FACET JOINT DEGENERATION IN PATIENTS WITH LUMBAR DISC HERNIATION AND PROBABLE DETERMINING FACTORS

DEGENERACIÓN FACETARIA EM PACIENTES COM HÉRNIA DE DISCO LOMBAR Y PROBABLES FACTORES DETERMINANTES

RESUMO

Objetivo: Avaliar a degeneração facetária em pacientes com hérnia de disco lombar tratados cirurgicamente, procurando correlacioná-la com possíveis fatores determinantes. Métodos: Estudo observacional do tipo transversal, que analisou prontuários, radiografias e ressonâncias magnéticas de 287 pacientes com hérnia de disco lombar, tratados cirurgicamente no Serviço de Cirurgia da Coluna do Hospital Ortopédico de Passo Fundo. Foram coletadas informações sobre idade e sexo. Nos exames de imagem, foram avaliadas as seguintes variáveis: angulação facetária e seu tropismo, mensurada pelo método de Karacan, inclinação sacral e lordose lombar, medidas pelo método de Cobb, artrose das articulações interfacetárias, pela classificação de Weishaupt e degeneração do disco intervertebral, medida pela classificação de Pfirrmann. Resultados: A correlação estatisticamente significativa entre degeneração facetária e idade (p = 0,002), assim como entre degeneração facetária e lordose lombar (p = 0,038). Não foi encontrada correlação entre degeneração facetária e inclinação sacral (p = 0,712). Conclusões: Verificou-se que há, de fato, uma multiplicidade de fatores relacionados com o grau de degeneração facetária da coluna lombar baixa. Estudos adicionais correlacionados com a assimetria das referidas articulações seriam importantes para elucidar uma conduta preventiva melhor para a referida degeneração, objetivando evitar lombalgia e ciatalgia secundárias à medida que a idade avança.

Descritores: Degeneração do Disco Intervertebral; Dor Lombar; Hérnia; Região Lombossacral.

RESUMEN

Objetivo: Evaluar la degeneración facetaria en pacientes con hernia de disco lombar tratados cirurgicamente, buscando correlacionarla con posibles factores determinantes. Métodos: Estudio observacional del tipo transversal, que analizó historiales, radiografías y resonancias magnéticas de 287 pacientes con hernia de disco lombar, tratados quirurgicamente en el Servicio de Cirugía de la Columna del Hospital Ortopédico de Passo Fundo. Fueron colectadas informaciones sobre edad y sexo. En los exámenes de imagen, se evaluaron las siguientes variables: angulación facetaria y su tropismo, medida por el método de Karacan, inclinación sacral y lordosis lombar, medidas por el método de Cobb, artrosis de las articulaciones interfacetarias, medida por la clasificación de Weishaupt y degeneración del disco intervertebral, medida por la clasificación de Pfirrmann. Resultados: Se observó relación estadísticamente significativa entre degeneración facetaria y edad (p = 0,002), y también entre degeneración facetaria y lordosis lombar (p = 0,038). No fue encontrada correlación entre degeneración facetaria y inclinación sacral (p = 0,712). Conclusiones: Fue verificado que hay, de efecto, una multiplicidad de factores relacionados con el grado de degeneración facetaria de la columna lombar baja. Estudios adicionales correlacionados con la asimetría de las referidas articulaciones serian importantes para elucidar una conducta preventiva mejor para la referida degeneración, objetivando evitar lombalgia y ciatalgia secundarias a medida que la edad avance.

Nivel de evidencia II; Estudio retrospectivo.
INTRODUCTION

Low back pain is a frequent symptom, affecting 80% of adults at some time during their lives. It is one of the ten main causes for consultations and each year is the reason that 5 to 10% of workers are absent from their jobs for more than seven days.¹ Disc herniation is the degenerative disease that leads to the highest number of spinal surgeries in adults.² This lesion can occur in any age group, but is most prevalent between 40 and 50 years of age. It is estimated that 2 to 3% of the general population may be affected, or approximately 5% in men and 2.5% in women.³

The spine is the main body support axis for the trunk and appendicular limbs, resisting the forces of compression, anteriorly, and tension, posteriorly. While this structure, formed by a complex group of osseous and discoligamentary structures, is axially very resistant, it also enables important mobility for the execution of multiple movements of flexion-extension, lateralization, and rotation.⁴,⁵ Each vertebral segment contains a triarticular complex, composed of the intervertebral disc and the paired, bilateral facet joints. While the intervertebral disc allows spinal movement, although limited, in all planes, the facet joints are naturally limited by their orientations, geometric positions, and capsules.⁶ Thus, there is a mechanism to control the axial rotation of the lumbar spine, which prevents the occurrence of vertebral shear.⁷ It should be noted that there is a natural asymmetry between the orientation of the facet joints, called facet tropism.⁸ Sacral slope and lumbar lordosis are also factors that vary from individual to individual and cause biomechanical changes in the load axis of the lumbar spine.⁹

Biomechanical changes below the lumbosacral spine can accelerate the aging of that region and in many individuals early degenerative changes cause chronic low back pain, often incapacitating and difficult to control.¹⁰ In patients with lumbar disc herniation whose main complaint is radicular, i.e., sciatalgia, low back pain may be associated with the early degenerative lumbosacral process that occurs in some individuals. After a surgical discectomy procedure, which aims to improve sciatica, the patient sometimes expresses frustration with the treatment because of persistent residual low back pain, which is actually caused by the local degenerative process and load distribution over the region.¹¹

Thus, the objective of the present study is to evaluate facet joint degeneration in patients with surgically-treated lumbar disc herniation, seeking to correlate it with possible determining factors, such as age, facet joint tropism, intervertebral disc degeneration, sacral slope, and lumbar lordosis.

METHODS

This is a cross-sectional observational study that analyzed the medical records of 287 patients diagnosed with lumbar disc herniation who underwent discectomy surgery during the period from 2002 to 2017. As inclusion criteria, patients were selected who had undergone surgery for lumbar disc herniation and whose medical records had lumbosacral radiographs in anteroposterior and lateral views and magnetic resonance of the lumbosacral spine with axial cuts. Patients with disc herniation at more than one level, herniation with bilateral radicular involvement, imaging examinations not suitable for measuring and classification, spondylolisthesis, or with spinal deviations of more than 10 degrees in the coronal plane were excluded from the study.

Information about sex and age was collected from the medical records. The following imaging examination variables were evaluated: location and level of the herniation according to Wiltse,¹² facet joint angulation and tropism measured by the Karacan et al. method,¹³ sacral slope and lumbar lordosis measured by the Cobb method using the Cobbometer® application, facet joint arthrosis according to the Weishaupt classification,¹⁴ and intervertebral disc degeneration according to the Pfirrmann classification.¹⁵

The descriptive quantitative data were expressed as means and standard deviations or, in case of asymmetrical distribution, as medians and interquartile intervals (25th percentile – 75th percentile), and the categorical data as relative frequencies and percentages. A normality test (Kolmogorov-Smirnov) was applied to the quantitatively variables and the need to use non-parametric tests was determined. Thus, the Mann-Whitney U-test was used for comparison and the Spearman rank test was used for the correlations. The chi-square test was used to compare the proportions. These analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 18.0 software (SPSS Inc., Chicago, IL, USA). The p-value indicated as statistically significant was p < 0.05.

RESULTS

The results were obtained according to: (a) demographic data; (b) the correlation between facet joint degeneration and age; (c) the correlation between facet joint degeneration and facet joint tropism; (d) the correlation between facet joint degeneration and disc degeneration; (e) the correlation between facet joint degeneration and sacral slope; and (f) the correlation between facet joint degeneration and lumbar lordosis.

a. Demographic data

Regarding the sex of the patients, 144 were male (50.2%) and 143 were female (49.8%). The patients ranged in age from 19 to 84 years of age, with a mean age of 46.3 years.

As regards the disc space where the herniation occurred, the predominant involvement was in L5-S1 in 136 patients (47.4%) and in L4-L5 in 120 patients (41.6%).

In relation to the side where the disc herniation occurred, 146 patients were affected on the left (50.9%) and 141 on the right (49.1%).

When evaluating the locations where the lumbar intervertebral disc herniations occurred, it was found to be central-lateral in 223 patients (77.7%), foraminal in 24 patients (8.4%), central in 29 patients (10.1%), and extra-foraminal in 11 patients (3.8%).

Data from the present study were analyzed in accordance with the ethical principles in research that are governed by the Resolution 196/96 of the National Council of Health and Resolution 466/12 of the National Health Council. The authors of this study signed a data use agreement, committing to data anonymity. The research project was approved by the Institutional Review Board of the Universidade de Passo Fundo (IRB/UPF), after having been forwarded via Plataforma Brasil (protocol number 2.929.767).
According to the Weishaupt classification,¹⁴ used to analyze facet joint degeneration, 42 patients were evaluated as grade 0 (14.6%), 124 as grade 1 (43.2%), 88 as grade 2 (30.7%), and 33 as grade 3 (11.5%). (Table 1)

According to the Pfirrmann classification¹⁵ used to analyze disc degeneration, 6 patients were evaluated as grade 1 (2.1%), 43 as grade 2 (15.0%), 136 as grade 3 (47.4%), 85 as grade 4 (29.6%), and 17 as grade 5 (5.9%). (Table 2)

b. Correlation between facet joint degeneration and age

The evaluation of the correlation between facet joint degeneration and age showed statistical significance (p = 0.002), i.e., as age increases, so does the Weishaupt grade.

c. Correlation between facet joint degeneration and facet joint tropism

No statistically significant results were found (p = 0.380) in the evaluation of the correlation between facet joint degeneration and facet joint tropism. It was observed, therefore, that the mean degree of facet joint tropism did not increase homogeneously with the progression of the joint degeneration score. However, it was found that the most degenerated facet joints (Weishaupt grade 3) were those with the greatest facet joint tropism (facet joint asymmetry). (Table 3)

d. Correlation between facet joint degeneration and disc degeneration

A statistically significant correlation was found in the evaluation of the correlation between facet joint degeneration and disc degeneration (p = 0.001). It was confirmed, therefore, that the greater the facet joint degeneration, the more the intervertebral disc was also degenerated.

e. Correlation between facet joint degeneration and sacral slope

A weak statistical correlation was observed in the evaluation of the correlation between facet joint degeneration and sacral slope (p = 0.038). Therefore, the greater the sacral slope, the more degenerated the facet joint tended to be.

f. Correlation between facet joint degeneration and lumbar lordosis

| Weishaupt | Number of patients (%) |
|-----------|------------------------|
| 0         | 42 (14.6)              |
| 1         | 124 (43.2)             |
| 2         | 88 (30.7)              |
| 3         | 33 (11.5)              |
| Total     | 287 (100)              |

| Pfirrmann | Number of patients (%) |
|-----------|------------------------|
| 1         | 6 (2.1)                |
| 2         | 43 (15)                |
| 3         | 136 (47.4)             |
| 4         | 85 (29.6)              |
| 5         | 17 (5.9)               |
| Total     | 287 (100)              |

Table 3. Relationship between facet joint degeneration and the mean degrees of facet joint tropism.

| Weishaupt | Mean degrees of facet joint tropism |
|-----------|-------------------------------------|
| 0         | 7.88                                |
| 1         | 6.54                                |
| 2         | 6.68                                |
| 3         | 8.12                                |
| Overall mean | 7.09                              |
facet joint degeneration and age, local disc degeneration, and sacral slope, but not between facet joint degeneration and lumbar lordosis.

Regarding the asymmetry of the facet joints (tropism), it was found that the most degenerated facet joints (Weishaupt grade 3) were those with the greatest facet joint tropism. However, the mean degree of facet joint tropism did not increase homogeneously with the progression of the joint degeneration score. Additional studies correlated with the asymmetry of these joints would be important for us to shed light on better preventive management of this degeneration with the goal of avoiding secondary lower back pain and sciatica as age progresses.

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

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