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CASE REPORT

Acromegalic Arthropathy and Ossification of the Yellow Ligament Treated with an Interlaminar Full-Endoscopic Approach: A Case Report

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ABSTRACT

Introduction: Acromegalic arthropathy is a cause of morbidity and functional disability, affecting large peripheral joint, especially the spine. Affected patients can suffer from lumbar and sciatic pain, with or without radiculopathy. Due to the severe arthrosis, stenosis with ossification of the ligamentum flavum can often occur.

Patient history: This study presents a 57-year-old patient with acromegalic arthropathy resulting from a growth hormone secreting pituitary macroadenoma. He was previously submitted to transsphenoidal surgery and present a history of L4-L5 decompression due to disc herniation and bilateral knee arthroplasty. The condition evolved to an acute left lumbar sciatic pain and the patient was refractory to clinical and physical therapy treatment.

Surgical procedure: Decompression and discectomy were performed through an interlaminar endoscopic approach. Cutting and diamond burs and Keirrinson-type forceps were used for decompression. Diamond burs were used in the calcified yellow ligament and in the intervertebral disc to remove the protruding disc.

Imaging exams: Preoperative exams showed calcified disc herniation and stenosis, with ossification of the posterior longitudinal ligament. Postoperative exams showed good decompression, removal of the calcified disc herniation and ossification of the posterior longitudinal ligament.

Patient follow-up: Immediate resolution of sciatica pain and neurological deficit, with a negative nerve stretching test. At one-year follow-up, the patient had no return of radicular symptoms.

Conclusion: Endoscopic surgery can be a reliable treatment option in approaching patients with severe stenosis of the spinal canal associated with calcified disc hernias and ossification of the ligamentum flavum, even when submitted to previous surgeries. This approach also presents benefits of a minimally invasive surgery.

Keywords: Acromegaly, Arthropathy, Ossification of the ligamentum flavum, calcified disc herniation, Full-endoscopic spine surgery, minimally invasive, Radiculopathy

INTRODUCTION

Acromegaly is a chronic, progressive, and debilitating disease, resulting from excessive secretion of growth hormone (GH) and insulin-like growth factor 1 (IGF-1). In most cases, it is sporadic and results from a GH-secreting pituitary adenoma (somatotropinoma), but it can also be associated with familial syndromes. The diagnosis occurs at any age, mostly between 30 and 50 years. Available treatments are neurosurgery, radiotherapy, and drug treatment with somatostatin analogues, cabergoline, or pegvisomant.[1]

Acromegalic arthropathy is an important cause of morbidity and functional disability, with bone changes being highly characteristic of this syndrome.[2] It affects large peripheral joints (hips, knees, and shoulders) and the axial skeleton, mainly the lumbar spine. The pathogenesis of acromegalic arthropathy can be related to endocrine manifestations, especially when IGF-1 induces the growth of joint cartilage and periarticular ligaments, but can also be associated with mechanical changes in joint geometry. This joint imbalance leads to repetitive intra-articular trauma, with consequent formation of scars, cysts, and osteophytes, which can further aggravate deleterious changes in joint geometry and result in degenerative joint diseases.[3]

Patients with acromegaly may develop arthropathy in all bones, but the appendicular and axial skeleton are more commonly affected. The pattern of joint involvement progresses with crepitation and pain, generally preserving joint mobility. The evolution of this arthropathy can lead to anatomo-clinical changes that are almost indistinguishable from osteoarthritis. However, in the initial stages, the accentuated cartilaginous hypertrophy is responsible for peculiar anatomo-radiological findings, mainly represented by the widening of joint and intervertebral disc spaces, especially in the dorsal-lumbar spine.[3-5]

Spinal stenosis is a condition in which the nerve roots are compressed by various pathological factors, leading to symptoms such as pain, numbness, and weakness, being quite prevalent in the elderly population with associated arthropathies. There are three anatomical sites affected by spinal stenosis: the central canal in the anteroposterior dimension, the neural foramen, and the lateral recess, which is defined as the area along the pedicle where a nerve root enters just before it exits through the neural foramen. These anatomical sites can be compressed by herniated discs, hypertrophy of facet joints, and ligaments, unstable slippage of a vertebral body relative to the level below, and hypertrophy of the ligamentum flavum.[6]

A calcified herniated disc or hard disc is defined as a disc containing calcification or ossification in the displaced portion of the herniated disc and is often associated with apophyseal osteophytes.[7] Chronic inflammatory reactions to a herniated disc can cause calcification, and this can generally occur when herniated discs last more than 6 months.[8] Hard or calcified disks are often adhered to the surrounding nervous tissue, and some authors[9-11] report the difficulty of removing the calcified hernial fragment by an endoscopic approach. Nonetheless, in this case report, we demonstrate that it is possible to perform a reliable decompression through this approach using drills and an adequate protection of the neural tissue.

Therefore, this article describes the resolution of a clinical case of lower limb radiculopathy in a patient with acromegaly, secondary to canal stenosis due to ossification of the yellow ligament, facet arthrosis, and calcified disc herniation, with emphasis on endoscopic surgical treatment.

CASE PRESENTATION

Patient history

A 57-year-old patient with a diagnosis of acromegaly resulting from a pituitary GH-secreting macroadenoma underwent transsphenoidal surgery in March 2013. Upon diagnosis, he complained of headache, sinusitis, enlargement of the extremities, and craniofacial alterations. He also denied complaints of arthralgia and did not present intestinal changes, hypertension, or diabetes. Since the patient was previously in the military, he was able to perform regular and high-intensity physical activities.

The exams showed normal visual field, colonoscopy, and echocardiogram. After the surgery, he did not obtain laboratory control of IGF-1, requiring monthly administration of Octreotide 20 mg/month and he already had alterations in perimetry. He evolved well for 5 years until he was off medication for a period of 6 months.

Since then, he has evolved with significant weight gain, hypertension, glucose intolerance, visual changes, polyarthralgia, and hypogonadism. Control sella magnetic resonance imaging (MRI) did not show signs of remnant tumor or recurrence. In 2018, the ultrasound showed severe hepatic steatosis, mild splenomegaly, and prostatic hyperplasia. In 2019, he presented intestinal

tubular adenoma with low-grade dysplasia, and polypectomy was performed. He was regularly using antihypertensive, antilipemic, Glucagon-like peptide 1 (GLP-1) analogues, Octreotide, and several medications for pain control.

The most serious joint involvement in this patient was in the knees and lumbar spine, causing significant physical limitation in a previously highly active individual (military reserve), corroborating the onset of the metabolic syndrome. In addition, he had a diagnosis of rheumatoid arthritis with a negative rheumatoid factor, characterizing the joint pattern of the disease with multiple bone erosions on imaging tests.

Due to his overweight, he underwent L4-L5 open microdiscectomy surgery, and bilateral knee arthroplasty surgeries were necessary due to severe arthrosis. Even by performing a continuous exercise and rehabilitation program, he developed an acute picture of left lumbar sciatic pain, with paresthesia and neurological deficit of the left L5 and S1 roots, decreased sensitivity, and grade 4 strength, with preserved reflexes.

Imaging tests showed stenosis of the lumbar canal at L5-S1 caused by calcified lumbar disc herniation and ossification of the ligamentum flavum (OLF), without improvement considering clinical and physical therapy treatments.

Surgical procedure

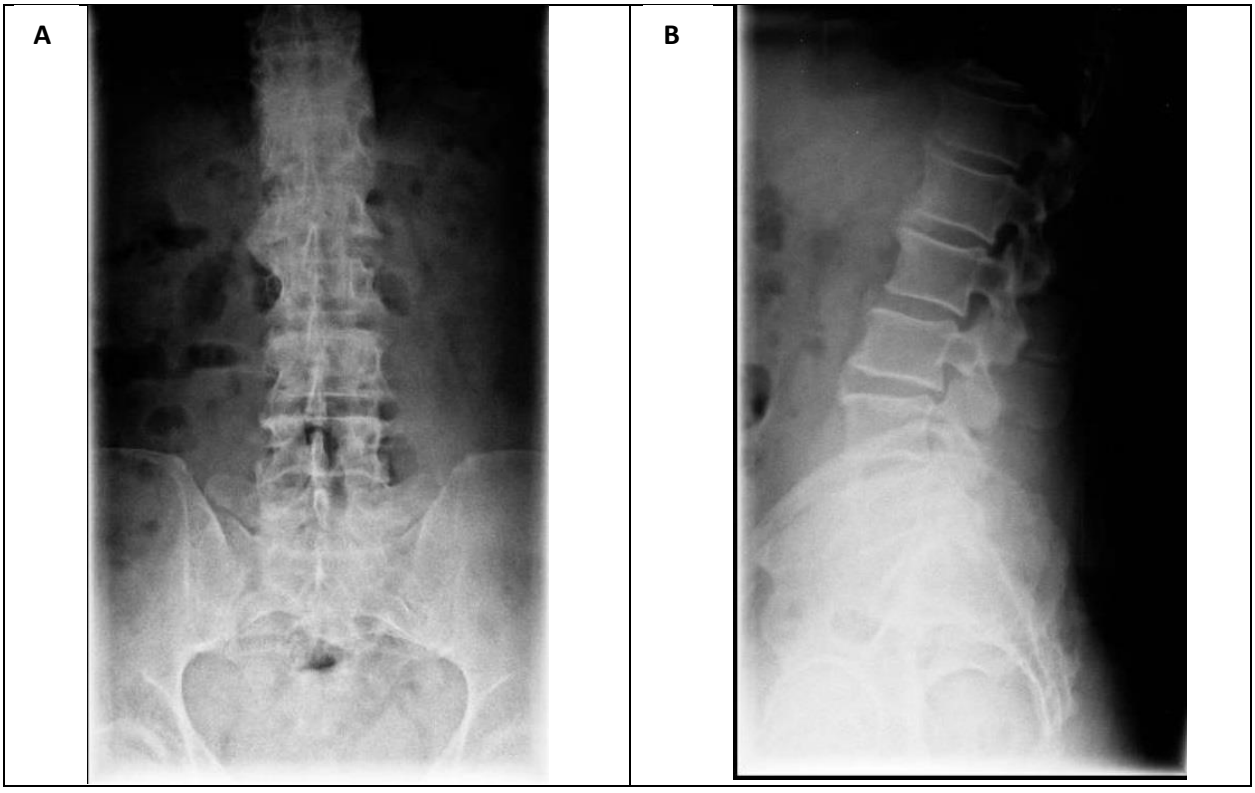
Given the chronic nature of the symptoms, the decompression and discectomy were performed through a full-endoscopic approach L5-S1.

Moreover, due to the characteristics of the patient's compression, the best access route was considered the interlaminar approach. This decision was due to the need to remove the bone from the vertebral lamina, the ligamentum flavum, and also the calcified disc herniation.

The use of cutting and diamond burs and Keirrinson-type forceps were necessary for safe decompression via endoscopic access. In this type of surgery, due to the adhesion of neural structures to chronically inflamed and calcified ligaments, the use of diamond burs was preferred to avoid dural injuries. In this case, we used diamond burs both in the calcified yellow ligament and in the intervertebral disc to remove the protruding disc.

Imaging exams

- Preoperative images, including radiographs, MRI, and computed tomography (CT) scan showed calcified left posterolateral disc herniation and stenosis with ossification of the posterior longitudinal ligament; and presurgical alterations in ipsilateral L4-L5. [Figures 1a-h].



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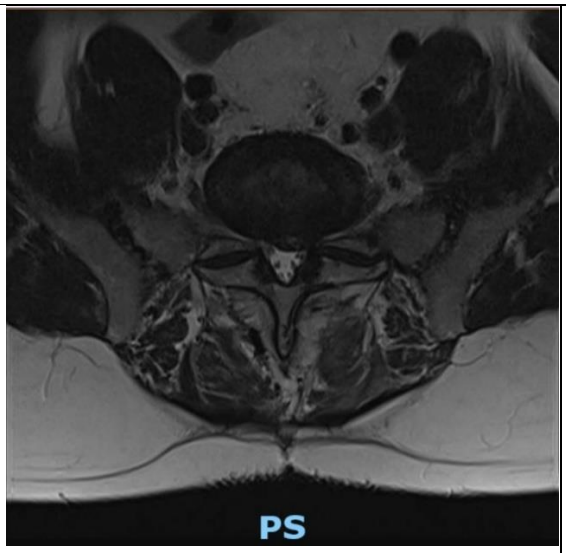

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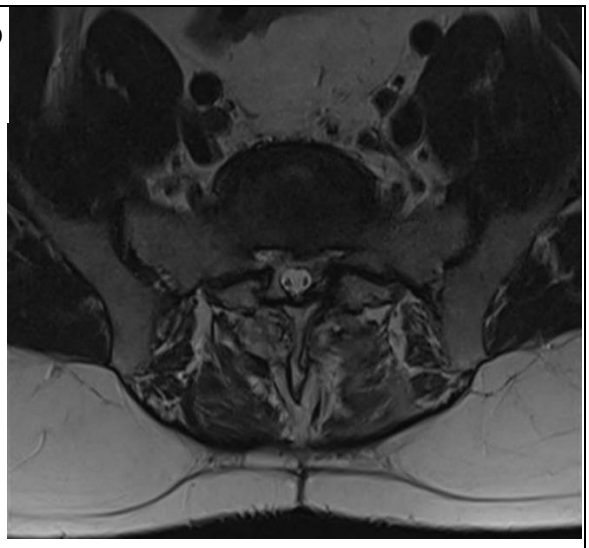

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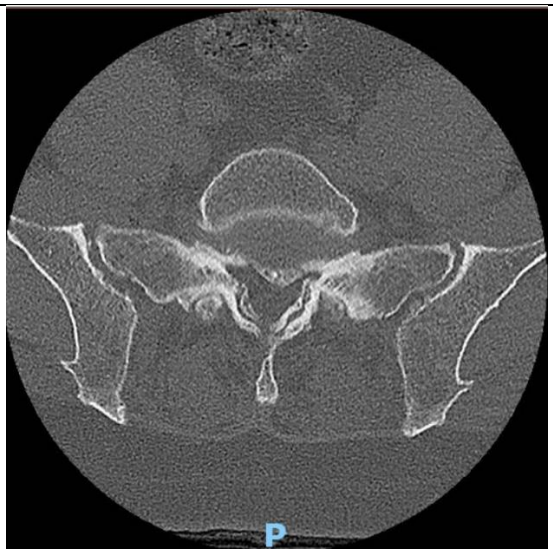
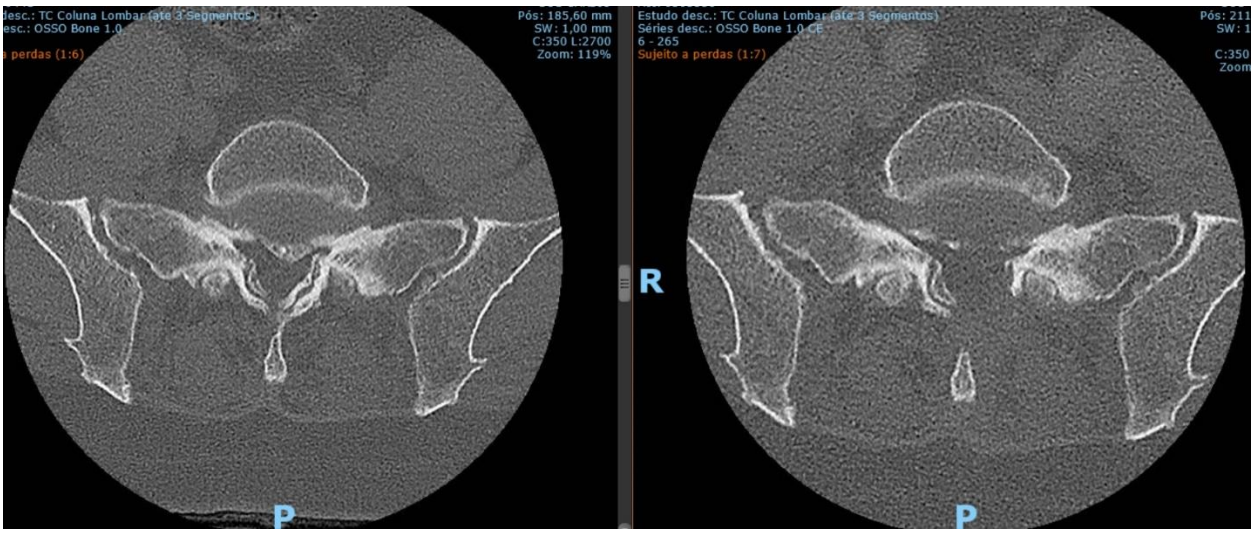


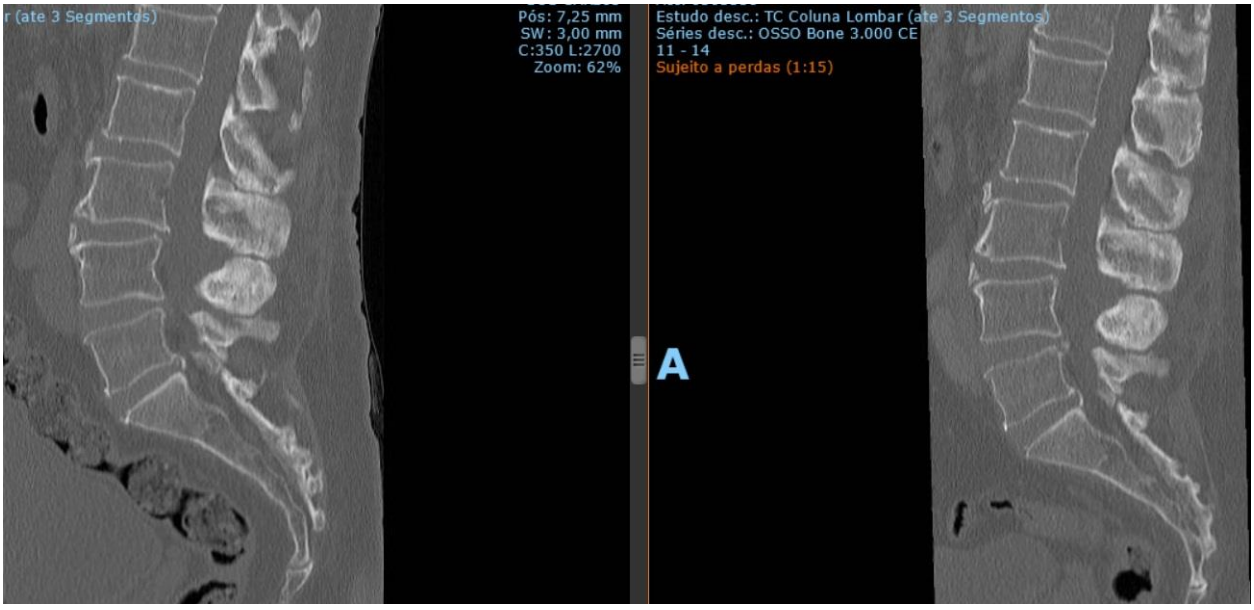
- Postoperative MRI and CT scan images showed good decompression, removal of the calcified left posterolateral disc herniation and ossification of the posterior longitudinal ligament; and presurgical alterations in ipsilateral L4-L5. [Figures 2a-b]. The area of the dural sac was measured pre and postoperatively to assess decompression and an image comparing two incisions. [Figures 2c-d].

MRI can help assess the degree of spinal cord compression or concomitant spinal edema. As shown in the pre- and postoperative exams, with the association of the two exams, it was possible to show the degree of compression of the cauda equina and the extent of possible decompression with the proposed treatment.

A



B



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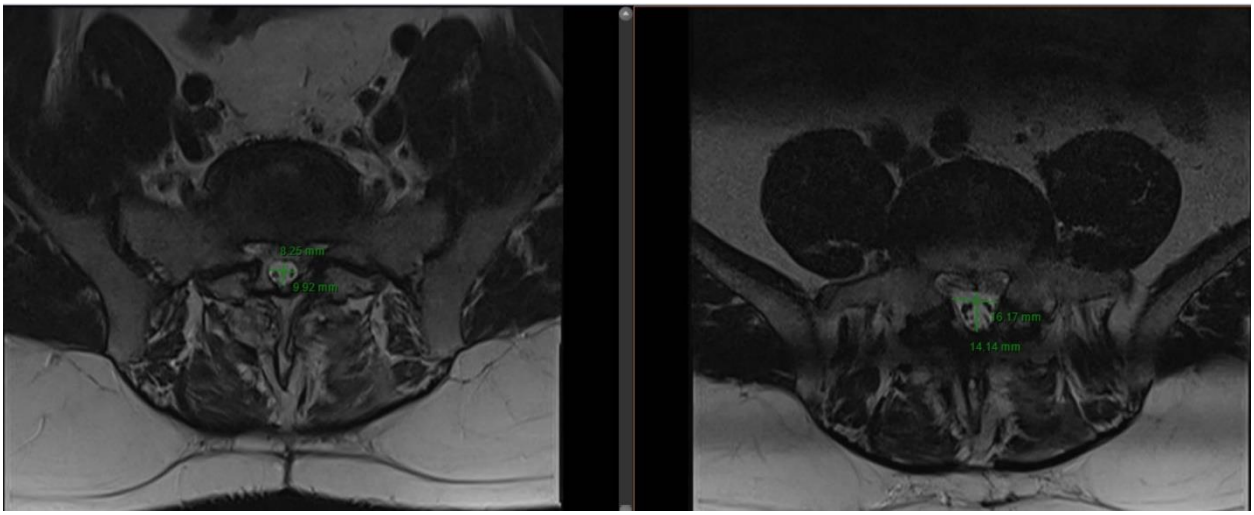

Patient follow-up

In the immediate postoperative period, the patient had complete improvement of the sciatica pain and neurological deficit, with a negative nerve stretching test.

Due to the minimally invasive access, he was discharged twelve hours after the procedure and started physiotherapy in the week following the procedure.

In one year of outpatient follow-up he had no return of radicular symptoms and was still undergoing to rheumatological treatment with recurrent attacks of polyarthralgia, which were controlled by clinical treatment without the need for surgical interventions.

DISCUSSION

Acromegalic arthropathy resulting from bone turnover increased by excessive GH is an alteration present in more than 50% of patients and affects them progressively and in a debilitating manner.[4] Microscopic findings showed an overgrowth of type II collagen preceding the development of ossification, with a reduction in the amount of elastin.

The impact on the quality of life of these patients is very great, as reported in the case above. Early diagnosis is, therefore, essential, as it could prevent the emergence of cardiovascular, respiratory, and neoplastic complications, which are mainly responsible for the increased mortality in acromegaly.[12]

The OLF was first observed in 1920 by Polgar.[13] It is more common in the dorsal column and can run in the cervical and lumbar region, being found mainly in the elderly, and can cause spinal stenosis.[14-16] Several authors report the surgical resolution of compressive conditions secondary to canal stenosis by OLF,[17, 18] including some by endoscopic approach.[19, 20]

The developmental mechanism of OLF may depend not exclusively on dynamic and static mechanical stresses, but also on the role of some growth factors.[15, 20] There seems to be an overexpression of genes and transcription factors centered on the Notch and Wnt signaling pathways due to increased mechanical stress.[16] There may be some tendency in the genesis of OLF secondary to the metabolic alteration of acromegaly with excessive GH and IGF-1.

Calcified lumbar disc herniation has a low incidence rate and a hard structure, which generally adheres extensively to the surrounding tissues, such as nerve roots and the dural sac. The symptomatology is low back pain, sciatica, and severe neurological symptoms in the acute phase.[21] Conservative treatments often fail, as there is no reabsorption of the hernial fragment.

Microdiscectomy or open discectomy are the standard procedures for symptomatic lumbar disc herniation and involve the removal of the portion of the intervertebral disc that compresses the nerve root or spinal cord (or both) with or without the aid of a magnifying glass or microscope magnification. Endoscopic interlaminar discectomy and transforaminal endoscopic discectomy are minimally invasive surgeries to treat lumbar disc herniation.

In comparison with the endoscopic technique, it presents a larger incision, greater injury to the paraspinal muscles, need for a larger laminectomy,

consequently generating significant tissue damage, considerable intraoperative blood loss due to the epidural venous plexus, denervation and muscle atrophy, and even segmental instability.[22, 23] Some authors also report less postoperative pain, shorter hospital stays, and earlier return to work.[24-26]

Due to the location of the main compressive site in the lateral recess at the L5-S1 level, and the association of pathologies with OLF, facet arthrosis, and calcified disc herniation, the interlaminar endoscopic approach was chosen instead of the transforaminal one.[27] Some studies report that both the interlaminar and transforaminal endoscopic access achieve good clinical efficacy for L5-S1 lumbar decompression; however, the interlaminar access has advantages of shorter operative time and fluoroscopy time in the treatment of calcified disc hernias.[28, 29]
Although it is technically more difficult and challenging to treat calcified disc hernias with the endoscopic technique due to the adhesion of the hernial fragment to the nerve roots and dural sac,[30] in this case the possibility of complete resection of the calcified disc was demonstrated even in the presence of severe stenosis.

With the emergence of surgical instruments in the last decade, such as Keirrison forceps, ultrasonic osteotomes, and endoscopic grinding burs, in addition to the evolution in the learning curve of surgeons, the indications for spine endoscopy surgery were gradually applied in the treatment of herniated discs associated with other causes of spinal stenosis.

Therefore, the present case report can raise the awareness of clinicians about currently available treatments for OLF arising from acromegalic arthropathy. This study also highlights the advantages of an endoscopic approach for treating these cases, which can reduce postoperative pain and complications related to more aggressive surgical techniques.

CONCLUSION

Endoscopic decompression can be safely used in canal stenoses. With the use of cutting and diamond burs, it is possible to treat the three components of canal stenosis, facet arthrosis, disc disease, and yellow ligament hypertrophy. The resolution of this rare case with the association of pathologies of OLF, facet arthrosis, and calcified disc hernia demonstrates that the spine endoscopy technique can be used for safe decompression of the vertebral canal, complete pain relief, regression of neurological deficit signs, minimal muscle damage and no dural damage.

PATIENT CONSENT STATEMENT

A written informed consent was obtained from the patient for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal upon request.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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