ABSTRACT

Objective: To determine the incidence and rate of disc degeneration adjacent to a lumbar fusion, as well as to analyze possible risk factors for its development. Methods: A retrospective study of a level of evidence IIB case series of 125 patients diagnosed with lumbar canal stenosis and spondylolisthesis, who underwent surgery from January 2011 to December 2016, with subsequent instrumentation and posterolateral fusion and outpatient follow-up in which the symptomatology and radiographic findings were evaluated to establish the diagnosis and management. Results: Twelve patients with adjacent segment disease were identified, with an incidence of 9.6%, higher both among female patients and in the seventh decade of life. The most frequent pathology was canal stenosis (42.4%), the most affected level was L4 / L5, and the procedure most associated with the prevalence of adjacent level degeneration was L4-L5 posterior transpedicular instrumentation. Conclusions: Sagittalization of the facet joint was a constant factor in all patients with involvement of the adjacent disc. The main clinical findings were treatment-resistant root pain and radiographic alterations characterized by spondylolisthesis, facet osteoarthritis and intervertebral disc herniation.

Level of Evidence IIB; Retrospective study.

Keywords: Spinal disease; Lumbosacral region; Arthrodesis.
INTRODUCTION

Hilibrand et al. classified adjacent segment involvement into two large groups: 1) subjects with “adjacent disc degeneration”, which describes the radiographic changes seen in the adjacent disc as compared to the immediate results from the initial surgical procedure and which do not necessarily correspond to the clinical findings and 2) subjects with “adjacent segment disease”, which refers to the development of new clinical symptoms that correspond to radiographic changes in the adjacent disc following previous vertebral fusion.1

Although the precise etiological mechanism for the development of adjacent disc involvement is unknown, degeneration of the mobile segments adjacent to a fusion has been described in the literature. In their biomechanical study using cadavers, Lee et al. observed a greater effort demand at the level of the disc adjacent to a lumbar fusion, with progressive degeneration and facet joint hypertrophy.2

Following posterior lumbar spine instrumentation, biomechanical changes characterized by increased loads associated with segment instability are presented.3 In order to diagnose adjacent segment disease, radiographical findings must be correlated with the presence of symptoms characterized by low back pain and radiculopathy, equal to the episodes prior to the procedure or new episodes occurring at least six months after the surgical procedure.4

In view of the studies conducted to date, it is reasonable to assume that both the progression of the degenerative disease and the biomechanical alterations seem to be determining factors in the development of adjacent disc disease.5

Risk factors include patient age (as the disease is more prevalent in people older than 55 years of age), sex, bone quality, type of procedure performed (laminectomy, facetectomy, or posterior transpedicular instrumentation), with a higher incidence in cases of degenerative spondylolisthesis, mainly at level L4-L5, and a higher incidence of presentation in the caudal levels of the lumbar spine.6

The main radiographic findings observed are disc degeneration, facet joint arthrosis, retro/anterolisthesis, instability7 which is classified as a displacement of more than 4 mm in the anteroposterior plane, 10° in the sagittal plane, more common in intervertebral disc herniation, and 5° of rotation between the vertebral platforms), ca

The clinical changes characterized by increased loads associated with segment instability are presented. The degenerative changes are manifested in the adjacent segment, with cephalad or caudad extension depending on the level affected.5,11

The objective of this retrospective study is to determine the incidence and rate of adjacent disc degeneration, as well as to analyze possible risk factors for the development of degeneration of the disc adjacent to a lumbar fusion.

METHODS

This is a retrospective study of a case series of 125 patients who underwent surgery with posterior instrumentation for degenerative lumbar pathology at the Centro Médico ISSEMYM Ectepec during the period from January 2011 to December 2016. The most frequent pathology was canal stenosis (42.4%), followed by spondylolisthesis (32.8%) and degeneration with disc herniation (24.8%). Posterior lateral arthrodesis instrumented with pedicle screws and heterologous graft plus bone matrix was performed in all patients, in addition to decompression in all those with neurological compromise. Follow-up of all patients was conducted in the outpatient clinic, where pain was clinically evaluated with the Visual Analog Scale (VAS), simple and dynamic radiographs were evaluated according to the stability criteria of White and Punjabi, and magnetic resonance images (MRI) were evaluated for disc degeneration, the presence of canal stenosis, and facet joint arthrosis. The fusion was considered to be correct if no interphase between the graft and the vertebral body was observed, there was an absence of instability in the dynamic radiographs, and there was good clinical tolerance.

Radiological criteria were used to define the involvement of the adjacent disc and the diagnosis was made via simple radiography and magnetic resonance. The adjacent disc was considered to be affected when a reduction in disc height greater than 4 mm, anterior instability greater than 4 mm, retrolisthesis and angulation greater than 10° were observed in the simple radiograph, and when degenerative discopathy, disc protrusion or herniation, and segmental stenosis were observed in the MRI. The following risk factors were analyzed: age, sex, number of instrumented levels, the status of the limiting disc prior to surgery as assessed by MRI (MODIC scale), lordosis of the instrumented segment and the lumbosacral lordosis (Cobb angle), and the sagittalization of the facet joints of the limiting disc (MRI axial slices).

Twelve patients were diagnosed with adjacent segment disease during the previously mentioned period, who presented radiculopathy as well as reduced function mainly due to neurogenic claudication.

RESULTS

Twelve patients were identified with adjacent segment disease, (Figure 1) with an incidence of 9.6%, an average presentation and surgical treatment period of 4.2 years, ranging from 1 to 7 years, a higher incidence in females (Figure 2), an average of 62 years of age, and higher incidence in the 7th decade of life. (Figure 3)

The most frequent pathology was canal stenosis (42.4%), followed by spondylolisthesis (32.8%) and degeneration with disc herniation (24.8%), (Figure 4)

The most affected level was L4/L5 and the procedure most associated with the prevalence of adjacent level involvement was posterior L4/L5 transpedicular instrumentation. Posterior transpedicular instrumentation of L5/S1 was performed in 3 of the patients, in which the instrumentation was extended by one cephalad level. (Figure 5)

All of the patients diagnosed with adjacent segment disease were treated surgically with extensions of the instrumentation without any significant differences between the distal and proximal levels.

Figure 1. No. of patients diagnosed with adjacent segment disease.

Figure 2. Incidence by sex.
DISCUSSION

Degeneration of the disc adjacent to a lumbar fusion is a problem that is often described in the literature. Although the exact mechanism that produces this degeneration is uncertain, it seems that biomechanical changes can influence early involvement of the adjacent disc. There was a higher prevalence of adjacent segment disease among the women and an incidence of 9.6% during the period investigated, with higher incidence in the seventh decade of life and in patients with a history of canal stenosis (42.2%). The average diagnosis and treatment time was 4.2 years, so it is important to identify degenerative pathologies of the adjacent level so they can be treated during the initial surgery in order to prevent progression to adjacent segment disease. Since our findings are correlated with the literature as regards L4/L5 being the principle level of involvement, the inclusion of the L5/S1 level in the first intervention may be a suitable alternative to prevent the progression of adjacent segment disease.

In the literature, injury to the inferior facet joint resulting from the placement of the pedicle instrumentation is described as a risk factor, as it can contribute to the instability of the limiting disc. Correct placement of the pedicle screws, without injury to the facet joint, may be a determining factor in reducing the incidence of adjacent disc injury. Changes in sagittal alignment are described in the literature as a possible risk factor for the development of disc involvement and are also implicated in adjacent disc involvement. The age and sex of patients are also indicated as risk factors in the literature, and in our study we observed greater affectation in women patients. The use of dynamic fixations or interspinous devices in the disc superior to an arthrodesis may well be an alternative in the prevention of this deterioration.

CONCLUSIONS

- More frequent in females.
- The main clinical findings are radicular pain resistant to treatment and with radiographic changes characterized by spondylolisthesis, facet joint arthrosis, and intervertebral disc herniation.
- The sagittalization of the facet joints was a constant factor in all patients with adjacent disc involvement.
- The established treatment with the best evolution of clinical symptoms is extension of the instrumentation.

ACKNOWLEDGEMENTS

To the medical personnel, affiliates, and residents of the Spine Surgery service of the Hospital Centro Médico ISSEMYM ECATEPEC.

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

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