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Research Article

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Schizas Classification As A Predictor of Complications In Patients Undergoing Over-The-Top Lumbar Decompression

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Abstract

Summary: *The Schizas classification allows us to speak in a standardized way about the degree of narrowing in cases of the lumbar canal. Currently, the use of minimally invasive approaches has become popular in the tubular over-the-top approach.*

Objective: *The objective of this study is to show whether there is a relationship between a greater degree of narrowing of the canal according to the Schizas classification with the presence of any early or late complication after a patient undergoes over-the-top lumbar decompression.*

Methods: *This is an analytical and retrospective study from July 2020 to February 2023. From each of the files, the MR was reviewed to classify the patients according to the Schizas classification, with follow-up in the post-operatory immediately and a follow-up 6 months after the intervention.*

Results: *We investigated whether there was a relationship between the degree of narrowing of the canal according to the Shizas classification and the presence of late complications, which was the poor response to the intervention, in which a significance of our p=0.035 was obtained, and it was observed that the highest degree of complications was present in the Shizas classifications B and C.*

Conclusions: *The Shizas classification proves to be a useful tool as a predictor of complications so that we can propose intraoperative strategies for the resolution of this type of complication to reduce risks and costs in this type of tubular decompression.*

Keywords: Narrow lumbar canal, Over-the-top tubular approach, shizas classification, cerebrospinal lake.

1. Introduction

The Schizas classification, developed in 2010, is an imaging tool that allows standardizing the evaluation of the degree of narrowing of the root canal in the lumbar region. This classification categorizes the levels of narrowing into four grades: A, B, C, and D, and takes into account elements such as the yellow ligament that are related to such narrowing [1].

The over-the-top approach, first described by Young in 1998, is used in a variety of indications, including radicular signs, neurogenic claudication, presence of facet cysts, cauda equina syndrome, and sagittal balance disturbances, such as hyperlordosis or flat back [2-4]. However, there are contraindications for its application, such as predominant axial pain, significant vertical instability, scoliosis of more than 30 degrees, congenital central stenosis, and Meyerding grade II spondylolisthesis.

From an anatomical point of view, it is important to note that the dura mater in the lumbar region is notably thinner. Under conditions of degenerative pathology and chronic compression, there is an increase in vascular congestion in the venous plexus and a decrease in arterial vascularity, which reduces the thickness of the dura mater and increases the risk of its rupture during lumbar decompression procedures. In addition, this pathophysiological process generates chronic inflammation and the release of proinflammatory factors, which are fundamental in the painful symptomatology characteristic of lumbar disc disease [5].

Minimally invasive lumbar spine surgery encompasses several techniques designed to reduce operative time, minimize muscle tissue damage, decrease bleeding, and shorten hospital stays. One of these techniques is the "over-the-top" tubular approach [6-8].

In addition, as in other lumbar spine procedures, the risk of developing cerebrospinal fluid fistulas has been observed in cases in which the tubular system is used. These fistulas present a high degree of complexity in their repair [9-11].

The main objective of this study is to investigate whether there is a relationship between the degree of canal narrowing, as assessed by the Schizas scale, and the presence of complications, either early (such as cerebrospinal fluid fistulas) or late (such as unsatisfactory response to treatment), after a patient undergoes lumbar decompression using the "over-the-top" approach.

2. Methods

This is an analytical and retrospective study, where the records of the patients who underwent over-the-top lumbar decompression at the Centro Medico Nacional ISSSTE 20 de noviembre from July 2020 to February 2023 were reviewed, regardless of gender or age. From each of the files, the magnetic resonance studies were reviewed to classify the patients according to the Schizas scale. In addition, the levels of the lumbar spine that were approached, the volume of bleeding, and the surgical time were obtained, as well as the Oswestry functional scale preoperatively, postoperatively, and a follow-up 6 months after the intervention. We also searched for those who presented cerebrospinal fluid fistula.

3. Statistical Analysis

Data are presented as mean and standard deviation (SD) or medians and interquartile ranges depending on the distribution of the variables. The distribution was evaluated with the Kolmogorov-Smirnov test. Dichotomous variables were presented as relative or absolute frequencies. Correlation between variables was evaluated with the chi-square test. The SPSS v.26 statistical program (IBM, USA) was used. A value of $p < 0.05$ was considered significant.

4. Results

Between July 2020 and February 2023, a comprehensive review of 15 records of patients who underwent over-the-top lumbar decompression procedures was performed. These patients, on average, had an age of 60.9 years (± 13.2), and most of them were female (n = 11, 73.3 %). Regarding the procedure itself, an average of 1.6 surgical levels (± 0.7) were approached, with an average surgical time of 195 minutes (± 70.9) and an average bleeding of 83.6 ml (± 121.7). To investigate whether smoking correlated with an increased risk of developing fistulas in these procedures, medical records were examined, revealing that only 3 patients (20 %) were smokers (Table 1).

Variable	Media (± DE)
Age	60.9 ± 13.2
Sex (%)	11 (73.3 %)
Surgical levels	1.6 ± 0.7
Surgical time (min)	195 ± 70.9
Bleeding (ml)	83.6 ± 121.7

Table 1: Clinical and surgical characteristics of the patients.

Regarding the levels of the lumbar spine that were usually approached, it was found that the most common were L4-L5 / L5-S1 (n = 6, 40 %), followed by L5-S1 (n = 3, 20 %). Complications related to these approaches occurred in 53.3 % of cases (n = 8), and fistula formation occurred in 26.7 % of patients (n = 4). In addition, the overall improvement of the patients was evaluated, revealing that 73.3 % (n = 11) experienced favorable results.

On the other hand, evaluations were performed using different scales, including the Schizas classification, the Visual Analog Scale (VAS) of pain before and after surgery, as well as at 6 months of follow-up, and the Oswestry low back pain disabili-

ty scale. The Schizas classification indicated that most patients were in categories A3 (n = 4, 26.7 %) and B (n = 4, 26.7 %) (Table 2). Regarding the VAS scale, pain before surgery was mainly at 9 (n = 6, 40 %), while after surgery and at 6 months, a reduction in pain levels was observed, with 46.7 % (n = 7) in both cases. Regarding the Oswestry disability scale, most patients showed 90 % disability before surgery (n = 5, 33.3 %), which was reduced to 40 % (n = 5, 33.3 %) after surgery and to 20 % (n = 9, 60 %) at 6 months follow-up.

Clasification	Frequency (%)
A2	3 (20 %)
A3	4 (26.7 %)
A4	2 (13.3 %)
B	4 (26.7 %)
C	2 (13.3 %)
Total	15 (100 %)

Table 2: Frequencies of the Schizas classification in the patients studied.

We explored whether there was a relationship between the degree of canal narrowing, according to the Schizas classification, and the presence of late complications, such as lack of clinical improvement and the appearance of cerebrospinal fluid fistulas. In this analysis, a significance of p=0.035 was obtained, suggesting that there is an association between the two, with Schizas classifications B and C correlating with a higher risk of complications (Table 3) (Figure 1).

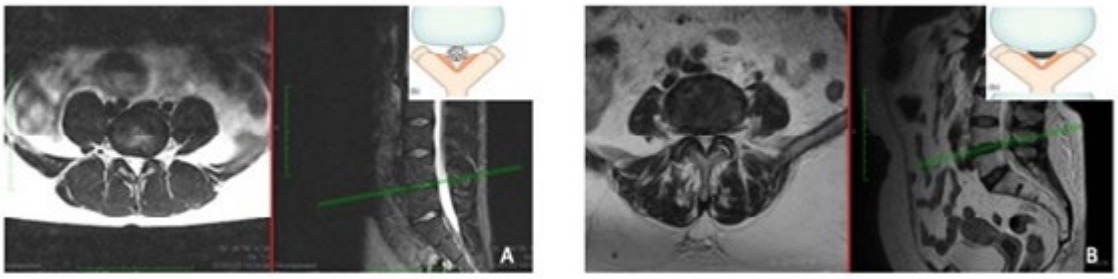

Figure 1: Magnetic Resonance Images of patients undergoing "Over The Top" lumbar decompression. A. Patient with Schizas grade B root canal stenosis. B. Patient with Schizas grade C root canal stenosis.

		Complications		
		Si	No	Total
Schizas	A2	1	2	3
	A3	0	4	4
	A4	1	1	2
	B	4	0	4
	C	2	0	2
Total		8	7	15

Table 3: Correlation between the Schizas classification and the presence of complications

5. Discussion

Currently, minimally invasive lumbar spine surgery has gained significant relevance among spine surgeons. Innovative techniques, such as the tubular over-the-top approach, have demonstrated a complication rate ranging from 1.6% to 6.6%, as reported in some case series [12].

In which cerebrospinal fluid fistulas occur in 2.7 to 7.2%, several forms of repair of cerebrospinal fluid fistulas have been described within the tubular approaches, where the implementation of long instruments require an important ability for mobility within the tubular system, in turn, the use of adhesive sealants is another alternative for the closure of these dental lesions [13,14].

Likewise, it is described in certain cases that despite the use of the mentioned closure techniques, the conversion of the surgery into a conventional surgery is suggested for the repair of these Dural incidents [15].

The fistula closure techniques previously mentioned were used

in our series of cases, obtaining a good response to the use of direct closure plus the placement of adhesive sealant, but a high percentage of complications were observed, related to dural lesions and an unsatisfactory response to decompression.

For this reason, we investigated a possible predictive risk factor for these complications, finding that the Schizas scale is a useful tool in the prediction of these adverse situations [1].

The results obtained in our study show a significant relationship between the degree of narrowing of the lumbar canal, measured by the Schizas classification. In the investigation, we obtained a significance value of p= 0.035, indicating a direct association between the degree of stenosis and complications, specifically the formation of a cerebrospinal fluid fistula and the persistence of symptoms even after surgery. This association was more evident in patients classified as B and C according to the Schizas scale (Figure 2).

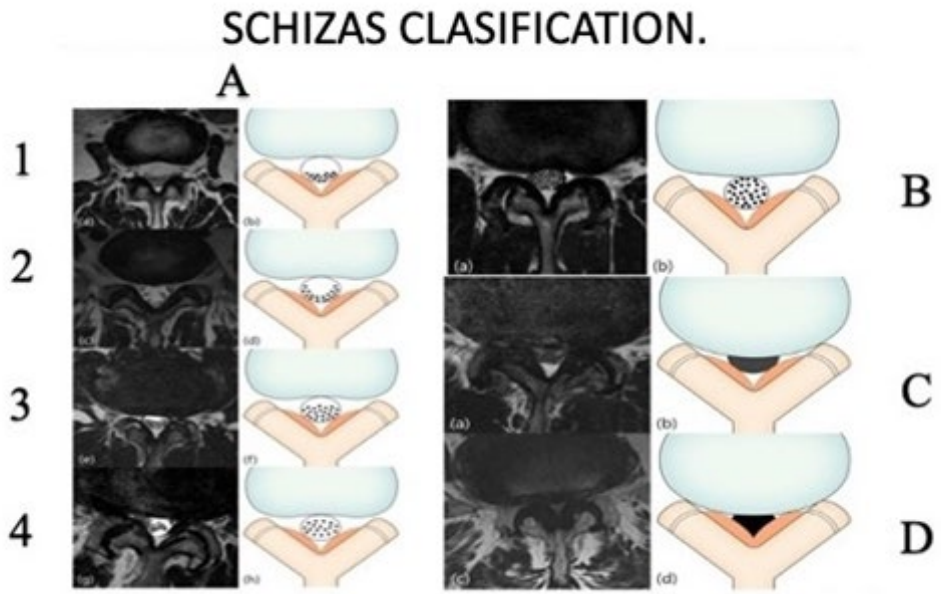

Figure 2: CLASSIFICATION OF SCHIZAS. Reprinted from Ko Y-j, Lee E, Lee JW, Park CY, Cho J, Kang Y, et al. (2020) Clinical validity of two different grading systems for lumbar central canal stenosis: Schizas and Lee classification systems.

The increased risk of fistula in the higher Schizas classifications could be attributed to degenerative changes caused by chronic compression. This chronic compression may alter the vascularity of the dura mater at that level, causing its thinning and thus increasing the risk of cerebrospinal fluid fistula (Figure 3).

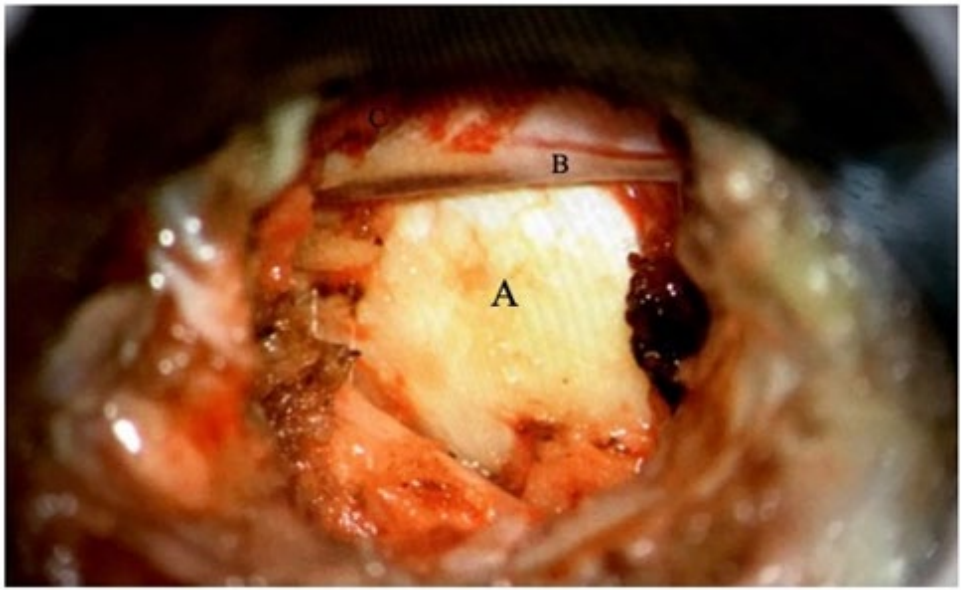

Figure 3: Tubular Approach For Over The-Top Decompression, A) Disc Protrusion Is Observed. B) Thinning Of The Dural Sac As Well As A Decrease In Its Vascularity. C) Venous Stasis Secondary To Disc Compression.

These findings suggest that preoperative assessment of lumbar stenosis using the Schizas classification may be a valuable tool for identifying patients at increased risk of dural complications and inadequate response to minimally invasive lumbar spine surgery.

6. Conclusions

Minimally invasive surgery in the lumbar spine, especially the tubular "over-the-top" approach, has gained prominence among spine surgeons. However, it presents challenges in terms of complications, such as dural lesions and unsatisfactory response to decompression. Our study has demonstrated a significant relationship between the degree of lumbar stenosis, as assessed by the Schizas classification, and these complications. Patients with a higher classification on the Schizas scale have a higher risk of developing a cerebrospinal fluid fistula and experiencing the persistence of symptoms after surgery.

These results suggest that the Schizas classification may serve as a valuable risk predictor in the preoperative evaluation of patients undergoing minimally invasive lumbar spine surgery. Early identification of these patients at increased risk for complications may help surgeons make more informed decisions and customize the surgical approach to improve procedural outcomes and safety.

In case the spine surgeon is few related to the tubular system and the resolution of complications by this system, we can recommend the use of spine surgery in a conventional way, however, studies that compare the classification of schizas with the results would be needed, obtained in spine surgery in a conventional way.

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