[16] reported that the main complication was pin tract infection in nine of the 38 patients. One had neuropraxia, in five cases the olive wire had to be changed/removed due to failure, and in one case the fragments had to be immobilized due to loss of reduction.

The leg anteromedial anatomical region has a thinner subcutaneous layer that, along with the need for resection with oncological margins, makes it difficult to cover the material to be implanted. Another complicating factor is the arrangement of the neurovascular bundles, which pass through leg joints and compartments, requiring careful surgical dissection to avoid damaging them.

CONCLUSION

Despite the technical difficulty of reconstructing the tibial distal region and the complications involved, patients' satisfaction at being able to move around in the immediate postoperative period, even with the aid of crutches, and the feeling of having their limb preserved can be a step prior to surgeries that do not preserve the limb, as long as patients receive clear guidance during preoperative outpatient consultations and understand the risks and benefits.

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EFFICACY OF FULL-ENDOSCOPIC INTERLAMINAR AND TRANSFORAMINAL DISCECTOMY FOR LUMBER DISC HERNIATION

EFICÁCIA DA DISCECTOMIA INTERLAMINAR E TRANSFORAMINAL TOTALMENTE ENDOSCÓPICA NA HÉRNIA DE DISCO LOMBAR

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ABSTRACT

A previous study has reported the therapeutic effects of interlaminar/transforaminal approaches under full-endoscopic visualization to treat L5-S1 lumber disc herniation (LDH). However, the comparison of interlaminar/transforaminal approaches to treat other segments of LDH remains unclear. Objective: To evaluate the clinical efficacy of full-endoscopic interlaminar and transforaminal lumbar discectomy to treat LDH. Methods: A total of 93 patients with LDH who underwent fully-endoscopic lumbar interlaminar/transforaminal discectomy were retrospectively collected. Patients were divided into a Transforaminal group (n = 41) and an Interlaminar group (n = 52). Clinical efficacy was evaluated by visual analogue scale (VAS), the Oswestry disability index (ODI), and the modified MacNab scoring system. Results: Of the 93 patients, involving segments in LDH referred to L_{3-4}, L_{4-5}, and L_{5-S1}. The fluoroscopy times in the Interlaminar group were smaller than that of the Transforaminal group. We found no obvious significances between the Transforaminal and Interlaminar groups regarding operation time, incision length, postoperative landing time, hospitalization, and incision healing time. Postoperative VAS and ODI scores notably improved at follow-up. Besides, almost 90% LDH patients achieved excellent/good outcomes. Conclusion: The full-endoscopic visualization technique via interlaminar and transforaminal approaches safely and effectively treat LDH. ***Level of Evidence III, Retrospective Study.***

Keywords: Lumbar Vertebrae. Intervertebral Disc Displacement. Endoscopic Surgical Procedures. Discectomy. Fluoroscopy.

RESUMO

Um estudo anterior relatou os efeitos terapêuticos das abordagens interlaminar/transforaminal sob visualização totalmente endoscópica para tratar a hérnia de disco lombar (HDL) L5-S1. No entanto, a comparação das abordagens interlaminar/transforaminal para o tratamento de outros segmentos de HDL permanece pouco clara. Objetivo: Avaliar a eficácia clínica da discectomia lombar interlaminar e transforaminal totalmente endoscópica no tratamento da HDL. Métodos: Foram recolhidos retrospetivamente 93 pacientes com HDL submetidos a discectomia lombar interlaminar/transforaminal totalmente endoscópica. Os pacientes foram divididos em um grupo transforaminal (n = 41) e um grupo interlaminar (n = 52). A eficácia clínica foi avaliada através da escala visual analógica (EVA), do índice Oswestry de incapacidade (ODI) e do sistema de pontuação de MacNab modificado. Resultados: Dos 93 pacientes, os segmentos envolvidos na HDL referiam-se a L_{3-4}, L_{4-5} e L_{5-S1}. Os tempos de fluoroscopia no grupo Interlaminar foram menores do que no grupo Transforaminal. Não encontramos significâncias óbvias entre os grupos Transforaminal e Interlaminar em relação ao tempo de operação, comprimento da incisão, tempo de pós-operatório, hospitalização e tempo de cicatrização da incisão. As pontuações EVA e ODI pós-operatórias melhoraram notavelmente no acompanhamento. Além disso, quase 90% dos pacientes com HDL obtiveram resultados excelentes/bons. Conclusão: A técnica de visualização totalmente endoscópica através de abordagens interlaminar e transforaminal trata a HDL de forma segura e eficaz. ***Nível de Evidência III, Estudo Retrospectivo.***

Descritores: *Vértebras Lombares. Deslocamento do Disco Intervertebral. Procedimentos Cirúrgicos Endoscópicos. Discotomia. Fluoroscopia.*

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INTRODUCTION

Lumber disc herniation (LDH) is a common orthopedic disease, especially stemming from the degeneration and injury of lumbar intervertebral discs and mainly manifesting itself as low back pain.[1] LDH generally requires surgical treatment. Although fenestration discectomy (FD) has a definite efficacy, it may include disadvantages such as great trauma and long postoperative recovery time.[2] Thus, spine surgeons have introduced minimally invasive procedures, such as microsurgical discectomy, microendoscopic discectomy, and so on.[3-5] Percutaneous endoscopic lumbar discectomy

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The study was conducted at Capital Medical University, Beijing Friendship Hospital, Department of Orthopedics.
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(PELD) has received greater attention as another minimally invasive spinal surgery due to its small incisions, fast recovery, short hospital stay, and clinical efficacy.[6,7] However, transforaminal PELD (PETD) offers difficulties when performed in the high iliac crest and narrow foramen at L5-S1.[8] Thus, improving the safety of the operation and reducing patients' radiation exposure to ensure the efficacy of the procedure has become another development direction.

Today, full-endoscopic discectomy is performed under high-quality visualization to reduce fluoroscopy times.[9,10] Correspondingly, Aydın and Bolat[11] have confirmed that full-endoscopic lumbar discectomies produces beneficial outcomes. Another similar study has stated that full endoscopic lumbar discectomies are effective for patients with all types of LDH, including severely difficult and extremely difficult cases.[12] Although full-endoscopic visualization can be used to conduct interlaminar and transforaminal discectomies, only one report has compared which approach better treats L5-S1 disc herniation.[13] However, the comparison of interlaminar and transforaminal approaches to treat other segments of LDH remains unclear. This study investigated the clinical efficacy of discectomy by full-endoscopic visualization via the interlaminar and transforaminal approaches to treat LDH at L5-S1 and other levels.

METHODS

Patients

A total of 93 patients with LDH who underwent fully-endoscopic interlaminar/transforaminal lumbar discectomies from June 2019 to December 2020 were retrospectively collected in this study. Of these, 57 cases had central disc herniation and 36, paracentral disc herniation. Patients who 1) were diagnosed with LDH; 2) had central or paracentral protrusion; 3) had received conservative treatments for more than three months with no significant effect; 4) had no severe ossification with or without disc calcification; and 5) had complete follow-up data were included in this study. Patients who 1) had symptoms and signs that were inconsistent with imaging findings; 2) had recurrent LDH; 3) had LDH and lumbar instability, lumbar spondylolisthesis, lumbar infection, lumbar tumor, mental disorder, etc., were excluded from this research. All LDH patients were operated under the full-endoscopic visualization surgical system (Jaime, Karlsruhe, Germany). According to this surgical approach, patients who were treated with fully-endoscopic transforaminal visualization were defined as the Transforaminal group (n = 41), whereas patients who received the interlaminar approach were defined as the Interlaminar group (n = 52). This study was approved by the Ethics Committee of the Beijing Friendship Hospital, Capital Medical University (2021-P2-385-01). Written informed consent was given by all participants.

Surgery technique

In the Transforaminal group, patients were positioned prone and locally anesthetized. Under the guidance of a C-arm X-ray detector, the distance between the median line and the lesion segment was opened 8-14 cm laterally as a simulated puncture point. After routine disinfection, a no.-18 puncture needle was inserted into patients' intervertebral foramen, followed by a guide wire. An 8-mm incision was made in patients' skin with the puncture point as the midpoint, and guide rods were placed in steps to expand the surrounding soft tissue. Following the introduction of a working cannula and the endoscopic surgical system, foraminoplasty was performed with a power drill under endoscopic viewing. Subsequently, the protruding nucleus pulposus tissue was completely removed until the nerve roots were exposed. When the dura mater and nerve roots fluctuated well, patients' fibrous annulus was corrugated with a plasma radiofrequency, ending the operation (Figure 1).

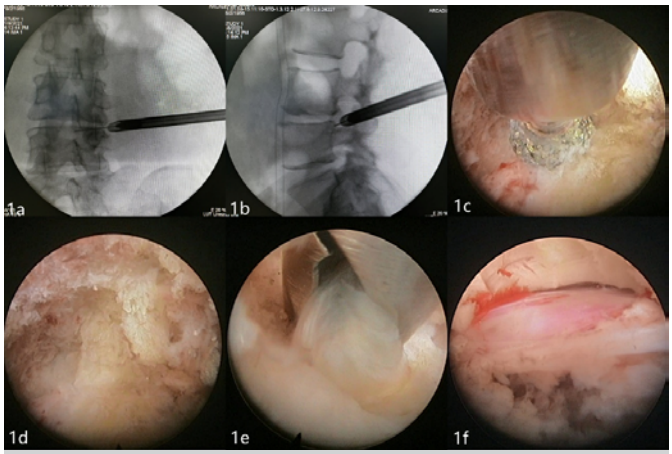

Figure 1. Operation procedure for the full-endoscopic visualization technique via the transforaminal approach. Intraoperative anteroposterior and lateral radiographs confirmed the intervertebral gap and foramina (a, b); The ventral superior articular process was shaped by a power drill (c); Ligamentum flavum and posterior edge of the intervertebral disc (d); Removal of the prominent nucleus pulposus (e); Exploration of nerve root relaxation with no nucleus pulposus left (f).

Interlaminar group patients were positioned prone under general anesthesia. The vertebral pedicle inner wall line of the surgical segment and the intersection of the upper vertebral body lower margin line were chosen as puncture points. After routine disinfection, a no.-18 puncture needle was inserted into the outer edge of patients' interlaminar space. An 8-mm incision was made in patients' skin and guide rods were placed in steps to expand the surrounding soft tissue. After the working cannula and endoscopic surgical system were introduced, interlaminar fenestration was performed by a power drill under endoscopic viewing. Part of the ligamentum flavum was removed to expose the nerve root and the protruding nucleus pulposus tissue was completely excised. When the dura mater and nerve roots fluctuated well, patients' fibrous annulus was corrugated by plasma radiofrequency, ending the operation (Figure 2).

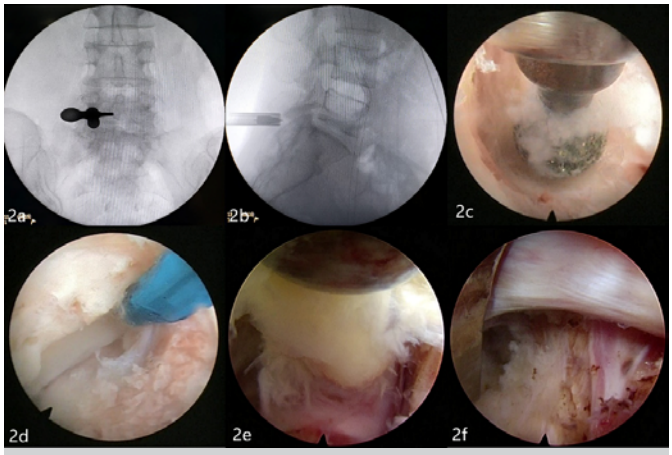

Figure 2. Procedures for full-endoscopic visualization via the interlaminar approach. Intraoperative anteroposterior and lateral radiographs confirmed the intervertebral gap and interlaminar space (a, b); Fenestration of interlaminar spaces on the affected side was achieved by a power drill (c); The insertion of the ligamentum flavum is exposed from the inner edge of the superior articular process (d); The outer edge of the autonomic nerve root was exposed inwardly and the prominent nucleus pulposus tissue was removed (e); Exploration of nerve root relaxation with no nucleus pulposus left (f).

<< SUMÁRIO

Postoperative management

Routine analgesic and neurotrophic drugs were postoperatively given to patients for three days.

One day after surgery, patients wore a waist circumference and were moved on the ground. Then, three days after the procedures, functional exercises were postoperatively conducted, including lower limb and lumbar back muscles exercises. Strenuous activities were avoided for one month after operation.

Postoperative evaluation

Operation time, fluoroscopy number, incision length, postoperative landing time, hospitalization time, incision healing time, and complications were recorded. The visual analogue scale (VAS) was used to evaluate patients' pain symptoms before and after surgery. Volunteers' ability of daily living was assessed by the Oswestry disability index (ODI). All patients were followed up for at least 12 months after surgery. The modified MacNab scoring system was utilized to evaluate surgery efficacy.

Statistical analysis

Data are shown as mean ± standard deviation (SD) and analyzed using SPSS 20.0. Data were enumerated using the chi-squared test. Perioperative data were compared using Student's t-test. The significances during follow-up (including VAS and ODI) were analyzed by two-away ANOVA followed by the Bonferroni test. A $p < 0.05$ was deemed as a significant difference.

RESULTS

General characteristics

Table 1 shows no obvious significances in gender, age, BMI, follow-up time, waist and leg VAS scores, and ODI between the two groups ($p > 0.05$). However, the operation segments in the Interlaminar group obviously differed from those in the Transforaminal group ($p < 0.05$).

Table 1. Baseline characteristics.

	Transforaminal group (n = 41)	Interlaminar group (n = 52)	t/χ^2 value	p-value
Age (years)	53.44 ± 14.09	49.69 ± 14.207	1.267	0.208
BMI (kg/m^2)	23.36 ± 1.47	23.45 ± 1.38	−0.312	0.756
Operation segments (n)			50.02	0.000
L3-4	3	-	-	-
L4-5	37	13	-	-
L5-S1	1	39	-	-
Waist VAS score	5.68 ± 1.01	5.58 ± 1.00	0.506	0.614
Leg VAS score	6.88 ± 1.01	6.85 ± 1.02	0.151	0.880
ODI (%)	39.71 ± 9.32	39.67 ± 9.11	0.018	0.986
Follow-up (months)	20.88 ± 6.03	21.21 ± 5.04	−4.033	0.127

BMI: body mass index; VAS: visual analogue scale; ODI: Oswestry disability index.

Operative technique and perioperative outcome

Patients of both groups received successful operations. The fluoroscopy times in the Transforaminal group (12.27 ± 1.07) were longer than in the Interlaminar group (8.02 ± 0.78) ($p = 0.000$). Moreover, we found no obvious significances between the Transforaminal and Interlaminar groups regarding operation time, incision length, postoperative landing time, hospitalization time, and incision healing time ($p > 0.05$) (Table 2).

Table 2. Comparison of perioperative data between the two groups.

	Transforaminal group (n = 41)	Interlaminar group (n = 52)	t value	p-value
Operation time (min)	150.15 ± 37.47	151.54 ± 37.58	−0.178	0.859
Incision length (mm)	10.05 ± 0.87	10.04 ± 0.91	0.056	0.956
Fluoroscopy times (n)	12.27 ± 1.07	8.02 ± 0.78	21.31	0.000
Postoperative landing time (day)	1.12 ± 0.40	1.42 ± 1.24	−1.644	0.105
Hospitalization time (day)	6.76 ± 0.44	6.75 ± 0.44	0.067	0.947
Incision healing time (day)	13.37 ± 0.80	13.42 ± 0.72	−0.362	0.718

Clinical outcomes

Follow-up showed no recurrence in both groups and some patients had pain and activity limitation that were relieved by painkillers and physical therapy. Additionally, we found no serious complications such as intervertebral space infections, lower limb thrombosis, dural sac ruptures, and vascular injuries.

Table 3 shows that VAS scores and ODI failed to significantly differ between both groups, whereas we found an obvious time effect. We observed no interactions between times and the groups.

Table 3. Comparison of visual analogue scale and Oswestry disability index between both groups.

	Time	Transforaminal group (n = 41)	Interlaminar group (n = 52)	Between-group effect	Within-group effect	Interaction
Waist VAS score	Pre-operation	5.68 ± 1.011	5.58 ± 0.997	F = 0.000, P = 0.993	F = 392.241, P < 0.001	F = 0.300, P = 0.753
	Postoperative 3 months	2.95 ± 0.999*	3.00 ± 1.103*			
	Postoperative 6 months	2.85 ± 0.963*	2.83 ± 1.098*			
	Last follow-up	2.27 ± 0.837*	2.35 ± 1.008*			
Leg VAS score	Pre-operation	6.88 ± 1.005	6.85 ± 1.017	F = 0.000, P = 0.988	F = 910.141, P < 0.001	F = 0.034, P = 0.910
	Postoperative 3 months	2.56 ± 0.976*	2.58 ± 1.091*			
	Postoperative 6 months	2.39 ± 0.919*	2.38 ± 0.973*			
	Last follow-up	2.22 ± 0.725*	2.25 ± 0.837*			
ODI (%)	Pre-operation	39.71 ± 9.320	39.67 ± 9.113	F = 0.036, P = 0.849	F = 193.316, P < 0.001	F = 0.113, P = 0.890
	Postoperative 3 months	28.05 ± 7.096	28.06 ± 7.524			
	Postoperative 6 month	24.34 ± 7.445*	23.44 ± 8.278*			
	Last follow-up	18.24 ± 7.562*	18.21 ± 7.920*			

VAS: visual analogue scale; ODI: Oswestry disability index.

Regarding within-group differences, VAS scores of waist and leg in two groups significantly decreased at three months after the procedures and then tended to stable ($p < 0.05$). However, ODI in two groups decreased six months after the operations and the last follow-up ($p < 0.05$).

Efficacy evaluation

According to the modified MacNab evaluation criteria, 90.24% of the Transforaminal group showed excellent and good outcomes. Briefly, 31 cases were excellent, 6 good, 3 fair, and 1 poor.

The Interlaminar group had 40 excellent cases (76.92%), six (11.54%) good cases, four (7.69%) fair cases, and two (3.85%) poor cases, showing a 88.46% excellent and good case rate. We found no statistically significant difference between both groups ($\chi^2 = 0.320$, $p = 0.956$) (Table 4). Figures 3-4 show the representative cases.

Table 4. Efficacy evaluation at last follow-up based on the MacNab score system.

	Transforaminal group (n = 41)	Interlaminar group (n = 52)	χ^2 value	p-value
Excellent (n, %)	31 (75.61)	40 (76.92)		
Good (n, %)	6 (14.63)	6 (11.54)		
Fair (n, %)	3 (7.32)	4 (7.69)		
Poor (n, %)	1 (2.44)	2 (3.85)		
Total (n, %)	41 (100)	52 (100)	0.320	0.956

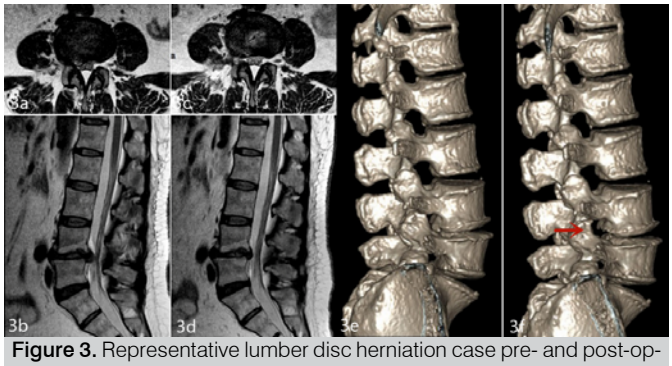

Figure 3. Representative lumber disc herniation case pre- and post-operation (L4-5, right paracentral type, female). Preoperative lumbar MRI showed that the L4-5 intervertebral disc was herniated to the right and that the L5 nerve root and dural sac were compressed (a, b); 12 months after the operation, lumbar MRI showed that the herniated intervertebral disc tissue had disappeared and that the right L5 nerve root and dural sac compression were relieved (c, d); Comparison of a three-dimensional CT reconstruction of the lumbar spine before and 12 months after the operation (the arrow indicates the L4-5 intervertebral

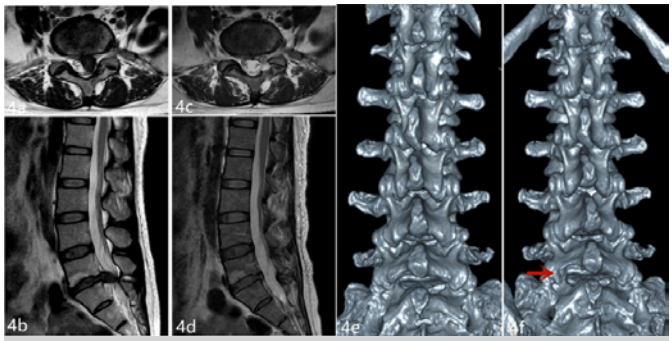

Figure 4. Representative lumber disc herniation case pre- and post-operation (L5-S1, left paracentral type, female). Preoperative lumbar MRI showed that the L5-S1 intervertebral disc was herniated to the left and that the S1 nerve root and dural sac were compressed (a, b); 12 months after the operation, lumbar MRI showed that the herniated intervertebral disc tissue had disappeared and that the left S1 nerve root and dural sac compression was relieved (c, d); Comparison of a three-dimensional CT reconstruction of the lumbar spine before the operation and 12 months after it (the arrow indicates the increase of the L5-S1 left interlaminar bone window after the operation) (e, f).

DISCUSSION

Growing evidence has shown that lumbar discectomy under the full-endoscopic technique ensures surgery safety by improving the visualization of the procedures.[14-16] Operations generally employ two approaches: transforaminal and interlaminar accesses. Additionally, spine surgeons know full-endoscopic transforaminal discectomy better to due to its relative maturity.[17,18] Correspondingly, the interlaminar approach was initially applied to patients with L5-S1 disc herniation to achieve sufficient resection.[9] However, the comparison of interlaminar and transforaminal approaches for LDH patients is yet to be fully reported. In this study, we found that both approaches under the guidance of the full-endoscopic technique achieved satisfactory efficacy.

Regarding anesthesia, a previous study has reported that full-endoscopic transforaminal and interlaminar lumbar discectomies were employed to treat L5-S1 LDH under general anesthesia.[13] A similar study has used the two approaches to treat all types of LDH under general anesthesia.[11] Nevertheless, Kim et al.[12] believed that PELD surgery can be performed under local anesthesia. LDH may show anomalous lumbosacral nerve roots and cutting these nerves would cause irreversible damage.[19,20] In the case of nerve root variation, PETD may damage the nerve root as patients are unable to give feedback to surgeons due to the general anesthesia. In our study, Transforaminal group patients received local anesthesia, supporting its effectiveness on lumbar discectomies.[21,22]

A previous study has reported that the average operation time of full-endoscopic lumbar discectomies via interlaminar and transforaminal approaches range from 40 to 210 min, respectively.[13] In this study, the average operative times of both groups conformed to the aforementioned reports. Moreover, we observed no obvious difference between the two groups regarding operative times. This may stem from our inclusion of LDH patients with different involved segments. Compared with full-endoscopic technique, patients during traditional PELD undergo longer fluoroscopy, causing excessive radiation exposure.[23] This study had fluoroscopy times ranging from 8.02 to 12.27 sec, lower in the Interlaminar group than in the Transforaminal group. A previous study has also confirmed that LDH L5-S1 patients undergoing the full-endoscopic technique via interlaminar approach undergo shorter fluoroscopies.[13] Another study has reported that the interlaminar approach can decrease intraoperative radiation exposure.[8] Furthermore, the ODI and VAS scores at the last follow-up significantly improved, whereas the efficacy between both groups was similar. Therefore, full-endoscopic visualization via interlaminar or transforaminal approaches can achieve good efficacy, indicating that it can reduce damage to the posterior lumbar spine under visual control.[24]

Recurrence and complications are important issues. Previous studies have reported that recurrence rates after PELD ranged from 0 to 5%.[11,25,26] This study found no recurrence in either the interlaminar or transforaminal groups during follow-up. Alternatively, the type of disc herniation and anular defect may be associated with recurrence rates.[27] In our study, a drill head with a 2.5-mm diameter under full-endoscopic technique could precisely and controllably resect bones, avoiding the postoperative "iatrogenic lumbar instability" due to the large diameter (diameter ≥ 7.5 mm) of bone resecting ring saws. This result agrees with a previous study that considered minimizing anular defects during operation as a protective factor.[28] Fortunately, almost 90% of our LDH patients obtained good clinical outcomes without serious complications. Yörükoğlu et al.[29] have analyzed complications using fully endoscopic interlaminar or transforaminal lumbar discectomies, finding that complications occur but most are resolved spontaneously. Taken together, the full-endoscopic technique via the transforaminal or interlaminar approaches can improve the treatment of LDH patients. Although both approaches can produce good therapeutic effect, they have corresponding indications. For instance, Choi and Park[30] have reported that the highest point of the iliac crest above

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the midline of the L5 pedicle will make the L5-S1 intervertebral foraminal approach ineffective. To avoid the influence of high iliac crest and other anatomical factors, Ruetten et al.[31] reported that 97.4% of patients with L5-S1 disc herniation have received the interlaminar approach with definite effects. Correspondingly, we also preferred the interlaminar approach in L5-S1. For patients with advanced age, poor physical fitness, and cardiovascular or cerebrovascular diseases, we tend to perform PETD under greater local anesthesia as much as possible. Those findings indicate that both approaches should complement, rather than replace, each other.

This study has limitations. We conducted this retrospective study in a single center medical institution with a small sample. Additionally, our follow-up time is short. In the future, we aim to increase the size of sample and follow-up time to evaluate the clinical efficacy of this technique for LDH patients.

CONCLUSION

The use of full endoscopic visualization technique via the transforaminal and interlaminar approaches can safely and effectively treat LDH. Importantly, patients can obtain satisfactory outcomes with less radiation exposure.

DATA AVAILABILITY STATEMENT

Data can be obtained with the permission of the corresponding author

AUTHORS' CONTRIBUTIONS: Each author contributed individually and significantly to the development of this article. GZ, XX: conceived this study and participated in data collection and analysis, result interpretation, and the drafting of this manuscript; NL: contributed to data collection, result interpretation, and the drafting of this manuscript. All authors read and approved the final manuscript and consented to its publication.

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FUNCTIONAL ASSESSMENT OF THE SHOULDER IN JIU-JITSU BLACK BELT ATHLETES

AVALIAÇÃO FUNCIONAL DO OMBRO EM ATLETAS FAIXAS-PRETAS DE JIU-JITSU

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ABSTRACT

Objective: To assess the epidemiological profile of Jiu-Jitsu black belt athletes, including the prevalence of pain and shoulder function. Methods: Cross-sectional study carried out with Jiu-Jitsu athletes from 2014 to 2016. The studied variables were: sex, age, dominant limb, weight, height, profession, time of Jiu-Jitsu practice, weekly training hours, other practiced sports, comorbidities, injuries and previous surgeries, medications and habits. For the functional assessment of the shoulder, the ASES Score was used. Results: 53 male athletes were evaluated. There was a prevalence of alcohol consumption (60.4%) and supplement use (32.1%). The practice of other sports included weight training (49.1%) and other martial arts (17%). There was a prevalence of knee (66.0%) and shoulder (52.8%) injuries and, in some cases, the need for surgical procedures. There was a prevalence of shoulder pain (73.6%) and more than half of the athletes (52.9%) had minimal or moderate limitation of shoulder function. Conclusion: Jiu-jitsu black belt athletes often have a history of injuries, with the shoulder being the second most affected body part. In more than half of the athletes, there was a prevalence of shoulder pain and functional limitation, according to the ASES Score. ***Level of evidence III, Retrospective comparative study.***

Keywords: Shoulder. Pain. Athletic Injuries.

RESUMO

Objetivo: Avaliar o perfil epidemiológico de atletas faixas-pretas de jiu-jitsu, incluindo a prevalência de dor e a função do ombro. Métodos: Estudo transversal realizado com atletas de jiu-jitsu entre 2014 e 2016. As variáveis estudadas foram: sexo, idade, membro dominante, peso, altura, profissão, tempo de prática do esporte, horas semanais de treino, outros esportes praticados, comorbidades, lesões e cirurgias prévias, medicamentos e hábitos. Para a avaliação funcional do ombro, foi utilizado o escore American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES). Resultados: Foram avaliados 53 atletas, todos do sexo masculino. Houve alta prevalência de consumo de bebida alcoólica (60,4%) e uso de suplementos (32,1%). A prática de outros esportes incluiu musculação (49,1%) e outras artes marciais (17%). Houve alta prevalência de lesões no joelho (66,0%) e no ombro (52,8%), e em alguns casos houve a necessidade de procedimentos cirúrgicos. Verificou-se alta prevalência de dor no ombro (73,6%), sendo que mais da metade dos atletas (52,9%) apresentaram limitação mínima ou moderada da função do ombro. Conclusão: Atletas faixas-pretas de jiu-jitsu frequentemente apresentam histórico de lesões, sendo o ombro o segundo local mais acometido. Houve alta prevalência de dor nos ombros e limitação funcional conforme o escore ASES em mais da metade dos atletas. ***Nível de evidência III, Estudo comparativo retrospectivo.***

Descritores: *Ombro. Dor. Lesões Esportivas.*

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INTRODUCTION

Combat sports are defined as the clash between two individuals with the goal of "finishing" the opponent through the fight. Brazilian Jiu-Jitsu (BJJ) is an important combat sport modality, which has been gaining popularity over the years.[1] BJJ is a martial art rooted in Kodokan, the pre-war Judo, and has been undergoing modifications.[2-4] It is known as the "gentle art" and its aim is to defeat the opponent through projections, chokes, twists and immobilizations resulting from tension force on the joints.[5]

The hierarchy of this modality is based on the system of belts, granted according to the athlete's experience, skills, and time practicing the sport.[6] In BJJ, the black belt represents an advanced level of technical and practical skills. To be eligible for a black belt, an athlete is required to be at least 19 years old and have spent at least one year as a brown belt. To progress from the black belt, the athlete must practice and teach at this level for at least three years.[7,8]
BJJ is based on the use of force of the opponents against themselves, not including movements such as kicks against the opponent.

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The study was conducted at Universidade Federal de Sao Paulo, Escola Paulista de Medicina, Departamento de Ortopedia e Traumatologia.
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Although less energy is put into the moves, BJJ athletes are subject to injuries, especially those with blue and black belts, mainly the latter. The objective of this study is to evaluate the epidemiological profile of black belt Jiu-Jitsu athletes and the prevalence of pain and shoulder function in this specific population.

METHODS

This is a cross-sectional epidemiological study, conducted from 2014 to 2016, with black belt Jiu-Jitsu athletes, with at least 10 years of practice, in several training centers in the city of São Paulo. This study was approved by the Medical Ethics Committee of the Federal University of São Paulo under registration number 57674116.9.0000.5505.

Data collection and sample

Black belt athletes with at least 10 years of Jiu-Jitsu practice were evaluated, composing a representative sample of a group of experienced and high-level athletes. The inclusion criteria were: Jiu-Jitsu athletes, black belt graduation, at least 10 years of practice, over 18 years of age. Exclusion criteria were: systemic disease with joint involvement and non-acceptance of the informed consent form (ICF).

Data collection was performed in gyms during training hours. The gyms were randomly selected within a 5 km radius of our research center. The data were collected by a single researcher, who visited the gyms on different days and times without giving athletes prior notice. After accepting the ICF, each athlete was given a previously tested self-administered questionnaire, with open and closed questions. The researcher was present during the completion of questionnaires to answer any questions. After completing the questionnaire, a physical evaluation was performed with the execution of special maneuvers for the shoulder and goniometry, performed with a manual goniometer.

Evaluated variables

The demographic variables were: gender, age, dominant limb, weight, height, profession, time of Jiu-Jitsu practice, weekly training hours, other sports practiced, comorbidities, injuries and previous surgeries, medications and habits. For the functional evaluation of the shoulder, the American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form of the American Academy of Orthopaedic Surgeons (ASES/AAOS) was used. According to the score,[9,10] the athletes were classified as: 1) asymptomatic (> 93.9), 2) symptomatic without functional limitation (77.7 to 93.9), 3) minimal functional limitation (54.5 to 77.7), 4) moderate limitation (32.5 to 54.5).

On the physical examination, the evaluated variables were: passive and active range of motion (elevation, lateral rotation and medial rotation with abduction at 90°) and special maneuvers for evaluation of the rotator cuff (Jobe, Patte and Gerber tests), impact (Neer, Hawkins-Kennedy and Yokum maneuvers), biceps-labral injury (Speed, Yergason and O'Brien) and instability (apprehension and Fukuda). Elevations lower than 150°, lateral rotations lower than 60° and medial rotations lower than 50°[11] were considered as deficit in the motion range.

Statistical analysis

For the statistical analysis, SPSS V20, Minitab 16 and Excel Office 2010 software were used and a significance level of 5% ($p < 0,05$) was defined. To evaluate the statistical dependence of two variables, the Chi-Square test was used; for two-by-two comparison of independent variables, the Mann-Whitney test was used; and for the analysis of the degree of association of two variables, Spearman's correlation was used. Non-parametric tests were used due to the identification of a sample without a distribution of normality by the Kolmogorov-Smirnov test.

RESULTS

Demographic characteristics

The sample consisted of 53 athletes from seven different gyms. All athletes evaluated were male. The mean age was 34.6 years (min: 30, max: 45), the mean body mass index (BMI) was 26.34 (min: 22.73; max: 31.74), the average training time was 13.8 years (min: 10; max: 25), the average weekly training time was 10 hours (min: 3; max: 40).

Life habits and sport practice

Forty-two athletes practiced another sport besides Jiu-Jitsu, especially weightlifting (49.1%) and other martial arts (17%). Thirteen athletes (24.5%) were professional Jiu-Jitsu athletes and the others practiced recreationally. Five (9.4%) athletes had some clinical comorbidity, including hypertension, type 2 diabetes, gastritis and asthma (Table 1).

Table 1. Prevalence of life habits, sports practice, injuries and surgeries in black belt Jiu-Jitsu athletes.

Habits	n	%
Anabolic steroid	9	17.0
Supplement	17	32.1
Alcoholism	32	60.4
Smoking	4	7.5
Sports		
Martial Art	9	17,0%
Football	4	7.5%
Weightlifting	26	49.1%
Cycling	4	7.5%
Surfing	7	13.2%
Crossfit	4	7.5%
Water Polo	1	1.9%
Skateboarding	2	3.8%
Swimming	1	1.9%
Jogging	4	7.5%
Volleyball	1	1.9%
Rugby	1	1.9%
Total	42	79.2%
Surgeries		
Shoulder	3	5.7 %
Hand and Fist	3	5.7 %
Knee	4	7.5%
Foot and Ankle	1	1.9%
Total	11	20.8%

Regarding life habits, nine (17%) athletes confirmed the use of anabolic steroids at some point in their sports lives, 17 (32.1%) used nutritional supplements, 32 (60.4%) reported drinking alcohol socially and 4 (7.5%) were smokers.

Injuries and surgeries

Forty-eight (90.6%) athletes had injuries during training or competitions, especially knee (66%) and shoulder (52.8%) injuries. Figure 1 shows the data on the prevalence of injuries in Jiu-Jitsu practitioners. Eleven (20.75%) athletes underwent surgical treatment for orthopedic injuries, including knee (7.55%), shoulder (5.66%), hand and wrist (5.66%), foot and ankle (1.89%) injuries.

<< SUMÁRIO

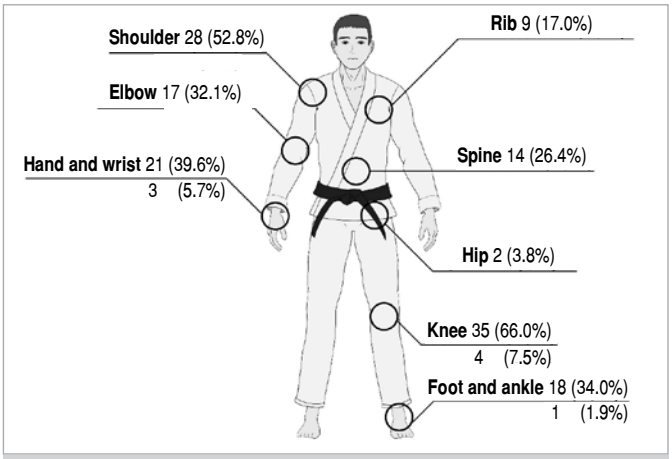

Figure 1. Prevalence of injuries and surgeries by body part. The values above the lines refer to the lesions and those below refer to the number of surgeries.

Shoulder evaluation

Thirty-nine (73.6%) athletes reported having shoulder pain. Range of motion (ROM) deficit was identified in 18 (34.0%) athletes. Loss of lateral rotation was the most prevalent (32.1%), followed by loss of elevation (7.6%) and medial rotation (5.7%) (Table 2). Patients with and without ROM deficit were not statistically different when compared in relation to quantitative variables (age, BMI, training time and weekly training hours). Decreased ROM showed a statistically significant relationship with positivity in special tests for biceps-labral injuries (p = 0.042) and cuff injuries (p = 0.004).

Table 2. Movements and elevation deficit, lateral rotation and medial rotation in black belt Jiu-Jitsu athletes.

	ELEVATION		LATERAL ROTATION		MEDIAL ROTATION	
	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT
ACTIVE	173°	174.8°	67.8°	69.2°	81°	83.2°
PASSIVE	174.6°	176.8°	70.5°	71.8°	82.5°	84.2°
DEFICIT	4 (7.6%)		17 (32.1%)		3 (5.7%)	

Only 26.4% of the athletes did not present positivity in the special tests. Nine (17.0%) wrestlers tested positive for one disease, 13 (24.5%) for two, 11 (20.8%) for three and six (11.3%) for four. Tests for Impingement Syndrome showed the highest positivity prevalence (54.7%), followed by tests for Rotator Cuff injuries (52.8%), biceps-labral injuries (39.6%) and instability (26.4%). There was no statistically significant relationship between the special tests and the quantitative variables, sports level, alcohol use, cigarettes or anabolic steroids.

The mean ASES score was 78.2 (min: 42; .max: 100), and 16 (30.2%) athletes presented scores compatible with normal shoulder function, 9 (17.0%) with some symptom without functional limitation, 25 (47.2%) with minimal limitation and 3 (5.7%) with moderate limitation. The ASES mean in patients with and without ROM deficit was 72.1 and 81.6, respectively, but without statistical difference (p = 0.058). ASES had a statistically significant correlation with age (p = 0.038): the higher the age, the lower the ASES and vice versa. Athletes with positivity in special tests presented worse ASES scores, and this association was significant for cuff tests (p = 0.001) and for impact (p = 0.003).

Table 3. Injuries and special tests for shoulder evaluation in black belt Jiu-Jitsu athletes.

Injury	Maneuver	Total	Right	Left	Dominant	Bilateral
Rotator cuff	Jobe	11 (20.75%)	3 (5.66%)	8 (15.09%)	5 (9.43%)	0
	Patte	21 (39.62%)	7 (13.20%)	15 (28.30%)	10 (18.87%)	1 (1.89%)
	Gerber	15 (28.30%)	6 (11.32%)	12 (22.64%)	8 (15.09%)	3 (5.66%)
	Total	28 (52.83%)	11 (20.75%)	22 (41.51%)	14 (26.42%)	5 (9.43%)
Impingement Syndrome	Neer	14 (9.43%)	3 (5.66%)	11 (20.75%)	5 (9.43%)	0
	Hawkins-Kennedy	13 (24.53%	10 (18.87%)	6 (11.32%)	11 (20.75%)	3 (5.66%)
	Yokum	15 (28.30%)	5 (9.43%)	12 (22.64%)	7 (13.21%)	2 (3.77%)
	Total	29 (54.72%)	13 (24.53%)	19 (35.84%)	14 (26.42%)	3 (5.66%)
Biceps-Labral Injury	Speed	4 (7.55%)	2 (3.77%)	2 (3.77%)	4 (7.55%)	0
	Yergason	5 (9.43%)	3 (5.66%)	2 (3.77%)	3 (5.66%)	0
	O'Brien	18 (33.96%)	12 (22.64%)	14 (26.41%)	13 (24.53%)	8 (15.09%)
	Total	21 (39.62%)	14 (26.41%)	15 (28.30%)	16 (30.19%)	8 (15.09%)
Glenoumeral instability	Apprehension	14 (9.43%)	7 (13.20%)	7 (13.20%)	6 (11.32%)	0
	Fukuda	1 (1.89%)	1 (1.89%)	1 (1.89%)	1 (1.89%)	1 (1.89%)
	Total	13 (24.53%)	9 (16.98%)	5 (9.43%)	5 (9.43%)	1 (1.89%)

DISCUSSION

This study investigated the epidemiological profile, pain prevalence and shoulder function of black belt Jiu-Jitsu athletes. In the evaluated athletes, high prevalence of alcohol consumption; supplement use; practice of other sports; knee and shoulder injuries and, in some cases, the need for surgical procedures were observed. A high prevalence of shoulder pain was also observed, and more than half of the athletes had minimal or moderate shoulder function limitations. The study highlights the specific black belt population, athletes who have high performance and long experience in the sport. Regarding the "gender" parameter, 100% (53) of athletes evaluated were male. Our sample was larger when compared to other studies conducted in Brazil.[12,13] It is important to highlight that, although our sample is predominantly male, in recent years, Jiu-Jitsu has aroused women's interest, especially for the benefits tied to it.[12]

In the present study, there was a high prevalence of alcohol consumption. We identified only two studies in the literature that reported on the consumption of alcoholic beverages by Jiu-Jitsu practitioners.[14,15] One of the studies reported that 90% (n = 9) of the athletes consumed alcoholic beverages twice a week.[14] The other study indicated that 45.1% of the Jiu-Jitsu athletes consumed alcoholic beverages.[15] It is important to consider that Jiu-Jitsu is a physical activity that takes great dedication, physical effort and continuous training. The ingestion of alcoholic beverages by athletes can delay

reflex effects, making them slower when defending themselves from moves, which may result in a higher injury frequency.[15]

There was also a high supplement consumption by the athletes in the study. Another study conducted in Brazil also found a high prevalence of consumption of dietary supplements by Jiu-Jitsu practitioners.[16] Food supplements can be used to improve performance in sports, but they should not be considered a conventional diet food and should be used under guidance. Athletes should also know the benefits and harms of overconsumption of these products.[16]

Most black belt Jiu-Jitsu athletes practiced other sports, especially weightlifting and martial arts. Although the practice of different sports is common, especially with weightlifting, we did not identify studies in the national and international literature that reported the practice of Jiu-Jitsu along other modalities and the increase or reduction of injury risk.

The topography of injury incidences in this sport is still divergent in the literature. Most research concludes that the highest incidence of injuries happens in the knees or hands, followed by the shoulders and elbows.[1,5,17] According to Machado et al.[17] most shoulder injuries occur in BJJ athletes when they apply or receive a fall or scraping move, and when they receive a move called "shoulder lock". The injury mechanisms described are traction on the joint, a direct trauma of the shoulder region with the mat, with this limb abducted or adducted, which may be associated with an external rotation, when abducted, or a fall on the shoulder, resulting in a hyperextension.[17]

There was a high prevalence of knee and shoulder injuries and, in some cases, the need for surgical procedures. Our findings are in agreement with other studies published in Brazil that report on knee and shoulder injuries.[1,12,13,18-20] In addition, another study described that 15% of athletes required surgery after the injury.[4] The incidence of injuries in Jiu-Jitsu can occur as in any other sport.[12] Injuries, such as bruises, dislocations, fractures, sprains and nonspecific pain may occur during the training or competition phases, as a result of a program in which activities have been incorrectly planned or executed.[12,21]

In the present study, there was also a high prevalence of shoulder pain (73.6%). This result is important, mainly because there is a lack of studies that address shoulder pain in Jiu-Jitsu athletes. This finding represents a wake-up call and injury prevention efforts should be considered. With epidemiological data it is possible to outline better preventive and treatment conducts, aiming at a more agile reinsertion of the athlete into sports practice without functional deficits.[1]

More than half of the athletes had minimal or moderate shoulder function limitation, and older athletes and positivity in rotator cuff and impact tests were associated with worse scores. We did not identify other studies that addressed shoulder function in Jiu-Jitsu athletes. The strong point of this study is the inclusion of a specific population of black belt athletes; however, this limits the possibility of generalizing the results to other categories of BJJ practitioners. Another relevant aspect of this study is the evaluation of shoulder pain and function in Jiu-Jitsu athletes, in which there is a gap in the literature, both in national and international studies. The possible limitations of this study are related to the memory bias associated with the self-report of functional limitation in the shoulder evaluation by the ASES Score and the fact that the sample studied did not include female athletes. We highlight that the sample size is representative of this population, and these data are fundamental to stimulate the development of clinical treatments and prevent pain and function limitation in Jiu-Jitsu athletes.

CONCLUSION

Black belt Jiu-Jitsu athletes often have a history of injuries, with the shoulder being the second most affected body part. Impingement Syndrome tests showed the highest prevalence of positivity, followed by Rotator Cuff injury tests. ROM deficit was common and is associated with positivity in tests for cuff and biceps-labral injuries. More than half of the athletes presented some degree of functional limitation by the ASES score, and both older athletes and positivity in cuff and impact tests were associated with worse scores.

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ASSESSMENT OF THE LEVEL OF SATISFACTION OF PATIENTS SUBMITTED TO LATARJET SURGERY UNDER OUTFIT SYSTEM COMPARED TO HOSPITAL SYSTEM

AVALIAÇÃO DO GRAU DE SATISFAÇÃO DO PACIENTE SUBMETIDO À CIRURGIA DE LATARJET EM REGIME AMBULATORIAL EM COMPARAÇÃO COM O REGIME HOSPITALAR

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ABSTRACT

Anterior shoulder instability causes functional changes that affect patients' quality of life. The Latarjet procedure is one of the most frequently performed surgeries for cases of recurrent shoulder instability. Objective: To assess the level of satisfaction of patients who underwent the Latarjet procedure in outpatient settings (day hospital) compared with inpatient settings. Methods: A questionnaire was administered to both groups and a descriptive analysis of the results was performed. Results: 51 patients were included, with a mean age of 29.9 years, 82.3% men and 17.6% women. Of the patients who underwent surgery in the day hospital, 46.1% were operated within 100 days of their first outpatient visit; among those in the inpatient group, 76.3% underwent surgery more than 200 days later. Delays occurred in 15.3% of cases in the day hospital compared with 68.4% in the inpatient group. Of the patients in the day hospital, 92.3% felt comfortable contacting the medical team in case of complications and would perform the procedure again in the same setting. Moreover, 63.2% of inpatients would have preferred to have been discharged on the same day. The final satisfaction rate for both groups was 100%. Conclusion: Outpatient surgery guarantees more patient comfort, safety, and can be performed in a timely manner and with fewer delays, which has influenced patients' decision to have surgery during the COVID-19 pandemic. ***Level of Evidence V, Cross-sectional Study.***

Keywords: Orthopedic Surgery. Ambulatory Surgery. Patient Satisfaction. Joint Instability. Glenohumeral Subluxation. COVID-19.

RESUMO

A instabilidade anterior do ombro acarreta alterações funcionais que impactam a qualidade de vida do paciente. A cirurgia de Latarjet é um dos procedimentos mais executados para casos de instabilidade recorrente de ombro. Objetivo: Comparar o grau de satisfação dos pacientes submetidos ao procedimento de Latarjet no regime ambulatorial (hospital dia) com o dos operados no regime hospitalar. Métodos: Um questionário foi aplicado em ambos os grupos e uma análise descritiva dos resultados foi realizada. Resultados: Foram incluídos 51 pacientes, com idade média de 29,9 anos, sendo 82,3% homens e 17,6% mulheres. Dos submetidos à cirurgia no hospital dia, 46,1% operaram em até 100 dias depois do primeiro atendimento ambulatorial; já entre os do grupo hospitalar, 76,3% operaram mais de 200 dias depois. O atraso na cirurgia ocorreu com 15,3% dos pacientes do hospital dia contra 68,4% do grupo hospitalar. Do hospital dia, 92,3% pacientes sentiram-se confortáveis em contatar a equipe médica em caso de intercorrências e fariam novamente o procedimento de forma ambulatorial. Além disso, 63,2% dos internados gostariam de ter recebido alta no mesmo dia. O grau de satisfação final em ambos os grupos foi de 100%. Conclusão: A cirurgia ambulatorial garante mais conforto para o paciente, mostrando-se segura e podendo ser performada em tempo hábil e com menos atrasos, o que influenciou a decisão dos pacientes em operar durante a pandemia de COVID-19. ***Nível de Evidência V, Estudo Transversal.***

Descritores: *Cirurgia Ortopédica. Cirurgia Ambulatorial. Satisfação do Paciente. Instabilidade Articular. Luxação Glenoumeral. COVID-19.*

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INTRODUCTION

Anterior shoulder instability is a spectrum of anatomical and functional changes that lead patients to experience recurrent loss of joint congruence or apprehension when performing activities, reducing their ability to perform basic daily functions and consequently their quality of life. The Latarjet procedure is one of the most performed surgeries for recurrent shoulder instability, consisting of transferring the coracoid to the anterior glenoid, preventing new episodes of dislocation and increasing patient safety when performing tasks.[1]

More than 50 years ago, this type of procedure could only be performed in a hospital, thus, patients had to be hospitalized and discharged after a few days. They often had to wait for months until the day of surgery due to the limited number of beds or the demand for other emergencies that needed to be dealt with sooner.[2] The concern of doctors and managers about the problems faced in performing surgeries is not new, especially in the current scenario, in which most hospital beds are allocated to COVID-19 patients, increasing the waiting list for orthopedic procedures. Studies from the beginning of the last century show patients who underwent surgery and returned home the same day, giving rise to the concept of outpatient surgery (also known as day hospital).[3] In the 1970s, the number of facilities and associations focused on the study of outpatient surgery increased, seeking to improve efficiency, convenience in care, and consequently, patient satisfaction.[4]

This study aimed to assess the level of satisfaction of patients who underwent the Latarjet procedure in outpatient settings compared with inpatient settings.

METHODS

This descriptive, observational, and cross-sectional study applied an informed consent form and a structured questionnaire on the level of satisfaction of patients who underwent outpatient surgery, based on a review article,[5] combining statements about the preoperative period, the day of surgery, and the postoperative period. The questionnaire was also adapted for patients who underwent inpatient surgery.

The patients assessed were divided into two groups: the first underwent outpatient surgery and the second inpatient surgery. Both groups were operated by the same team of surgeons.

The surgery performed was the open Latarjet procedure for anterior glenohumeral instability, which consists of transferring and fixing the coracoid process to the anteroinferior glenoid, acting with a triple biomechanical effect: anterior bone block, the sling effect caused by the joint tendon, and the stability caused by the repair of the coracoacromial ligament in the capsule[6] (Figure 1). All patients underwent a regional brachial plexus block as anesthesia for the surgery.

All patients were discharged from the hospital with the same analgesic guidelines and prescriptions for anti-inflammatories, simple analgesics, and opioid analgesics.

Before the questionnaire was administered, the project was sent to the Research Ethics Committee, which approved it under number CAAE 89698818.5.0000.5505.

The platform used for data collection was Google Forms. The answers were stored in a database and analyzed using SPSS software. The values are expressed as mean ± standard deviation. Pearson's Chi-squared test was used to compare the frequency of the variables. The percentage of postoperative pain in both groups and age were analyzed using one-way analysis of variance (ANOVA). The impact of patient satisfaction was assessed using linear analysis.

Figure 1. Latarjet technique for fixing the coracoid process in the anteroinferior glenoid.

RESULTS

This study collected data from 51 individuals. The relevant independent variables included in the analysis were sex, age, waiting time until surgery, comfort with having surgery during the COVID-19 pandemic, and information, guidance, and attitude of the team in general before, during, and after the procedure.

The mean age was 29.9 ± 7.1 years, 42 men (12 in the outpatient group and 30 in the inpatient group) and nine women (only one in the outpatient group and eight in the inpatient group).

We found no significant differences in pain assessment between the two groups. The expected pain in the first postoperative week, assessed using the visual analogue scale (VAS), was 6.45 ± 1.79. Regarding the time until surgery in relation to the first outpatient visit, four patients waited < 50 days (day hospital), three waited 50 to 100 days (two in the outpatient group and one in the inpatient group), 11 waited 100 to 200 days (only three in the outpatient group and eight in the inpatient group), 31 waited > 200 days (two in the outpatient group and 29 in the inpatient group), and only two patients (outpatient group) did not remember. In total, 76.3% of patients who underwent inpatient surgery waited > 200 days and 21.1% waited 100 to 200 days. Moreover, 46.1% of patients in the outpatient group waited < 100 days (Table 1).

Table 1. Estimated waiting time until the day of surgery for patients who underwent outpatient (day hospital) and inpatient surgery.

Estimated waiting time	Inpatient surgery	Day hospital
< 50 days	0	4
50–100 days	1	2
100–200 days	8	3
> 200 days	29	2
Don't remember	0	2

For 53.8% of outpatients, the procedure performed in the day hospital had a positive influence on their decision to have surgery during the COVID-19 pandemic. However, 76.9% of all patients were indifferent to the decision to have surgery during the pandemic. Only 15.7% of patients became more anxious after receiving information about the surgery, and 92.1% felt that they had fully understood the information. In total, 54.9% believed that the best time to receive this information was a few days before surgery, while for 21.5%, the best time was a few weeks before. Eight patients were indifferent as to the best time.

There was a significant difference and a greater chance of delays in inpatients than in outpatients ($p < 0.01$). In total, 15.3% of patients reported a delay in outpatient surgery, but considered the waiting time to be reasonable. In inpatient surgery, 68.4% reported a delay (Figure 2) and considered the time to be long but acceptable.

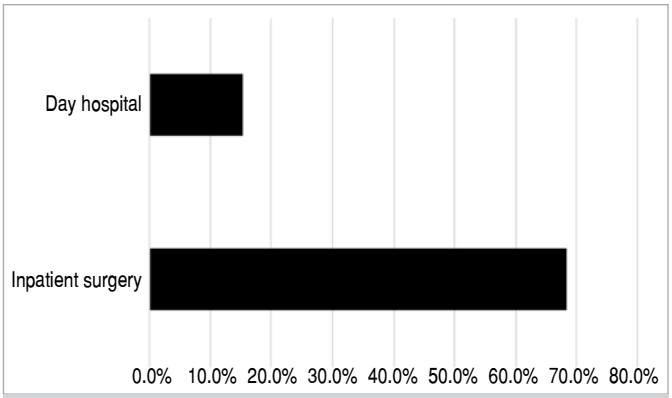

Figure 2. Average delay in surgery among patients who underwent outpatient (day hospital) and inpatient surgery.

In this study, 90% of the patients fully trusted the health professionals responsible for their treatment and 98% had prior contact with the nurses or doctors who would be in the operating room before undergoing surgery. For 64.7%, this contact completely relieved their anxiety, while for 21.5%, the contact partially relieved their anxiety and 11.7% were indifferent.

Regarding the attitude of the medical and nursing teams and other professionals, no significant differences were found between the groups. Almost all patients rated the professionals 4 and 5. The characteristics evaluated by the patients were friendliness, availability, sensitivity, concern, professionalism, and attention.

Care after discharge was the same or simpler than expected for 100% of outpatients and 92.1% of inpatients. Only three patients complained that care was more difficult than expected.

Regarding contact with the medical team in case of complications, there was no significant difference ($p < 0.01$). Of the patients who underwent outpatient surgery, 92.3% felt comfortable, while in the inpatient group, the opposite was true: 94.7% did not feel comfortable using the contacts provided.

Regarding postoperative complications, only three patients in the inpatient group had to return to the unit after discharge, two due to pain and one due to superficial infection of the surgical wound (Table 2). The complaints were resolved in the emergency room, without the need for further hospitalization. For 89.4%, the medications administered in the postoperative period were sufficient for pain relief.

Table 2. Postoperative complications and the need to return to the unit.

	Inpatient surgery	Day hospital
Pain	5.2%	0%
Superficial infection	2.6%	0%
No complications	92.1%	100%

In the outpatient group, 92.3% would undergo the procedure again in the proposed setting and only one reported he would prefer to be hospitalized. Of the inpatients, 63.2% would have preferred to undergo outpatient surgery, without the need for hospitalization. In both groups, the final level of satisfaction with the surgery in general was 100%.

DISCUSSION

Regarding the epidemiology of shoulder instability, the age of the patients corresponds to the age range in the literature:[7] generally young, active adults, who are also men in most cases of recurrent dislocation.[8]

The waiting time from the first outpatient visit to the day of surgery was shorter in the day hospital group. In almost half of the cases, the interval between the first visit and surgery was three months. This process took almost twice as long in more than half of the patients who underwent inpatient surgery. According to the literature, the average waiting time for outpatient surgery is 100 days and for inpatient surgery 140 days,[9] which is similar to the findings of this study.

The COVID-19 pandemic was also a factor that led to a large reduction in surgeries, due to both the reduction in beds for surgical patients and patients' fear of coming into contact with hospital services and running the risk of infection.[10] The absence of the need for hospitalization led almost half of the patients who underwent outpatient surgery to accept the waiting time and be more relaxed about having the procedure during the pandemic.

Another relevant point in patient care is the provision of information about the procedure. Almost all patients were able to understand the pathology, the risks and benefits of surgery, and how it would be performed, and for more than half, this information should be provided a few days before surgery. Therefore, going for a consultation a few days before surgery can further reassure patients. Another factor that proved to reduce patients' anxiety was the prior conversation before entering the operating room. For more than half of patients, this was a protective factor for anxiety.

As day hospital services operate during business hours, the number of procedures performed is limited and they need to be scheduled and organized on the surgical map, leading to punctuality in almost all cases. In inpatient settings, despite the existence of a team that coordinates the surgical schedule, unforeseen events, such as emergency surgeries, and delays in scheduled procedures can always occur, as the results show. However, the medical and nursing teams are on an equal footing in both services, scoring highly in the subjective criteria, which shows that the care provided to patients is practically the same.

Patients' pain was the same in both groups in the postoperative period, which was expected to be higher for the patients operated in the day hospital, either because they believed they would not have stricter control of their medication schedules or because they felt postoperative instructions was more difficult. This was not true, since for most patients the care would be simpler or identical to what they expected.

Also, regarding hospital discharge, a relevant piece of information was the comfort of using emergency contacts. Patients who underwent inpatient surgery did not feel comfortable calling or texting a member of the medical team, which can be explained by the presence of a backup team (nurses, technicians, and assistants) providing care. The opposite was true for patients who underwent outpatient surgery, as almost all of them felt comfortable contacting the medical team, if necessary, since they did not have emergency support in case of complications.

Postoperative complications were minimal, which is expected for the procedure. The main complaint was pain, which in almost all patients was well controlled with the prescribed analgesia.

Finally, almost all outpatients would undergo the procedure again in the same setting and recommend it to friends or family. On the other hand, in the inpatient group, more than half would have preferred to be discharged on the same day, which reinforces the safety of the Latarjet procedure even in the immediate postoperative period.

CONCLUSION

Although satisfaction with the outcome of the Latarjet procedure was very good in both groups, the experience of patients who underwent outpatient surgery was better for the patient, with fewer delays, timely performance, and less preoperative anxiety, especially during the COVID-19 pandemic.

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EPIDEMIOLOGY OF POST-TRAUMATIC SPINAL CORD INJURY IN A TERTIARY HOSPITAL

EPIDEMIOLOGIA DO LESADO MEDULAR PÓS-TRAUMÁTICO EM UM HOSPITAL TERCIÁRIO

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ABSTRACT

Objective: to outline the profile of risk groups for spinal cord injury (SCI) at the Hospital de Clinicas de Campinas by an epidemiological survey of 41 patients with SCI. Methods: Data from patients with SCI were collected and analyzed: demographic data, level of neurological injury, visual analogue scale (VAS), and the current American Spinal Injury Association (ASIA) impairment scale (AIS), using questionnaires, medical records, and imaging tests. Fisher's exact test was used to assess the relationship between categorical variables, Spearman's correlation coefficient was used for numerical variables, and the Mann-Whitney and Kruskal-Wallis tests were used to analyze the relationship between categorical and numerical variables, with significance level of 5%. Results: There was a prevalence of 82.9% of men, a mean age of 26.5 years, and traffic accidents as the cause of SCI in 56.1% of cases. Conclusion: Results suggest the importance of SCI prevention campaigns directed at this population. ***Level of Evidence II, Retrospective Study.***

Keywords: Epidemiology. Spinal Cord Injuries. Paraplegia. Quadriplegia.

RESUMO

Objetivo: Traçar o perfil dos grupos de risco para trauma raquimedular (TRM) do Hospital das Clínicas de Campinas através de levantamento epidemiológico de 41 pacientes vítimas de TRM. Métodos: Foram coletados e analisados dados demográficos, nível da lesão neurológica, escala visual analógica (EVA) e American Spinal Injury Association impairment scale (AIS) atuais, através da aplicação de questionários, análise de prontuários e de exames de imagem. Para avaliar a relação entre as variáveis categóricas foi utilizado o teste exato de Fisher; para as variáveis numéricas foi utilizado o coeficiente de correlação de Spearman; e para a análise da relação entre variáveis categóricas e numéricas foram utilizados os testes de Mann-Whitney e Kruskal-Wallis, adotando nível de significância de 5%. Resultados: Houve prevalência de 82,9% do sexo masculino, média de idade de 26,5 anos e de 56,1% casos de TRM causados por acidente automobilístico. Conclusão: Os resultados sugerem a importância da realização de campanhas de prevenção ao TRM voltadas para essa população. ***Nível de Evidência II, Estudo Retrospectivo.***

Descritores: *Epidemiologia. Traumatismos da Medula Espinal. Paraplegia. Tetraplegia.*

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INTRODUCTION

Spinal cord injury (SCI) includes any type of injury to the spine (bone, ligament, spinal cord, disc, vascular, or radicular)[1] that leads to permanent or temporary dysfunction of the spinal cord and consequent neurological, motor, sensory, and/or autonomic deficits,[2] affecting not only physical but also mental and social health of individuals, and transforming young productive individuals into people who require specialized, high-cost care.[3]

A recent meta-analysis reviewed the worldwide incidence of SCI, reaching 105 new cases per million inhabitants, with a higher incidence in developing countries.[2] Traffic accidents and falls from height were the main causes of SCI in the studies.[4] In Europe, estimates show 16 new cases per million, less than half the incidence in the United States (US).[5,6]

The incidence of SCI in the US is 38 new cases per million inhabitants per year, or 10,000 new cases per year, of which 4,000 die before reaching hospital and 1,000 during hospitalization. The highest

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The study was conducted at Universidade Estadual de Campinas, Faculdade de Ciencias Medicas, Departamento de Ortopedia e Traumatologia, Laboratorio de Biomecanica e Reabilitacao do Aparelho Locomotor.
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incidence is among individuals aged 20 to 24 years, of whom 65% are under 35 and 80% are men. Motor vehicle accidents correspond to 50% of cases, followed by falls, with 15% to 20%.[7]

Knowledge of the epidemiology of SCI is essential for proposing preventive measures and concentrating technical and human resources in reference services for the care and treatment of these patients.[8]

Thus, this study aimed to perform an epidemiological survey of patients with SCI at the Hospital de Clinicas de Campinas (HC/UNICAMP), in order to outline a profile of risk groups for SCI, allowing not only treatment and rehabilitation, but also primary prevention.

METHODS

Data collection

From May 21, 2018 to May 15, 2019, data were collected from 41 patients with SCI who underwent different treatments in different Brazilian hospitals and were followed up at the Ambulatorio de Reabilitaçao Raquimedular, Departamento de Ortopedia e Traumatologia do Hospital de Clinicas da Universidade Estadual de Campinas (UNICAMP), Brazil.

Medical questionnaires were applied to all patients and medical records and imaging tests (X-rays, CT scans, and MRI scans) were analyzed. Demographic data and information on the level of SCI and the treatment performed at the time of the trauma were collected. The visual analog scale (VAS) and the current American Spinal Injury Association (ASIA) impairment scale (AIS) were used to evaluate the neurological level.[9]

Patients who did not agree to participate in the study and who did not have adequate imaging tests to define the diagnosis of trauma were excluded.

The procedures of this study are in accordance with the 1995 Declaration of Helsinki. The study was duly approved by the institution's Research Ethics Committee (CAAE: 84859717.5.0000.5404). All patients voluntarily participated in the study and signed the informed consent form.

Statistical analysis

To describe the profile of the sample, frequency tables were prepared for the categorical variables, with absolute frequency (n) and percentage (%) values, and descriptive statistics for the numerical variables, with mean, standard deviation, minimum, maximum, and median values.

Fisher's exact test was used to assess the relationship between categorical variables. Spearman's correlation coefficient was used to assess the relationship between the numerical variables. The Mann-Whitney and Kruskal-Wallis tests were used to assess the relationship between categorical and numerical variables, with a significance level of 5%.[10]

RESULTS

This study included 41 patients, 34 men (83%) and seven women (17%). The mean age at the time of the trauma was 26.5 years (11–46 years) and the mean body mass index (BMI) was 23.6 kg/m^2 (15.8–32.3 kg/m^2). Table 1 presents the distribution of the study population by sex.

The population included 23 (56.1%) victims of traffic accidents, four (9.8%) victims of falls from height, seven (17.1%) victims of shallow water diving, and seven (17.1%) victims of stab wounds (SW) or gunshot wounds (GSW). Table 2 presents the distribution of SCI by causes.

The mean age at the time of the assessment was 39.4 ± 11.2 (17–65) years. The mean time of assessment after initial trauma was 151.3 ± 83.1 (13–276) months. The mean age of patients at SCI was 26.5 ± 8.3 (11–46) years. Their mean weight was 72.2 ± 13.7 (50–113) kg. The mean height was 1.75 ± 0.1 (1.6–1.9) m. The mean BMI was 23.6 ± 4 (15.9–32.3) kg/m^2. The mean VAS score was 2.4 ± 2 (0–7). Table 3 shows the demographic data of the study population.

Table 1. Population distribution by sex.

Sex	Frequency	%
Women	7	17.1
Men	34	82.9

Table 2. Distribution of spinal cord trauma by causes.

Category	Frequency	%
Traffic accident	23	56.1
SW/GSW	7	17.1
Shallow water diving	7	17.1
Fall from height	4	9.7

SW/GSW: stab wound/gunshot wound

Table 3. Demographic data of the study population.

Variable	Mean ± SD	Minimum–Maximum
Current age (years old)	39.4 ± 11.2	17–65
Time of SCI (months)	151.3 ± 83.1	13–276
Age at SCI (years old)	26.5 ± 8.3	11–46
Weight (kg)	72.2 ± 13.7	50–113
Height (m)	1.75 ± 0.1	1.6–1.9
BMI (kg/m^2)	23.6 ± 4	15.9–32.3
VAS	2.4 ± 2	0–7

SCI: spinal cord trauma; BMI: body mass index; VAS: visual analog scale.

In total, 18 (43.9%) victims had cervical trauma and 23 (56.1%) had thoracic trauma.

Moreover, 21 patients had paraplegia (51.2%) while 20 had quadriplegia (48.8%). Table 4 presents the frequency of paraplegia and quadriplegia in the study population.

Our population included three AIS 4 patients (7.3%), 37 AIS 5 patients (90.2%) and one AIS 6 patient (2.4%). Table 5 shows details of the neurological assessment of the study population.

In total, 10 patients (24.4%) underwent conservative treatment and 31 (75.6%) underwent surgical treatment. Table 6 shows that of the patients treated surgically, 10 were operated by anterior approach (24.4%), 19 by posterior approach (46.3%), and two by double approach (4.9%).

Table 4. Frequency of paraplegia and quadriplegia in the study population.

Category	Frequency	%
Paraplegia	21	51.2
Quadriplegia	20	48.8

Table 5. American Spinal Injury Association impairment scale classification of the study population.

AIS	Frequency	%
4	3	7.3
5	37	90.2

AIS: ASIA impairment scale.

<< SUMÁRIO

Table 6. Surgical treatments performed.

Category	Frequency	%
Anterior approach	10	32.3
Posterior approach	19	61.3
Double approach	2	6.4

DISCUSSION

In Brazil, estimates show the occurrence of 40 new cases of SCI per million inhabitants, representing about 8,000 new cases a year, with a high cost to the health system. The most frequent causes are SW/GSW, traffic accidents, shallow water diving, and falls from height. It occurs predominantly in young adults, and 60% of victims are aged 10 to 30 years, in a ratio of four men to one woman.[3,11]

A recent systematic review analyzed 10 studies on the epidemiology of SCI in Brazil, published from 2010 to 2016. The highest incidence of SCI was among men, young adults, and individuals with low schooling levels, and the most common causes were traffic accidents, falls from height, and SW/GSW.[12]

A recent study conducted in the US used the National Electronic Injury Surveillance System to assess cervical and thoracic spine fractures from 2007 to 2016, stratified by demographic data such as sex, age, and ethnicity. Of the 131,176 fractures identified, 95.4% were in the thoracic spine, 4.7% in the cervical spine, and 1.2% involved both. Moreover, 91.1% were single-level lesions and 8.9% affected multiple levels. The most common age was 20 to 29 years.[13]

A population-based prospective cohort study showed that the cost per patient was almost U$ 200,000.00 during the first two years after the injury, including home care, medical services, and secondary complications. In the US, about 15% of patients with spinal trauma are likely to have neurological impairment.[14]

A meta-analysis of 64 studies on the epidemiology of SCI in 28 developing countries showed an incidence of 25.5 cases per million inhabitants per year, ranging from 2.1 to 130.7/million/year. Men account for 82.8% of cases, with a mean age of 32.4 years. The main causes of SCI were traffic accidents (41.4%) and falls (34.9%). Complete SCI occurred in 56.5% of cases, and paraplegia (58.7%) was more common than quadriplegia (40.6%).[15]

A Brazilian study showed that the main causes of SCI were traffic accidents, falls from height, SW/GSW, and diving, and the most affected region was the dorsal spine. Most patients progressed to Frankel A.[16] These results are similar to the findings of our study.

In a 2018 study with 2,076 patients from a network of rehabilitation hospitals in Brazil, 83% were men, the mean age was 31 years, 67.7% had paraplegia, and the main cause was traffic accident (43.7%), followed by GSW (28.4%).[17]

A study conducted in a tertiary hospital in Sao Paulo evaluated 515 patients with SCI, of whom 85.6% were men, the mean age was 39.4 years, the main cause was fall from height (47%), and 52.9% of patients were classified as Frankel A.[3]

A retrospective study analyzed the epidemiology of SCI in a public hospital in Joinville, Santa Catarina, and showed a prevalence of 87% of men. A total of 47.8% of the injuries were caused by motor vehicle accidents and 26.1% by GSW.[18]

The data from the aforementioned study were similar to the findings of our study, which showed a prevalence of 82.9% of men, a mean age at SCI of 26.5 years, and traffic accidents as the cause of SCI in 56.1% of cases.

Clinical trials and case reports suggest that early treatment can improve the neurological recovery of these patients and prevent further spinal cord damage.[19]

SCI is an important cause of morbidity, affecting young adults and producing extremely severe socioeconomic consequences, with life-long costs for rehabilitation and loss of productivity for the patient. Mortality is higher the older and the worse the neurological status of the patient.[20]

CONCLUSION

Due to the high morbidity of SCI and its prevalence mainly in young adult men, SCI prevention campaigns directed at this population are essential.

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ACUTE RADIATING LOW BACK PAIN IMPACT ON ROUTINE AND FUNCTION OF THE BRAZILIAN POPULATION: A CROSS-SECTIONAL STUDY

IMPACTO DA LOMBOCIATALGIA AGUDA NA ROTINA E FUNÇÃO DA POPULAÇÃO BRASILEIRA: UM ESTUDO TRANSVERSAL

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ABSTRACT

Acute radiating low back pain is a frequently occurring clinical condition among the population, and it represents a significant portion of urgent care in public health services. Objective: Consider the clinical characteristics, demographics, as well as the intensity of the pain, discomfort, and dysfunction of patients who show a clinical diagnosis that is compatible with acute radicular pain, new or reoccurring after an asymptomatic period. Methods: Patients that display a clinical diagnosis that is compatible with acute sciatic nerve pain, with the beginning of it starting within three months, without previous history of a similar occurrence, were seen in an orthopedic health clinic from July 2020 to January 2021. Results: A total of 42 patients were seen with a compatible diagnosis, which represents 1.4% of all medical visits. To the best of our knowledge, no studies have considered the clinical and demographic characteristics of patients with acute radicular pain in the Brazilian population. This study has found a mean value on the disfunction index that is greater than what is suggested by the current literature. Conclusion: About 30% of individuals showed functional involvement that was considered crippling, which presented a stronger association with individuals with the presence of motor deficits, intensity of radiating pain, and professional inactivity. **Level of Evidence IV, Cross-Sectional Study.**

Keywords: Sciatica. Low Back Pain. Radiculopathy.

RESUMO

A lombociatalgia aguda é uma condição clínica bastante frequente na população e representa uma porção expressiva dos atendimentos de urgência nos serviços de saúde pública. Objetivo: Avaliar as características clínicas e demográficas, bem como a intensidade da dor e da disfunção de pacientes com quadro clínico compatível com dor radicular aguda, inédita ou recorrente após período assintomático. Métodos: Consideraram-se pacientes com quadro clínico compatível com dor ciática aguda que tenha se iniciado em até três meses, sem história prévia de episódio semelhante e que foram atendidos em uma unidade de pronto atendimento ortopédico entre julho de 2020 e janeiro de 2021. Resultados: Foram atendidos 42 pacientes com quadro clínico compatível, representando 1,4% do total de atendimentos realizados no serviço. Não há relatos de estudos que buscaram avaliar as características clínicas e demográficas dos pacientes com dor radicular aguda na população brasileira. Neste estudo, contudo, encontrou-se um elevado valor médio no índice de disfunção em comparação com a literatura atual. Conclusão: Cerca de 30% dos indivíduos apresentaram acometimento funcional considerado incapacitante, sendo que a presença de déficits motores, a intensidade de dor irradiada e a inatividade trabalhista foram estatisticamente maiores nesse grupo em relação aos demais. **Nível de Evidência IV, Estudo Transversal.**

Descritores: *Ciática. Dor Lombar. Radiculopatia.*

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INTRODUCTION

Acute radiating low back pain, also known as sciatic pain or sciatica, is a very common clinical condition in the population and accounts for a significant portion of emergency care visits in public healthcare services.[1] When associated with deficits in strength and sensitivity in a specific dermatome or myotome of the lower limbs, it is referred to as radiculopathy. The most common etiology is discogenic causes, such as lumbar disc herniation,[2] however, degenerative, joint-related, neoplastic, and infectious causes can also present with these symptoms.[3] The incidence and prevalence of sciatica is still controversial, with wide variation among studies available in the literature. An epidemiological review from 2008[4] identified that the prevalence of symptoms consistent with radicular pain ranged from 1.6% to 43%, with annual prevalence varying in the literature from 2.2% to

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The study was conducted at Universidade Federal de Sao Paulo.
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34%.[5] On the other hand, robust scientific evidence has pointed to an association between the incidence of this condition and the patient's age, being rare before the age of 20 and more often around the age of 50, decreasing afterwards.[6]

The natural history of acute radicular pain (onset within the last three months) is mostly benign, with approximately 70% of patients experiencing significant improvement within four weeks, and 60% of these individuals returning to work within that period[7] after clinical treatment involving rest, analgesia, and physical rehabilitation. Despite this, acute sciatica presents great direct and indirect socioeconomic impacts due to its high prevalence and the fact that it mostly affects the most economically active population.[8]

We have not found any studies investigating the epidemiology of acute radicular pain in the Brazilian social context. This study aims to assess the clinical and demographic features, as well as pain intensity and dysfunction in patients with clinical profiles consistent with acute radicular pain, whether it is a first-time experience or a recurrence after a symptom-free period. The study was conducted at an orthopedic emergency unit that is reference in the Brazilian public health system.

METHODS

Study design

This cross-sectional observational study was conducted in the orthopedic emergency unit of a quaternary care hospital that serves as a reference facility within the Brazilian Unified Health System, namely the Sao Paulo Hospital of the Universidade Federal de Sao Paulo.

This research is an extension of another umbrella project being conducted by the same group of researchers, which has received approval from the Research Ethics Committee of the institution under reference number 4.232.193 (CAAE: 32486420.7.0000.5505).

Participants and procedures

Patients exhibiting clinical symptoms consistent with acute sciatic pain—radiating low back pain to lower limbs accompanied by positive results in femoral stretch tests—within the past three months, without any history of a similar episode, and presenting to an orthopedic emergency department from July 2020 to January 2021 were included for the evaluation by spine group. Eligible participants received information about the study procedures and signed an informed consent form.

Patients with symptoms present for over three months prior to the study, exhibiting consistent clinical history and ongoing symptoms, as well as those with a history of spinal surgeries, infections, or trauma/fractures, were excluded from the study. Additionally, the presence of comorbidities or personal history that contradicts the use of oral corticosteroids, which is investigated by this umbrella project, was also considered as a criterion for exclusion.

During the initial interview, the research team physicians collected demographic/social and clinical data. They also applied the translated and adapted Brazilian Portuguese version of the Oswestry Disability Index (ODI) and the Visual Analog Scale (VAS) for pain in the lumbar region that extends to the lower limbs.

The survey collected demographic information such as age, gender, weight, height (expressed as body mass index or BMI), employment status, regular physical activity, smoking history, and comorbidities. The clinical factors considered were time of onset of symptoms, side affected, and presence of motor or sensory deficits.

The RedCAP system was used for storage and confidentiality of the acquired data, with exclusive access granted to the research team following verification and approval by the São Paulo Hospital Research Ethics Committee (CoEP).

Statistical analysis

Statistical analysis was conducted using SPSS Statistics software program, based on the variables exported from the RedCAP database.

Categorical and continuous variables were analyzed by calculating the frequency and the mean standard deviations, respectively. The chi-squared test and Fisher's exact test were applied for statistical evaluation in the contingency table and the Student's t-test for independent samples.

To determine the correlation between demographic and clinical factors and dysfunction observed during the initial consultation (assessed by the Oswestry scale), participants were split into two groups: mild to severe dysfunction (ODI < 60), which does not interfere with daily activities, and incapacitating dysfunction (ODI ≥ 60), which requires assistance to perform these activities. Sociodemographic data between individuals in both groups were compared. Statistical significance was determined at $p < 0.05$ (>95% confidence interval).

Correlation tests such as Pearson's Coefficient and Spearman's Coefficient were performed to analyze the strength of the association for statistically significant differences.

RESULTS

From July to December 2020, 42 patients received treatment for a clinical condition consistent with acute sciatica, representing roughly 1.4% of all orthopedic consultations provided by this service during that period. From these patients, 19 (45.2%) were male and 23 (54.8%) were female. The mean age of the participants was 44.2 years, with a standard deviation of 16.35 years. We found no significant difference between sexes. Regarding ethnicity and skin color, 15 patients identified as Mixed-race (37.5%), 13 (32.5%) as White, 11 (27.5%) as Black, and three participants were unable to define.

The mean body mass index (BMI) was 28, with a standard deviation of 5.49. When stratified by sex, the mean for male patients was 27.03 with a standard deviation of 4.71, whereas for female patients it was 29.73 with a standard deviation of 5.66. However, we found no statistically significant difference between the two ($p = 0.11$). Regarding habits, 10 (23.8%) patients reported regularly using tobacco, and 36 (85.7%) participants reported not engaging in regular physical activity (at least three times a week). Of the participants who did exercise regularly, four reported running or walking and two engaged in gym activities. Concerning employment status, 34 patients (81.91%) held formal jobs with contracts, four (9.5%) were unemployed (either seeking work or working informally), and four (9.5%) were already retired. Of those who retired, two (50.0%) were due to length of service and two (50.0%) due to previous pathologies/incidents.

Table 1 summarizes the sociodemographic variables.

Considering the clinical history of the current pathology, 9 (21.4%) patients reported that the symptoms started less than 7 days ago, whereas 22 (52.4%) patients reported that the onset occurred 7 to 30 days ago, and 11 (26.2%) patients sought medical attention from 30 days to 3 months after the onset of the current condition. For 19 patients (45.2%), acute sciatic pain was a new occurrence, whereas 23 participants (54.2%) had reported a similar event for more than one year but were asymptomatic.

Table 1. Summary of the sociodemographic data obtained in the interview.

		N	% of N	Mean	Standard deviation
Sex	Male	19	45.2		
	Female	23	54.8		
Age	18-20	2	4.8	44.98	15.31
	21-40	15	35.7		
	41-60	20	47.6		
	> 60	5	11.9		
Skin color	White	13	32.5		
	Mixed race	15	37.5		
	Indigenous people	0	0.0		
	Yellow	1	2.5		
	Black	11	27.5		
Body Mass Index	Underweight	0	0.0	28.51	5.49
	Normal	9	21.4		
	Overweight	21	50.0		
	Grade I obesity	7	16.7		
	Grade II obesity	3	7.1		
	Grade III obesity	2	4.8		
Professional status	Active	34	81.0		
	Unemployed	4	9.5		
	Social security	0	0.0		
	Retired	4	9.5		
Active smoking	Yes	10	23.8		
	No	32	76.2		
Regular physical activity?	No	36	85.7		
	Yes	6	14.3		
Total		42	100		

The physical examination identified the presence of motor deficits (considering the global strength scale proposed by the Medical Research Council) in seven patients (35.3%). Among these, four patients had more than one affected root, of which six (85.2%) had a deficit in the L5 lumbar root, three (42.9%) in the L4 root, and two (28.6%) had a clinically evident reduction in motor strength in the S1 root. Sensory deficits were noted in 16 participants (38.1%). Hypoesthesia was identified in the L4 dermatome of nine participants (56.3%), the L5 dermatome of eight (50%), and S1 in six (37.5%).

Regarding the assessment of function using the Oswestry scale, it was found that the sample followed a normal pattern after applying the Shapiro-Wilk test. The mean value was 49 points, with a SD of 17.48 (Figure 1). According to sex, the mean for males was 49.89, with a SD of 15.45, and the mean for females was 47.65, with a SD of 18.57, showing no statistical difference ($p = 0.68$). When stratified by severity of dysfunction, we found a statistically normal distribution, with 15 (35.7%) patients showing a degree of dysfunction considered mild/moderate (ODI up to 40 points), 14 considered severe (ODI from 41 to 60 points), and 13 with disabling dysfunction (ODI greater than 60 points).

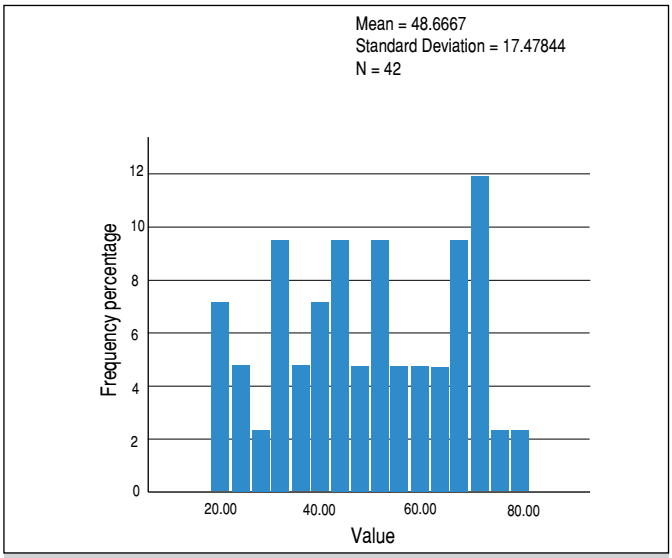

Figure 1. Histogram representing the distribution of values obtained with the application of the ODI.

Table 2. Summary of the data obtained by the physical examination and application of the Oswestry and VAS forms.

		N	% of sample
Time of onset of symptoms	From 0 to 7 days	9	21.4
	7 days to 1 month	22	52.4
	From 1 to 3 months	11	26.2
Motor deficit	Yes	7	16.7
	No	35	83.3
Similar previous episodes	Yes	23	54.8
	No	19	45.2
Sensory deficit	Yes	16	38.1
	No	26	61.9
ODI value (in categories)	Mild/moderate	15	35.7
	Severe	14	33.3
	Crippling	13	31.0
VAS for radiating low back pain	Mild/moderate	6	14.3
	Severe	18	42.9
	Very severe	18	42.9
VAS for axial low back pain	Mild/moderate	7	16.7
	Severe	14	33.3
	Very severe	21	50.0

The intensity of pain at the initial consultation was assessed using the VAS, and the mean value found for low back pain was 7.11, with a SD of 2.49, whereas for radiating low back pain it was 6.71, with a SD of 2.28. Table 2 summarizes the data obtained by clinical evaluation.

Furthermore, we investigated the relationship between sociodemographic variables and degree of dysfunction. A cut-off point of 60 was used since it is considered a determining factor for functional incapacity. To compare the prevalence of variables, contingency tables (Tables 3 and 4) were constructed. A statistically significant difference ($p = 0.046$) was found between the groups regarding sociodemographic variables, with no significant differences between sex, age group, BMI, physical activity, and smoking habit.

Table 3. Contingency table for comparison of sociodemographic variables according to the severity of the dysfunction.

		Non-disabling (< 60) 29 (69.0%)	Crippling (≥ 60) 13 (31.0%)	Total – 42 (100%)	Significance (p-value)
Sex	Male	14 (33.3%)	5 (11,9%)	19 (45.2%)	0.401
	Female	15 (35.7%)	8 (19.0%)	23 (54.8%)	
Age (in categories)	≤ 40 years	14 (33.3%)	3 (7.1%)	17 (40.5%)	0.115
	> 40 years	15 (35.7%)	10 (28.3%)	25 (59.5%)	
Body mass index (in categories)	Normal	7 (16.7%)	2 (4.8%)	9 (21.4%)	0.421
	Overweight/ obesity	22 (52.4%)	11 (26.2%)	33 (78.6%)	
Active smoking	Yes	6 (14.3%)	4 (9.5%)	10 (23.8%)	0.367
	No	23 (54.8%)	9 (21.4%)	32 (76.2%)	
Regular physical activity (at least 3x/ week)	No	25 (59.5%)	11 (26.2%)	36 (85.7%)	0.615
	Yes	4 (9.5%)	2 (4.8%)	6 (14.3%)	
Professional activity	Formal employment	26 (61.9%)	8 (19.0%)	34 (81.0%)	0.046
	Inactive (unemployment, retirement)	3 (7.1%)	5 (11,9%)	8 (19.0%)	

Table 4. Contingency table for comparison of clinical variables according to the severity of the dysfunction.

		Non-disabling (< 60) 29 (69.0%)	Crippling (≥ 60) 13 (31.0%)	Total – 42 (100%)	Significance (p-value)
Similar previous episodes – N (%)	Yes	16 (38.1%)	7 (16.75%)	23 (54.8%)	0.599
	No	13 (31.0%)	6 (14.3%)	19 (45.2%)	
Time of onset of symptoms – N (%)	From 0 to 7 days	7 (16.7%)	2 (4.8%)	9 (21.4%)	0.336
	7 days to 1 month	13 (31.0%)	9 (21.4%)	22 (52.4%)	
	From 1 to 3 months	9 (21.4%)	2 (4.8%)	11 (26.2%)	
Motor deficit – N (%)	Yes	2 (4.8%)	5 (11,9%)	7 (16.7%)	0.021
	No	27 (64.3%)	8 (19.0%)	35 (83.3%)	
Sensory deficit – N (%)	Yes	9 (21.4%)	7 (16.7%)	16 (38.1%)	0.144
	No	20 (47.6%)	6 (14.3%)	26 (61.9%)	
VAS for axial low back pain – N (%)	Mild/Moderate (0 to 4)	5 (11,9%)	2 (4.8%)	7 (16.7%)	0.199
	Severe (5 to 7)	12 (28.6%)	2 (4.8%)	14 (33.3%)	
	Very severe (8 to 10)	12 (28.6%)	9 (21.4%)	21 (50.0%)	
VAS for radiating low back pain – N (%)	Mild/Moderate (0 to 4)	6 (14.3%)	0 (0.0%)	6 (14.3%)	0.043
	Severe (5 to 7)	13 (31.0%)	5 (11,9%)	18 (42.9%)	
	Very severe (8 to 10)	10 (23.8%)	8 (19.0%)	18 (42.9%)	

Using the same cut-off value for dysfunction, a contingency table was constructed to compare both groups regarding clinical data. A statistically significant difference was observed between them in terms of the presence of motor deficits ($p = 0.021$) and the intensity of pain symptoms radiating low back pain measured by the VAS ($p = 0.043$). Finally, measures of association were applied, such as Pearson's Coefficient of Contingency and Spearman's correlation. The values indicated a moderate association between professional activity ($R = 0.33$) and intensity of radiating low back pain ($R = 0.77$), along with the presence of disabling dysfunction secondary to acute sciatica and motor deficit ($R = 0.778$).

DISCUSSION

When acute low back pain radiates to the lower limbs, it is referred to as radicular or radiculopathy pain, which is a primary cause of dysfunction in individuals aged 20 to 60 years.[10] This leads to significant direct and indirect economic impacts, estimated to be around $100 billion annually in the United States.[11] Lumbar disc herniation is the most prevalent associated pathology. However, degenerative changes including facet hypertrophy, synovial cysts, as well as tumorous and infectious causes may also elicit this clinical presentation.

To the best of our knowledge, no studies in the literature have evaluated the clinical and demographic characteristics of patients with acute radicular pain in the Brazilian population. A study by Gotfryd et al.[12] conducted an epidemiological assessment of patients with acute low back pain based on a sample of the Brazilian population. Our study differs from that one by several factors. We highlight that both studies examined a population sample with lumbar spinal pathologies with acute onset (less than 3 months) of the same nationality. However, they differed in the socioeconomic status of the participants. The first study was conducted in a high-cost private hospital, whereas our study was conducted in a referral service of the Brazilian Unified Health System. Furthermore, our study focused on individuals with a clinical picture consistent with acute radiculopathy, whereas the previous study emphasized participants with predominantly axial pain.

The sample of 41 patients evaluated in this study showed a normal distribution concerning sociodemographic characteristics (Table 1). The patient demographics, comprising sex (with a slight female predominance of 54.8%), age (mean 44 ± 15.3 years), and skin color align with data obtained from epidemiological studies among diverse populations.[13] The majority of patients (78.1%) had a BMI exceeding normal values (> 24.9), with a sample mean of 28.5 ± 5.4 and 28.6% of individuals indicating obesity (BMI ≥ 30). These figures are also consistent with the distribution in the general Brazilian population, whose estimated prevalence of overweight and/or obesity is 61.7% according to the most recent IBGE data.[14] Furthermore, in a meta-analysis that included 26 studies, published in 2013, Shiri et al.[15] identified a statistically significant correlation between overweight/obesity and the prevalence of sciatica in the general population. Furthermore, a positive correlation was found between BMI above the values considered normal and hospitalization, as well as increased risk of hospitalization and surgeries related to the clinical condition.

In another meta-analysis published by the same author,[16] in 2015, with around 28 articles, active smoking was identified as a moderate risk factor (OR = 1.64) for the development of acute radicular pain. In our sample, the prevalence of active smokers was estimated at 23.8%. Considering that approximately 12.8% of the Brazilian population report using tobacco products, according to data from the Brazilian National Health Survey, the prevalence among individuals with radiating low back pain evaluated in this study is significantly higher than in the general population.

Regarding the clinical characteristics of this group of patients, the mean ODI value was 48.6 ± 17.47, with a median of 49.0, which is considered severe dysfunction according to the scale. This value is substantially higher than that found in most comparable literature that, despite evaluating different outcomes, involved a sample of patients with radicular pain. Meyer et al.,[17] in a research project aimed at comparing the results of endoscopic surgery with microdiscectomy for lumbar disc herniation, included a sample of

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47 participants whose mean ODI value was 29.0 ± 8.8. In another study series, which aimed at the efficacy of anesthetic transforaminal injection for the treatment of acute radicular pain,[18] with a sample of 61 participants, the mean value was 40.85 ± 5.36. It is important to note, however, that both studies involved patients whose sciatica pain persisted even after clinical treatment, unlike our study. When different populations are considered by a group of researchers from other countries, the reported mean values are also considerably lower, ranging from 30 ± 13.2 in a study by Iversen et al.[19] to 42.4 (ranging from 14 to 80) in an article published by Kennedy et al.[20]. Furthermore, Konstatinou et al[21] compared the functional impact of acute radicular pain with that of low back pain alone and found that low back pain with radiating pain was statistically more disabling than those without associated radicular pain. In that series, the authors demonstrated a mean baseline ODI value for patients with sciatica of about 49.1 (6-86), similar to our research.

One of the main causes associated with this higher rate of dysfunction in initial care can undoubtedly be attributed to the prevailing social context at the time of this research. Patients were recruited for this study during the COVID-19 pandemic, which began in Brazil at the end of February and continued until the publication date of this study. In the absence of an effective treatment to slow down or prevent the spread of Sars-CoV-2, the main prevention policies were the use of masks and social distancing. Furthermore, public authorities have recommended that the general public avoid hospital environments due to the higher risk of contagion in these locations, except in the most serious cases.[22]

As a result, it is possible that most people who had milder acute radicular pain did not seek medical attention due to public health guidelines aimed at reducing COVID-19 transmission. Therefore, it is possible that "indirect selection" of patients occurred, that is, those with greater dysfunction were the ones who opted to be evaluated in a more complex hospital, which is also a regional reference in COVID-19 treatment, thus increasing the baseline value of the dysfunction index evaluated by the ODI.

To compare clinical and demographic variables among individuals with incapacitating dysfunction (ODI ≥ 60 points) and those with mild to severe dysfunction (ODI < 60 points), we designed a contingency table that compares both groups (Table 3). We found that the group classified with incapacitating dysfunction included 13 individuals (31.0%), whereas those with less severe dysfunction corresponded to 29 individuals (69.0%). Performing the prevalence ratio between the two, we observed a statistically significant difference in relation to professional activity ($p = 0.046$), motor deficit ($p = 0.021$), and intensity of radiated pain ($p = 0.043$).

When assessing variations in professional activity, a higher prevalence of inactive patients, either due to unemployment or retirement, was found in the group with greater dysfunction compared with those with an ODI < 60 points, who were mostly formally employed. Among the possible explanations, employee payment and benefits are highlighted. In 2000, Atlas et al.[23] concluded that patients receiving some kind of work compensation had a higher risk of exhibiting greater dysfunction at initial care than those who were professionally active. The same researchers, using data obtained from the Spine Patient Outcomes Research Trial (SPORT)[24] demonstrated statistically significant differences related to outcomes after conservative and surgical treatment between individuals who were receiving social security compensation and those who were not. Thus, evaluating potential secondary benefits associated with the presented dysfunction is crucial in determining the appropriate treatment.

Another possible explanation, which has become even more important during the context of economic instability due to the COVID-19 pandemic, is related to the deterioration of mental health with the appearance of symptoms of anxiety, fear, and distress related to financial difficulties, which are more prevalent in professionally inactive individuals. The association between the perception of acute sciatic pain, both in terms of intensity and dysfunction, and mental health is well established, as is the prognosis and evolution of the clinical picture.[25]

Finally, a statistically significant higher prevalence of objective motor deficits (muscle strength ≤ 3 on the MRC scale) was identified among those with a degree of dysfunction considered crippling. The correlation coefficient analysis identified a strong association between the severity of the dysfunction and the presence of reduced motor strength. The mean ODI for patients with motor deficits (7 patients, approximately 16%) was 64.5 ± 12.6, whereas the mean ODI for patients without deficits (36 patients, approximately 83.66%) was 45.4 ± 16.6, with a statistically significant difference ($p = 0.007$) between the groups. These findings agree with the case series described by Falavigna et al.[26] whose aim was to assess whether the presence of motor deficits influenced post-operative outcomes in patients with herniated lumbar discs. In this situation, the authors found a slight variance in the mean ODI score between the groups, which was statistically significant but did not meet the minimal clinically significant difference (10 points) recognized for this measure. This suggests that although the difference was statistically significant, it was not clinically relevant.

Our opinion is that the sample in this study displays distinct characteristics from the 2014 article since it only included patients who sought emergency care due to recent onset of symptoms. In contrast, the previous article focused on patients whose conservative treatment had failed, receiving surgical indication. Thus, it is possible that patients who have had the deficit for a longer period have already adapted their usual and professional routines to the limitation in motor strength, and, therefore, the functional impact has diminished over time. This opinion is strengthened by an article published by Stienen et al.[27] in 2020, according to which quality of life forms, including the ODI, tend to underestimate the impact of motor deficits on the function of patients with spinal pathologies.

This study contains some limitations. The main reason for this is the exceptional social context caused by the COVID-19 pandemic, which, combined with the recommendations for social isolation by health authorities, has affected the treatment provided by healthcare services for several diseases. Thus, the demographic and social portrait of patients with acute sciatic pain reproduced by this study may not represent the pattern observed in periods of normality. Research conducted in the post-pandemic period could more accurately reflect the manifestation of this pathology in the Brazilian population and also allow assessment of the impact of the pandemic on the outcome of these patients.

Furthermore, since this is a cross-sectional observational study with a single-center sample, the analysis of causal factors associated with dysfunction in this group of patients is limited. Longitudinal studies are needed to assess whether the variables that showed statistically significant differences in relation to the proportions have a causal relationship with the severity measured by the ODI. Since this is a sub-project of another protocol developed by the same group of researchers, whose primary outcome is the clinical and functional response after treatment with oral corticosteroids, patients with comorbidities or contraindications to the use of this class of medication, especially those with type 2 diabetes mellitus, were not included.

CONCLUSION

This study aimed to analyze the profile of Brazilian patients who seek emergency medical attention due to acute radicular pain, with onset of up to three months. We found that these patients

suffer from more significant functional impairment compared with samples from similar series conducted in other countries. Around 30% of the individuals had functional impairment considered to be crippling, and the presence of motor deficits, intensity of radiating pain, and professional inactivity was statistically higher in this group than in the others, suggesting that these variables may influence the perception of symptoms.

However, we highlight that the evaluation was conducted during the COVID-19 pandemic, and the social isolation measures recommended during that period may have resulted in only patients with more severe clinical conditions seeking medical care, given the risks associated with SARS-CoV-2 infection. Future longitudinal studies should be conducted to assess the impact of the pandemic on the management of this group of patients.

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THE EFFECTIVENESS OF FORAMINAL ROOT BLOCK IN RELIEVING SCIATIC PAIN DUE TO LUMBAR DISC HERNIATION

A EFICÁCIA DO BLOQUEIO RADICULAR FORAMINAL NO ALÍVIO DA DOR CIÁTICA DEVIDO À HÉRNIA DISCAL LOMBAR

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ABSTRACT

Objective: To evaluate the clinical profile, pain improvement, and the need for surgical interventions in patients undergoing transforaminal block with the use of corticosteroids and anesthetics. Methods: This is a prospective, randomized, double-blind study with 45 patients with unilateral radicular pain in their lower limbs and a single-segment lumbar disc herniation diagnosis. In the intervention group, transforaminal blocks with bupivacaine, dexamethasone, and clonidine were applied and in the control group, distilled water and bupivacaine. The Oswestry questionnaire was applied. Results: We included 24 female (53.4%) and 21 male patients (46.6%). Of those with an occupation, 85.71% (n = 30) were relieved from their duties due to their illness and 14.29% (n = 5) continued to work with limitations. Those who underwent transforaminal block with an injection of corticosteroids, clonidine, and anesthetics showed immediate relief. However, such effect failed to alleviate patients' symptoms after three weeks. We observed that 52% of patients showed varying degrees of improvement. The control group experienced mild pain relief after one week, which also failed to last after three weeks. Moreover, 50% of patients improved in varying degrees. Conclusion: Further studies with larger samples, new epidemiological data, and longer follow-ups are necessary to validate our hypotheses. **Level of Evidence II, Prospective Study.**

Keywords: Disc Herniation. Nerve Block. Sciatica Neuropathy.

RESUMO

Objetivo: Avaliar o perfil clínico, a melhora da dor e a necessidade de intervenções cirúrgicas em pacientes submetidos ao bloqueio transforaminal com uso de corticosteroides e anestésicos. Métodos: Estudo prospectivo, randomizado e duplo-cego realizado com 45 pacientes com dor radicular unilateral em membros inferiores e diagnóstico de hérnia discal lombar em um único segmento. No grupo intervenção, os bloqueios transforaminais foram feitos com bupivacaína, dexametasona e clonidina; no controle, água destilada e bupivacaína. Foi aplicado questionário de Oswestry. Resultados: A amostra foi composta de 24 mulheres (53,4%) e 21 homens (46,6%). Dos pacientes com ocupação, 85,71% (n = 30) estavam afastados de suas funções devido à doença e 14,29% (n = 5) continuavam a trabalhar com limitações. Os que foram submetidos ao bloqueio transforaminal com injeção de corticoide, clonidina e anestésico apresentaram alívio imediato. Após três semanas, contudo, o efeito não perdurou de forma tão satisfatória, e 52% dos pacientes apresentaram melhora em graus variados. No grupo controle, houve discreto alívio álgico após uma semana, que não perdurou de forma satisfatória após três semanas, com 50% dos pacientes evoluindo para melhora em graus variados. Conclusão: Mais estudos com espaço amostral maior, novos dados epidemiológicos e seguimento mais prolongado são necessários para validar as hipóteses aventadas. **Nível de Evidência II, Estudo Prospectivo.**

Descritores: *Hérnia de Disco. Bloqueio Nervoso. Neuropatia Ciática.*

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INTRODUCTION

Chronic pain configures a public health issue that may be associated with trauma or illness and persist after the initial injury has healed.[1] This condition generates a growing demand for public health services and includes prolonged treatments and financial impacts.[2]

The current aging of the population has increased the prevalence of chronic and degenerative diseases and the incidence of pain

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and disability. Patients mainly complain of chronic pain, which markedly interferes with their quality of life.[2,3] Low back pain, one of the most common health problems in adults, refers to pain and discomfort below individuals' costal margin and above their upper gluteal line, which may include pain in lower limbs and be classified as chronic if it persists for more than three months.[1]

Lumbar disc herniation is the most common diagnosis among the degenerative changes to the lumbar spine, configuring one of the main conditions causing chronic pain and one of the biggest causes of sickness benefits in Brazil due to disability retirement and surgical intervention, according to INSS 2019 data.[4-6] It shows a multifactorial etiology related to occupations with physical exertion and high workloads,[7] often occurring between individuals' third and fifth decades of life (the mean age of the first acute episode revolves around 37 years). Estimates suggest that from 2 to 3% of the population have a diagnosis of lumbar disc herniation (especially in people aged over 35 years) and a 4.8 and 2.5% prevalence in men and women, respectively.[4,5,7,8]

Disc herniation consists of the displacement of the nucleus pulposus in an intervertebral disc due to a rupture of the annulus fibrosus — usually in its posterolateral region.[3,4,8-10] Its clinical manifestations will depend on the volume of herniated material due to the compression and irritation of lumbar roots and dural sac. Its symptomatology includes initial low back pain, which may evolve to radicular pain, lumbosciatalgia (accompanying the dermatome corresponding to the compromised level, radiating to the gluteus or posterior thigh, and changing with the movement of the lumbar spine), or pure sciatica.[3-5,8,11]

Proper physical examination is essential for diagnosis, which can determine the vertebral space in which the hernia is located by carefully evaluating dermatomes and myotomes. Some specific tests, such as Lasègue's sign and hip extension, can help diagnoses by reproducing or increasing patients' pain. Imaging tests are also critical for the diagnosis, location, classification, and prognosis of the disease, including magnetic resonance imaging, the gold standard for diagnosis.[4,5]

Therapy prioritizes minimally invasive surgical procedures due to their lower tissue aggression, shorter hospitalization times, lower anesthetic risks, and early return to work activities.[4,12] Radioscopy-guided transforaminal and epidural blocks exemplify such minimally invasive techniques to treat lumbar disc herniation.[4,12,13]

This study aimed to evaluate the clinical profile, pain improvement, and the need for surgical interventions in patients undergoing these minimally invasive techniques, especially transforaminal blocks with corticosteroids.

METHODS

Study design

This is a prospective, randomized, double-blind study in which 45 patients with unilateral radicular pain in their lower limbs and evidence of single-segment lumbar disc herniation were evaluated from November 2018 to April 2020.

Ethical aspects

Informed consent forms describing the risks and benefits of the instituted therapy were signed by all patients, who were allocated into two groups by coin tosses: "heads" for group 1 (intervention) and "tails" for group 2 (control). This study was approved by the National Research Ethics Committee under number 3.104.615/18 (available on Plataforma Brasil).

Exclusion criteria

Presence of other diseases with pain symptoms (such as trochanteric bursitis, gluteal tendinopathy, and coxarthrosis), lumbar tumors, infections with root compression, diagnosed renal lithiasis, patients who used anticoagulants or antiplatelet agents; those who had undergone a foraminal and/or epidural block in the previous three years; and those who had undergone disc surgical procedures such as microdiscectomy, open discectomy, or arthrodesis.

Performed technique

Patients were positioned in horizontal ventral decubitus, their abdomen was supported by a pillow, their hips and knees were semi-flexed at about 30 degrees, and their vital parameters were monitored.

A supported surgical instrument under patients' lumbar region was used to establish the desired exact target. The tip of the instrument was mobilized until it coincided with the target of an image corresponding to the relevant lower pedicle under a slight medial deviation. The target was locally infiltrated with 2% lidocaine. A 22-gauge 3.5-inch spinal needle with a Quincke tip was introduced following the coaxial technique and observed as a single point under radioscopy along its path (Figure 1).

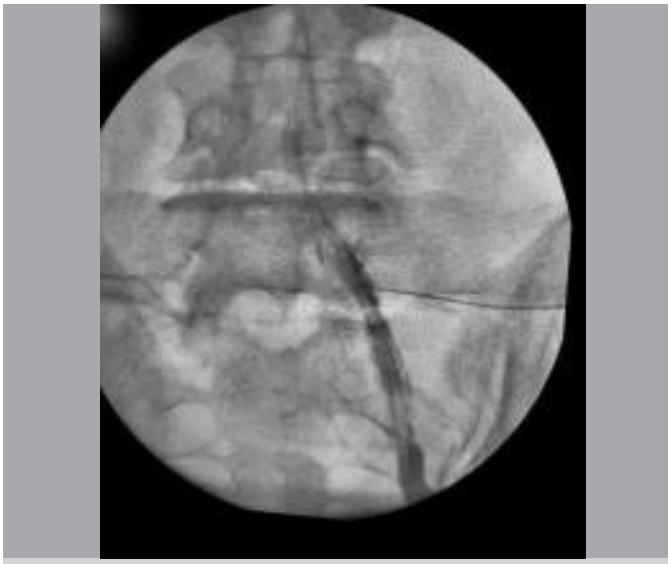

Figure 1. Nerve root delineated by contrast and visualized on radioscopy.

As the needle was introduced, the position of the radioscopy equipment was changed to provide the incidence of the absolute profile so the needle depth could be controlled. A contrast was injected under continuous radioscopy to monitor its distribution in the epidural space and ensure adequate infiltration into the extravascular medium. A solution was injected after we obtained an adequate distribution and good anatomical delimitation according to the contrast. Finally, patients were referred for post-anesthetic recovery and observation for 30 minutes. No medication was prescribed after the procedure.

In the intervention group, block solutions were composed of 1 mL of 0.5% bupivacaine (a local anesthetic), 2 mL of dexamethasone 10 mg/2.5 mL, and 1 mL of clonidine 150 mcg/mL. In the control group, blocks were performed with 3 mL of distilled water and 1 mL of 0.5% bupivacaine.

A simplified Oswestry disability questionnaire was applied before the procedure (Q1), one week after it (Q2), and three weeks after it (Q3). It consisted of 10 graded questions (from 0 to 5 points) on pain intensity; personal care; ability to carry load, move, and remain in a position for a certain time; changes in sleep, sexual and social life; and inability to travel. The closer to 100%, the greater patients' disability and the closer to 0%, the lower patients' disability.

RESULTS

In total, 45 patients participated in this study, 53.4% of which were women and 46.6% men. Mean female and male age totaled 51.1 years (SD=10.65) and 49.1 (SD=9.75), respectively. The intervention group consisted of 25 patients, mostly women (60%; n = 15) with a mean age of 52.2 years (± 10.8). The control group included 20 patients, 55% of which were men (n = 11) with a mean age of 50.4 years (± 8.8) (Table 1).

Table 1. Demographic data

	Intervention (n = 25)	Control (n = 20)	Total (n=45)
Age	51.25 (10.25)	48.8 (10.38)	50.23 (10.31)
Gender			
Male	10 (40%)	11 (55%)	21 (46.7%)
Female	15 (60%)	9 (45%)	24 (53.3%)

About 77.78% of our patients had a salaried occupation and 8.89% of them had retired before showing typical lumbar compression. Of the patients who had an occupation, 85.71% were on sick leave and 14.29% continued to work with limitations. Only six patients reported no paid activities. Domestic workers (22.9%) and bricklayers/construction assistants (17.1%) were the most prevalent occupations (Table 2).

Table 2. Occupational data.

Occupation	Total (n=35)	On sick leave (n = 30)
Domestic worker	8	7
Bricklayer/Construction assistant	6	6
General services	5	4
Trader	4	1
Electrician	2	2
Administrative worker	2	2
Teacher	2	2
Laundry worker	1	1
Attendant	1	1
Marble & granite worker	1	1
Carpenter	1	1
Nursing Technician	1	1
Psychopedagogue	1	1

About 80% of patients underwent one or more therapeutic modalities, such as physical therapy, hydrotherapy, and acupuncture. We found that 76% of patients in the intervention group underwent physical therapy; 25% hydrotherapy; and 28%, acupuncture; whereas in the control group, 75% underwent physical therapy; 20%, hydrotherapy; 45% acupuncture (Table 3). No evaluated cases evinced that these adjuvant therapies had satisfactorily and regularly relieved patients' symptoms.

Table 3. Adjuvant treatments.

	Intervention (n = 25)	Control (n = 20)	Total (n=45)	
Adjuvant Treatment	20 (80%)	16 (80%)	36	(80%)
Physical therapy	19 (76%)	15 (75%)	34	(75.55%)
Hydrotherapy	5 (25%)	5 (20%)	10	(22.22%)
Acupuncture	7 (28%)	9 (45%)	16	(35.55%)

The most frequent block level (Table 4) in our sample was L5-S1 (53.3%), followed by L4-L5 (40%) and L3-L4 (6.7%). Overall, blocks on patients' right side prevailed (64.4%). The control group showed a predominance of L5-S1 (50%) blocks on patients' right side (75%). The intervention group showed a similar predominance of L5-S1 blocks (56% of our sample) on volunteers' right side (56% of all blocks).

Table 4. Block level and side.

	Intervention (n = 25)	Control (n = 20)	Total (n=45)
Nerve roots			
L3-L4	2 (8%)	1 (5%)	3 (6.7%)
L4-L5	9 (36%)	9 (45%)	18 (40%)
L5-S1	14 (56%)	10 (50%)	24
Affected side			
Left	11 (44%)	5 (25%)	16 (35.6%)
Right	14 (56%)	15 (75%)	29 (64.4%)

To better understand patients' improvement or worsening, after summing and comparing their Q1, Q2, and Q3 questionnaire scoring, we divided volunteers into groups according to varying degrees of improvement or worsening over one or three weeks after the procedure. The +A group represented those patients whose condition improved as their scores showed a decrease of about 20 points between Q1 and Q2 or Q3 (i.e., over one or three weeks after the block), whereas the −A Group represented those whose questionnaire scores showed an increase of 20 points (i.e., in which patients' symptoms significantly worsened over one or three weeks). Subsequent groups (+B/−B; +C/−C; +D/−D) followed the same order. The B Group included all scores that varied from 10 to 19 points; the C Group, from five to nine points; and the D Group, from one to four points. Patients in the A Group show large variations between the symptomatology reported at the time of the block and subsequent scenarios; whereas those in the B and C Groups, moderately so; and those in the D Group, very little. Regarding our evaluation of the variation between pre-block questionnaire scores and those one week after the procedure, Figure 2 shows that the intervention group had three patients (12%) in the +A group, six (24%) in the +B group; five (20%) in the +C group, and four (16%) in the +D group; whereas the intervention group patients with higher questionnaire scores (reflecting clinical worsening) referred to three volunteers (12%) in the −D group, four (16%) in the −C group, and no participants in the −B and −A groups.

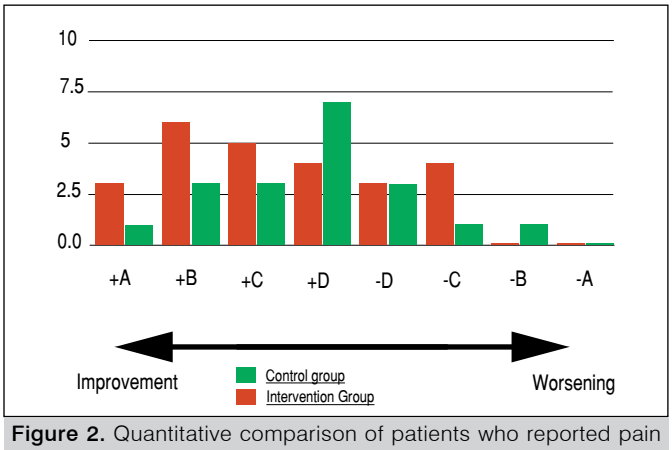

Figure 2. Quantitative comparison of patients who reported pain improvement or worsening one week after undergoing blocks for the intervention (red) and control groups (green).

We found that one patient in the control group (5%) was in the +A group, three (15%) in the +B group, three (15%) in the +C group, and seven (35%) in the +D group; whereas the patients in this group who

experienced symptom worsening in the first week after the procedure included three patients (15%) in the −D Group, one (5%) in the −C Group, one (5%) in the −B Group and no volunteer in the −A Group. Finally, one patient (5%) showed no variation between Q1 and Q2.
Figure 3 shows our comparative analysis between pre-block scores and those three weeks after the procedure. After three weeks, we included one intervention group patient (4%) in the +A group; seven (28%) in the +B group; one (4%) in the +C group; and four (16%) in the +D group. In the same group, of those patients who showed worsened pain and limitations, three (12%) were in the −D group; five (20%), in the −C group, and no volunteer in the −B and −A groups. We found that four patients (16%) showed no variation between Q1 and Q3 after three weeks. In total, 52% of the patients in the intervention group showed varying degrees of improvement.

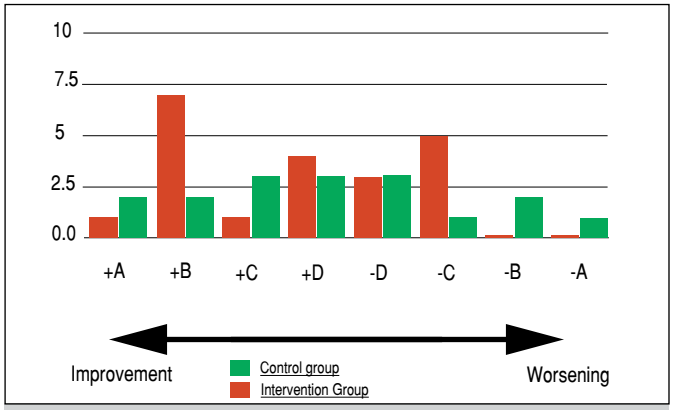

Figure 3. Quantitative comparison of patients who reported improved or worsened pain three weeks after undergoing blocks in the intervention (red) and control groups (green).

We observed that, three weeks after the blocks, two patients in the control group (10%) were in the +A group; two (10%) in the +B group; three (15%) in the +C group, and three (15%) in the +D group; whereas three patients (15%) were in the −D group; one (5%) in the −C group; two (10%) in the −B group; and one (5%) in the −A group. We found that three patients (15%) showed no variation in their questionnaire scores. In all, 50% of the control group showed varying degrees of improvement.
Pre-block means according to the Oswestry index in the intervention group totaled 61.68 (± 10.4), whereas in the control group, 60.3 (± 15.3) (Figure 4).

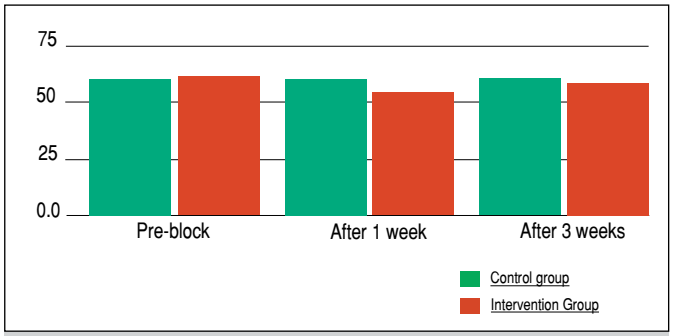

Figure 4. Comparison between pre-block means and those one and three weeks after the procedure for the control and intervention groups

DISCUSSION

Lumbar disc herniation shows a greater prevalence in men, occurring mainly between the third and fifth decades of their lives.[4,5,7,8] This study found a mean age of 50.23 years and that women (53.3%) composed most participants affected by this pathology. Although our age results agree with the literature, we found a female majority, which may suggest a population profile in our sample. Souza et al.[13] evaluated 61 patients who underwent transforaminal blocks, most of which were women (55.7%).
Cardoso et al.[14] found that the group with the highest prevalence of herniated discs consisted of domestic service workers, as in our research. We found that the group of construction workers showed no relation with a diagnosis of disc herniation but Daltaban et al.,[15] describe such occupation as one of the most closely related to lumbar disc herniation, agreeing with our sample. The most common location for the L5-S1 procedure (53.3%) in this study agrees with Garcia et al.,[7] evincing the importance of the association of occupation with lumbar disc herniations and indicating that more details about them should be addressed, such as the workload.
This study shows that patients subjected to transforaminal blocks with corticosteroid and anesthetic injections experienced immediate relief but that this effect failed to continue to satisfy patients after three weeks, whether they noticeably improved or not. The control group showed a slight pain relief one week after the procedure, which failed to last after three weeks. Our comparison between group means shows no satisfactory response in any group.
Souza et al.,[13] performed foraminal blocks in 61 patients, 32 of which with an anesthetic and corticosteroids and 29 with only a saline solution. This study observed a statistically significant improvement in the group that received medication in relation to the control group after one week according to the used pain scale and after three weeks following the Oswestry questionnaire. The control group in our study received an anesthetic with distilled water, eliciting a response that resembled that in the group that received corticosteroids, from which we can infer that improvements in the first week probably stem from the effect of the anesthetic. The improvement we observed after three weeks according to the Oswestry questionnaire indicates that we should extend our follow-up to at least three months so we can obtain more accurate and comparable results.
Manchikanti et al.'s[16] double-blind clinical trial with 120 patients with unilateral sciatica performed transforaminal infiltrations with corticosteroids and anesthetics in one group and with anesthetics and a saline solution in the other group. Both showed significant short- and long-term improvements in relation to control. When compared to our study, this result also favors the possibility that improvements in the first weeks is related to the use of anesthetics in the solution rather than to corticosteroids.

CONCLUSION

Results suggest the positive effect of the solution containing corticosteroids and anesthetics and that containing distilled water and anesthetics one week after we performed foraminal blocks. However, three weeks after the procedure, the corticosteroid and anesthetic solution showed no effective improvements, whereas patients blocked with distilled water and anesthetic continued to show some improvement. We should stress that the clinical picture of pain due to nerve compression has a self-limited character and may influence symptomatic variations over time.

AUTHORS' CONTRIBUTIONS: Each author contributed individually and significantly to the development of this article. ASG, MMO, EJFS: data collection and manuscript drafting; MOB: draft review and infiltration performance; RQC: infiltration performance; AABG: draft review.

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TIBIOCALCANEAL ARTHRODESIS: A COMPARISON OF ANTERIOR APPROACH AND TRANSFIBULAR APPROACH

ARTRODESE TIBIOCALCANEANA: COMPARAÇÃO ENTRE ABORDAGEM ANTERIOR E A ABORDAGEM TRANSFIBULAR

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ABSTRACT

Objective: The aim of this study was to evaluate the clinical and radiologic results and complications of patients who underwent ankle arthrodesis performed by the transfibular approach and anterior approach in end-stage ankle osteoarthritis. Methods: Between 2016 and 2022, 41 patients who satisfied the inclusion criteria for this retrospective comparative analysis were included. Of them, 19 patients are included in the anterior approach group and 22 patients are included in the transfibular approach group. The mean age of the participants is 58.9 years. Collected data included the BMI, American Orthopedic Foot and Ankle Society (AOFAS) hindfoot scale, visual analogue scale (VAS) score, diabetes, smoking, time to fusion, nonunion, union rate, preoperative and postoperative coronal tibiotalar angle and complications. Result: The mean time to bone union was 14.3 weeks (range 11–17 weeks) in the anterior approach group, and 11.3 weeks in the transfibular approach group. Statistically significant difference was found between the two groups. Nonunion occurred in one case in the transfibular approach group and three cases in the anterior approach group. There was no significant difference in the nonunion rate between the both groups (p = 0.321). VAS score, and AOFAS score of the two groups were similar and no significant differences were found (p = 0.491, p = 0.448, p = 0.146, p = 0.073, p = 0.173, p = 0.506, respectively). Conclusions: A stable and firm ankle arthrodesis and plantigrade foot can be achieved with both transfibular approach and anterior approach technique. ***Level of Evidence III, Retrospective Comparative Study.***

Keywords: Ankle Joint. Arthrodesis. Arthritis.

RESUMO

Objetivo: Avaliar os resultados clínicos e radiológicos e as complicações de pacientes submetidos à artrodese de tornozelo realizada por abordagem transfibular e abordagem anterior em fase terminal de osteoartrite de tornozelo. Métodos: Foram incluídos 41 pacientes atendidos entre 2016 e 2022 que satisfizeram os critérios de inclusão para esta análise comparativa retrospectiva. Destes, 19 incluídos no grupo de abordagem anterior e 22 no grupo de abordagem transfibular. A média de idade foi de 58,9 anos. Os dados coletados incluíram o índice de massa corporal (IMC), a escala de retropé da American Orthopedic Foot and Ankle Society (AOFAS), o escore da escala visual analógica (EVA), assim como a presença de diabetes, tabagismo, tempo de fusão, não união, taxa de união, ângulo tibiotalar coronal pré e pós-operatório e complicações. Resultado: O tempo médio de consolidação óssea foi de 14,3 semanas (variação de 11 a 17 semanas) no grupo de abordagem anterior e 11,3 semanas no grupo de abordagem transfibular. Foi encontrada diferença estatisticamente significante entre os dois grupos. A consolidação não ocorreu em um caso no grupo de abordagem transfibular e em três casos no grupo de abordagem anterior. Não houve diferença significativa na taxa de não consolidação entre os dois grupos (p = 0,321). Os escores nas escalas EVA e AOFAS dos dois grupos foram semelhantes, não sendo encontradas diferenças significativas (p = 0,491, p = 0,448, p = 0,146, p = 0,073, p = 0,173, p = 0,506, respectivamente). Conclusões: Uma artrodese estável e firme do tornozelo e um pé plantígrado podem ser obtidos tanto com a abordagem transfibular quanto com a técnica de abordagem anterior. ***Nível de Evidência III, Estudo Comparativo Retrospectivo.***

Descritores: *Articulação do Tornozelo. Artrodésia. Artrite.*

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INTRODUCTION

Objective

The most famous and commonly used procedure for end-stage ankle arthritis is still open ankle arthrodesis.[1] It has been accomplished using a variety of surgical procedures, including plates, intramedullary nails, screws, external fixators, and a combination of these techniques.[2,3]

Tibiotalar joint stabilization and stiff fixation are the goals of ankle arthrodesis. A plantigrade foot is made possible by a stable ankle

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The study was conducted at Hitit University, Erol Olçok Training and Research Hospital.
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arthrodesis. Ankle arthrodesis has, however, been linked to several significant complication. Nonunion of the tibiotalar joint is the most significant and frequent complication.

Currently, the transfibular, anterior, medial, and posterior methods, among others, have all been documented for tibiotalar arthrodesis.[4] Because they offer a larger surgical field of vision, the anterior approach and transfibular approach have become more popular in recent years. However, DeHeer et al.[5] found that utilizing the transfibular technique, it is challenging to obtain the right tibiotalar deformity on the coronal plane. In one study,[6] comparable fusion rates for each method were observed, although the outcomes in terms of complications varied. To the best of our knowledge, there is, however, relatively little research that compares anterior and transfibular techniques.

This retrospective study's objective was to assess the clinical, radiological, and postoperative complications of ankle arthrodesis in patients with ankle arthritis carried out by anterior and transfibular methods.

METHODS

The research protocol was approved by the Hitit University Ethics Committee (04.11.2022-23), and informed consent was obtained from all patients.

Study patients

41 patients who received transfibular or anterior tibiotalar arthrodesis between February 2016 and February 2022 and were monitored for more than a year were included in this study. Patients with septic arthritis, neuropathic arthritis, and follow-up periods of less than two months were excluded. Before surgery, all patients with ankle arthritis had conservative care. If persistent discomfort around the ankle made movement impossible, however, they undergo either fusion of the ankle using an anterior or transfibular method. The study comprised a total of 41 patients.

Demographic information, BMI, the AOFAS hindfoot scale, the VAS score, diabetes, smoking, the time to fusion, the nonunion rate, the union rate, the preoperative and postoperative coronal tibiotalar angle, and complications were all noted. The AOFAS hindfoot scale and VAS score were used to evaluate the clinical assessment.

Radiological assessment

To validate the union of the ankles joint and the position of the tibiotalar joint, anterior-posterior, and lateral X-ray views were examined. The presence of trabecular lines at the point of contact and the removal of the radiolucent line between the talus and tibia on the anterior-posterior and lateral X-ray views were used to verify the bony union monthly.[6] The coronal tibiotalar angle was assessed for postoperative varus/valgus deformity using the angle between the long axis of the tibia and the calcaneus on the hindfoot anterior-posterior X-ray.[7]

Surgical techniques

Transfibular approach

An approximately 6 to 8 cm lateral single incision was made across the distal fibula while the patient was in the lateral decubitus posture and under spinal or general anesthesia. The fibula was cut with Oscillating Saw at approximately 5 cm proximal to the ankle joint, and the osteotomized fragment was transected in the sagittal plane for use as a bone transplant. The articular cartilage of the ankle joint was observed using a lamina spreader. Osteophyte and arthritic articular cartilage on the tibia and talus were both removed. Following joint preparation, the arthrodesis was carried out using three 6.5-mm cancellous screws that are partially threaded to accomplish the ankle alignment in 0°–5° abduction, 5°–10° external rotation, and neutral plantar flexion. Two of them were positioned from the anterolateral side of the tibia to the medial side of the talus, and one 6.5-mm cancellous lag screw was positioned across the talus from the anteromedial to the posteroinferior. Two parallel 4.5 mm cortical screws were used to secure the onlay distal fibular graft (Figure 1).

Figure 1. Preoperative weightbearing radiographs of the ankle. Takakura stage 4. (A) anteroposterior X-ray and (B) lateral X-ray. Anterior approach was performed with three 6.5-mm cannulated screws. Ankle anteroposterior (C) and lateral (D) radiographs view showing fusion of the ankle joint at the final follow up (13 months after operation).

Anterior approach

An 8–10 cm long longitudinal single incision was made over the anterior tibial tendon while the patient was supine and under spinal or general anesthesia. The articular cartilage of the tibial plafond, the talar dome, and the osteophyte were removed, together with the anterior joint capsule. Under fluoroscopic guidance, three partly threaded 6.5-mm cancellous screws were used to fix the arthrodesis after joint preparation. One 6.5-mm screw was inserted from the anterolateral side of the tibia to the medial side of the talus and two 6.5-mm cannulated screws were inserted into the anteromedial side of the tibia from the lateral side of the talus (Figure 2).

Figure 2. Preoperative weightbearing radiographs of the ankle. Takakura stage 3. (A) anteroposterior X-ray and (B) lateral X-ray. Transfibular approach was performed with three 6.5-mm cannulated screws and two 4.5 cannulated screws with fibular onlay bone graft; (C) anteroposterior view; (D) lateral view showing fusion of the ankle joint at the final follow up (11 months after operation).

Postoperative management

On the 14th postoperative day, the sutures were removed in both surgical techniques. Following surgery, a short leg cast was applied for two to four weeks. A walking boot was used for an additional four weeks after the cast was removed. Patients were restricted from bearing any weight for the first month following surgery. After that, they were permitted to bear some weight, and after radiographic evidence of bone union, they were permitted to full weight-bearing ambulation. Serial radiographs were taken at 2, 4, 6, and 12 months

<< SUMÁRIO

as well as every year after that until the bone had fused. On follow-up radiographs, the coronal tibiotalar angle, implant location, and bony union were all assessed. The postoperative rehabilitation process was the similar in both groups.

Statistical analysis

Statistical analyses of the data were performed with the SPSS (Version 22, SPSS Inc., Chicago, IL, USA, Undergraduate: Hitit University) software. Descriptive statistics were reported using numbers and percentages for categorical variables, and mean ± standard deviation or median (minimum-maximum) depending on data distribution for numerical variables. The normal distribution test of numerical data was evaluated with the Shapiro Wilks test. Mann Whitney U test was used in the comparison of numerical data between two independent groups, since parametric test assumptions were not provided. Chi-square or Fisher's exact test was used depending on the sample sizes in the crosstab cells for ratio comparisons between research groups. $p < 0.05$ was accepted for statistical significance level in all comparisons.

RESULT

Between 2016 and 2022, 41 patients who satisfied the inclusion criteria for this retrospective comparative analysis were included. Of them, 19 patients are included in the group AA (anterior approach) and 22 patients are included in the TF (transfibular) group. The mean age of the participants is 58.9 ± 9.13 years. The study included 12 (% 29.3) women and 29 (%70.7) men. Body mass index (BMI) was 26.79 2.71 kg/m^2 on average. Regarding sociodemographic and clinical statistics, the results of the study showed that there is no statistical difference between two groups (Table 1).

Table 1. Comparison of socio-demographic and clinical data of patients between research groups.

		Anterior approach (n = 19)	Transfibular approach (n = 22)	p values
Gender	Male	13 (68.4%)	16 (72.7%)	0.763[a]
	Female	6 (31.6%)	6 (27.3%)	
Diabetes mellitus	No	4 (21.1%)	5 (22.7%)	1.000[b]
	Yes	15 (78.9%)	17 (77.3%)	
Smoking	No	5 (26.3%)	7 (31.8%)	0.699[a]
	Yes	14 (73.7%)	15 (68.2%)	
Complication	No	16 (84.2%)	22 (100%)	0.091[b]
	Yes	3 (15.8%)	0	
Diagnose	Trauma	13 (68.4%)	14 (63.6%)	0.747[a]
	Primer artrit	6 (31.6%)	8 (36.4%)	
Age		57.16 ± 8.44	60.41 9.62	0.261[c]
BMI (kg/m^2)		25.62 ± 2.44	26.8 2.57	0.329[c]
VAS score				
Preoperative		7 (4-8)	7 (4-8)	0.491[d]
		(6.32 ± 1.33)	(6.59 ± 1.29)	
Postoperative		2 (0-4)	2 (0-4)	0.448[d]
		(2.37 ± 1.11)	(2.09 ± 1.26)	
AOFAS score				
Preoperative		43 (27-56)	47.5 (31-56)	0.146[d]
		(42 ± 8.28)	(45.5 ± 6.33)	
Postoperative		78 (58-86)	81 (67-89)	0.073[d]
		(75.5 ± 7.88)	(79.2 ± 6.36)	
Coronal angle				
Preoperative		78 (54-102)	75.5 (54-102)	0.173[d]
		(80.7 ± 11.8)	(75.2 ± 13.6)	
Postoperative		87 (83-90)	88 (84-90)	0.506[d]
		(86.7 ± 2.01)	(87.2 ± 1.87)	

[a] Chi square test with n (%); [b] Fisher exact test with n (%); [c] Student's t-test with mean ± standard deviation; [d] Mann Whitney U test with median (min-max) and mean ± standard deviation.

Among the research groups, the distribution of gender, diabetes, smoking conditions, complication incidence rates, and diagnosis status were statistically similar ($p = 0.763$, $p = 1.000$, $p = 0.699$, $p = 0.091$, $p = 0.747$) respectively with each other. The average age and the mean BMI of the two groups has no statistically significant difference ($p = 0.261$ and $p = 0.329$) respectively. Preoperative and postoperative coronal tibiotalar angle, VAS score, and AOFAS score of the two groups were similar and no significant differences were found ($p = 0.491$, $p = 0.448$, $p = 0.146$, $p = 0.073$, $p = 0.173$, $p = 0.506$, respectively Table 1). In the AA group, the mean VAS and AOFAS ankle-hindfoot functional score improved from 6.32 (range, 4 to 8) and 43 (range, 27 to 56) preoperatively to 2.37 (range, 0 to 4) and 78 (range, 58 to 86) at the final follow-up, respectively. In the TF group, the mean VAS and AOFAS ankle-hindfoot functional score improved from 7 (range, 4 to 8) and 47.5 (range, 31 to 56) preoperatively to 2 (range, 0 to 4) and 81 (range, 67 to 89) at the final follow-up, respectively.

There was no noteworthy difference in the nonunion rate between the both groups ($p = 0.321$). The mean time to bone union in the AA group was 14.3 weeks (range 11–17 weeks), while it took 11.3 weeks in the TF group (range 9-13 weeks), statistically significant difference was found between the two groups ($p < 0.001$) (Table 2). The distribution of the time to fusion values between the two groups was shown in Boxplot and Figure 1.

Table 2. Comparison of non-union rates and time to fusion values of patients between research groups.

		Anterior approach (n = 19)	Transfibular approach (n = 22)	p values
Non-union	No	16 (84.2%)	21 (95.5%)	0.321[a]
	Yes	3 (15.8%)	1 (4.5%)	
Time fusion		14 (11-17)	11.5 (9-13)	< 0.001[b]
		(14.3 1.48)	(11.3 1)	

[a] Fisher exact test with n (%); [b] Mann Whitney U test with median (min-max) and mean ± standard deviation.

DISCUSSION

Open ankle arthrodesis is the most common surgical procedure for end-stage ankle osteoarthritis.[8] The literature has reported several surgical techniques, including the transfibular, anterior, and posterior approaches.[4] However, transfibular technique or anterior approach technique have been used for the most of the open ankle arthrodesis procedures.[9] The ankle joint surface can be seen in great detail from the anterior approach. This method, however, can harm the front vasculature and has limited exposure to the posterior malleoli.[5] The anterior technique, which similarly has limited benefit in instances with significant varus-valgus deformity or bone loss, is more likely to cause damage to the superficial peroneal nerve and the neurovascular system anterior tibia.[10]

There is less danger of complications such as wound dehiscence, infection, and prolonged recovery in the transfibular method than in the anterior route because the delicate tissues are less denser on the anterior side than on the lateral side. The subtalar joint, sinus tarsi, and ankle joint are all exposed during the transfibular process, which is useful for deformity treatment. It permits extensive contact areas, great stability, and fixation utilizing a fibular strut graft in addition to simple rectification of abnormalities such as ankylosis. The transfibular approach is a widely utilized technique today due to the superb lateral joint visibility and simple repair of sagittal abnormalities.[11] The transfibular method does have some drawbacks, though, including challenges with plate attachment, coronal plane correction, and medial gutter debridement.[12]

According to Nielsen, Linde, and Jensen,[13] between 77% and 100% of patients who underwent open surgery with internal

fixation experienced fusion. The anterior technique has a 100% success rate, according to Gordon et al.[14] The transfibular method was recommended by Holt et al.,[15] who also noted fusion rates of 93%. The rates of union were 95.4 % and 89.5 %, respectively, according to Kim et al.'s[11] in the comparison of the groups i.e. anterior approach group with the transfibular approach group. 41 patients with advanced ankle arthritis were examined in our study. Regarding the incidence of nonunion and hindfoot alignment, between the two groups, there was no substantial distinction statistically. In the anterior approach group, there were three nonunion instances and one in the transfibular approach group. In the transfibular group, we attained a union rate of 95.5 percent, while in the anterior approach group, we achieve a union rate of 84.2 percent. Regarding clinical outcomes, union rate, and postoperative complications, our results were comparable to those of earlier research.[16,17]

Limitation of the study

This study has some limitations, including a retrospective methodology and a limited patient population. Therefore, additional prospective randomized studies comparing the anterior approach and the transfibular technique with more patients are needed to confirm the best course of action for end-stage ankle arthritis.

CONCLUSION

To conclude, we found that the transfibular technique and anterior technique were effective in managing end-stage ankle arthritis. A stable and firm ankle arthrodesis and plantigrade foot can be achieved with any surgical technique. However, the transfibular method allows for quicker mobilization and recuperation and adds additional support with the fibular onlay graft.

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