Case Report
Endoscopy
http://dx.doi.org/10.1590/S1808-185120242304291142

TRANSCORPOREAL ENDOSCOPIC RESECTION OF OSTEOID OSTEOMA IN S1: CASE REPORT

RESSECÇÃO ENDOSCÓPICA TRANSCORPÓREA DE OSTEOMA OSTEÓIDE EM S1: RELATO DE CASO

RESECCIÓN ENDOSCÓPICA TRANSCORPORAL DE OSTEOMA OSTEOIDE EN S1: REPORTE DE CASO

Diogo Costa de Almeida[1,2], Kelsen de Oliveira Teixeira[1,2], Ricardo Squiapati Graciano[1,2], Bruno Brasil do Couto[3,4], Mateus Machado Bergamaschi[1], Marcelo Botelho Soares de Brito[1,3,4], Fernanda Wirth[5], João Paulo Machado Bergamaschi[1,2,5]

1. Universidade de São Paulo, Ribeirão Preto Medical School (USP-RP), Specialization Course in Endoscopic Spine Surgery, Ribeirão Preto, SP, Brazil.
2. Atualli Spine Care Clinic, São Paulo, SP, Brazil.
3. Articulare Clinic and Porto Dias Hospital, Belém, Pará, Brazil.
4. Hospital Porto Dias, Belém, PA, Brazil.
5. Atualli Academy, São Paulo, SP, Brazil.

ABSTRACT

The objective of this article was to present an uncommon case of fully endoscopic resection of an osteoid osteoma in the S1 vertebra in a patient with lower back pain and no neurological symptoms. The patient was a 26-year-old male with significant lower back pain, worsening at night and improving with the use of non-steroidal anti-inflammatory drugs (NSAIDs). Lumbar imaging revealed an osteoblastic lesion near the right pedicle in the S1 vertebral body, with no evident nidus or contrast uptake. A biopsy guided by computed tomography confirmed the diagnosis of osteoid osteoma. The patient was treated with a fully endoscopic transcorporeal resection of S1 via a posterolateral extra-foraminal approach. The surgical technique was detailed, and the patient showed immediate clinical symptom improvement. Although there are several surgical techniques for the resection of spinal tumors, there is no consensus in the literature regarding the best surgical technique or conservative treatments. However, fully endoscopic techniques are emerging as a promising method for both diagnosis and treatment, potentially reducing complications and procedural morbidity. ***Level of Evidence IV; Case Report.***

Keywords: Osteoma, Osteoid; Endoscopic Surgical Procedure; Sacral Vertebrae; Low Back Pain; Spinal Neoplasms.

RESUMO

O objetivo desse artigo foi apresentar um caso incomum de ressecção totalmente endoscópica de um osteoma osteóide na vértebra S1 em um paciente com dor lombar sem sintomas neurológicos. Paciente masculino de 26 anos com dor lombar baixa importante, com piora noturna e melhora com uso de anti-inflamatórios não esteróides (AINE). Exames de imagem lombar evidenciaram lesão osteoblástica no corpo de S1 próximo do pedículo direito, sem nidus evidente e sem captação por contraste. Foi realizada biópsia guiada por tomografia computadorizada, confirmando o diagnóstico de osteoma osteóide. O paciente foi tratado com ressecção totalmente endoscópica transcorpórea de S1 por via póstero-lateral extra-foraminal. A técnica cirúrgica foi descrita detalhadamente e o paciente apresentou melhora clínica imediata dos sintomas. Embora existam diversas técnicas cirúrgicas para ressecção de tumores na coluna, não há consenso na literatura sobre a melhor técnica cirúrgica ou sobre tratamentos conservadores. Entretanto, a técnica totalmente endoscópica vem surgindo como um método promissor, tanto para diagnóstico quanto para tratamento, com possibilidade de redução de complicações e morbidade do procedimento. ***Nível de Evidência IV; Relato de Caso****.*

Descritores: *Osteoma Osteoide; Procedimentos Cirúrgicos Endoscópicos; Vértebra Sacral; Dor Lombar; Neoplasias da Coluna Vertebral.*

RESUMEN

El objetivo de este artículo fue presentar un caso inusual de resección totalmente endoscópica de un osteoma osteoide en la vértebra S1 en un paciente con dolor lumbar sin síntomas neurológicos. El paciente era un hombre de 26 años con dolor lumbar significativo, que empeoraba por la noche y mejoraba con el uso de antiinflamatorios no esteroideos (AINE). Las imágenes lumbares revelaron una lesión osteoblástica en el cuerpo vertebral de S1, cerca del pedículo derecho, sin nidus evidente y sin captación de contraste. Se realizó una biopsia guiada por tomografía computarizada, que confirmó el diagnóstico de osteoma osteoide. El paciente fue tratado con una resección transcorporal totalmente endoscópica de S1 mediante un abordaje posterolateral extra-foraminal. La técnica quirúrgica fue descripta en detalle, y el paciente mostró una mejora clínica inmediata de los síntomas. Aunque existen varias técnicas quirúrgicas para la resección de tumores espinales, no hay consenso en la literatura sobre la mejor técnica quirúrgica o sobre los tratamientos conservadores. Sin embargo, las técnicas totalmente endoscópicas están surgiendo como un método prometedor, tanto para el diagnóstico como para el tratamiento, con la posibilidad de reducir las complicaciones y la morbilidad del procedimiento. ***Nivel de Evidencia IV; Reporte de Caso.***

Descriptores: *Osteoma Osteoide; Procedimientos Quirúrgicos Endoscópicos; Vértebra Sacra; Dolor de la Región Lumbar; Neoplasias de la Columna Vertebral.*

Study conducted by the Atualli Spine Care Clinic, São Paulo, SP, Brazil.
Correspondence: João Paulo Machado Bergamaschi. Atualli Academy, 539 Bela Cintra Street, 6th floor, Consolação, São Paulo, SP, Brazil. jberga@clinicaatualli.com.br

CC BY

Received on 10/15/2024 accepted on 11/01/2024
Reviewed by: Erasmo Zardo

INTRODUCTION

The osteoid osteoma (OO) is a benign bone-forming tumor[1]. They are relatively rare tumors, accounting for only 10% of all primary tumors[1]. Most tumors in the spine occur in the posterior elements[2]. Generally, it presents clinically with a picture of axial pain without apparent cause, worsening at night and alleviated by the use of symptomatic and analgesic[1]. The diagnosis can be made through imaging exams such as X-rays, computed tomography (CT), and magnetic resonance imaging (MRI), classically presenting as a central radiolucent lesion, surrounded by a variable area of sclerosis, with the central region possibly being evident or not (nidus)[3]. CT is the exam with the best accuracy for diagnosis when compared to X-rays and MRI[4].

Conservative and surgical approaches are available for treatment possibilities for OO. Some percutaneous techniques[5] guided by CT or MRI are described in the literature, allowing more precision during chemical ablation, radiofrequency, or cryotherapy[5,6].

More recently, with the advent of endoscopic spinal surgery, the possibility of OO resection under direct visualization and with minimal secondary tissue aggression arises, thus determining lower rates of surgical complications[7].

In this context, we aim to report a case of OO in the body of the S1 vertebra treated by endoscopic resection and to conduct a simple literature review on the subject.

CASE REPORT

The patient signed the informed consent form (ICF), and the report was approved by the Ethics Committee (CAAE 70416223.8.0000.5487, opinion number 6.339.106).

Male patient, 26 years old, without comorbidities, no history of trauma, no clinical and laboratory signs of infectious diseases, complaining of low back pain that worsened at the end of the day for about 6 months. Presented with burning pain in the lower right paravertebral lumbar region that worsened with movement and improved with the use of non-steroidal anti-inflammatory drugs (NSAIDs). Patient without complaints of pain radiation and sensory and motor changes.

Regarding pain intensity, the patient was assessed using the visual analog scale (VAS) with an intensity of 7 (0-10) for lower back pain and functional disability by the Oswestry Disability Index (ODI) scoring 50%, indicating severe disability (severe disability between 41-60%).

On clinical examination, the patient presented with pain on deep palpation of the right lumbar paravertebral muscles at the level of the L5 spinous process, without pain on bone palpation of the spine, with slight spasm of the right paravertebral muscles, without deformities. Normal neurological examination and negative provocative maneuvers for radiculopathy.

In the simple X-rays of the lumbar spine, no bone lesions were evident, only a slight scoliotic posture with convexity to the left (Figure 1A). The CT of the lumbar spine showed a lesion with osteosclerotic predominance in the body of S1 on the right, measuring approximately 1.5 cm by 0.8 cm, without signs of aggressiveness (Figures 1B,1C). In the MRI with T1 and T2 weighting, we observe a hypoattenuating lesion with a hypercaptant central region (nidus), mainly observed in T2 in the posterolateral portion of the S1 body (Figures 1D,1E). The bone scintigraphy exam showed no abnormal uptake in the S1 region at any stage.

It was decided to perform a biopsy guided by tomography. Anatomopathological study and immunohistochemistry confirmed the diagnosis of OO. The patient, after undergoing the biopsy, showed partial improvement in the lower back pain condition, reducing the need for NSAID use for about three months. After this period, the patient returned to presenting with pain levels similar to those at the beginning of the clinical picture.

As the patient presented with significant functional disability, surgical intervention was proposed. Considering that it was a single, benign, well-defined lesion located on the body of S1 with proximity to neurological structures and also in a young patient, an endoscopic approach was indicated to reduce the risks of neurological injury, decreasing the chance of partial resection, and reducing the risks of instability due to excessive resection of the posterior elements.

The procedure was performed by a spine surgery specialist with over 5 years of experience in endoscopic spine surgery. The chosen access was the right extra-foraminal postero-lateral route, with a skin incision of 7 mm at 10 cm from the midline.

Procedure performed under general anesthesia. The puncture was guided by radioscopy targeting the superolateral portion of the right pedicle of S1. The dilators were placed after positioning the guide wire, and the eight-millimeter diameter working cannula was introduced. Following the confirmation of the extra-foraminal positioning, the ENDOLINE endoscope with a 4.3mm diameter working channel and a 30-degree angulation was introduced (Figure 2).

Initially, hemostatic control was performed with bipolar forceps and resection of soft tissues to identify the right pedicle of S1. Foraminoplasty and resection of the cranial edge of the pedicle were performed with a foraminoplasty drill. During the bone resection process, in addition to direct visualization, radioscopy was used to confirm our location. The posterior cortex of the S1 body was removed, and spongy bone interspersed with vascularized tissue was identified. Bone resection was performed until bone with a normal macroscopic appearance was identified at all lesion edges. After hemostasis with bipolar forceps, the endoscope, and working cannula were removed, and skin suturing was performed with a simple 3.0 nylon stitch. The procedure lasted 71 minutes without clinical or anesthetic complications.

In the immediate postoperative period, the patient already showed improvement in lower back pain despite reporting discomfort at the access site. He maintained a normal neurological exam and was discharged from the hospital 6 hours after the procedure. Activities of daily living were resumed immediately, and work activities were resumed in two weeks.

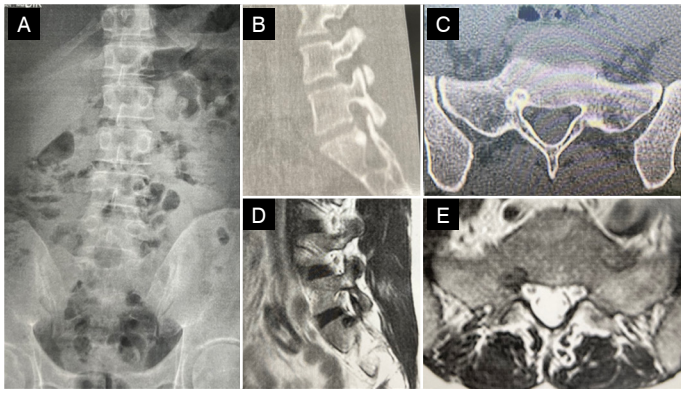

Figure 1. Preoperative exams of the patient: simple radiography (A), CT (B,C), and MRI (D,E).

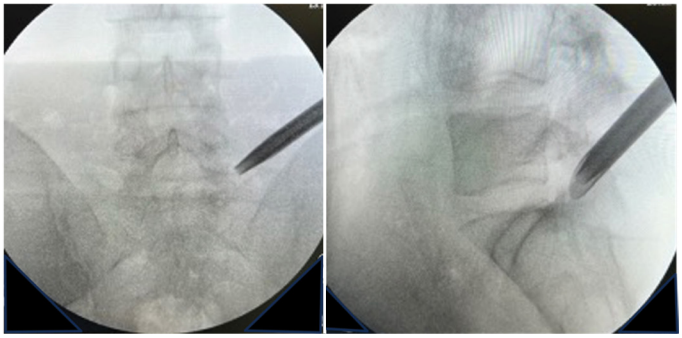

Figure 2. Positioning of the dilator and working sleeve in the super-lateral portion of the right pedicle of S1.

In the first outpatient reassessment, after 14 days of the procedure, the patient showed significant improvement in pain with a lumbar VAS of 1 and an ODI of 4% (minimal disability), with the complaint of mild lower back pain more on the access route. The patient returned on an outpatient basis one month post-operatively with CT and MRI controls showing adequate resection of the OO (Figure 3) and complete pain improvement (lumbar VAS of zero) and ODI of 0%. After 18 months after the procedure, the patient was in outpatient follow-up, maintaining clinical improvement and radiological exams without signs of recurrence.

DISCUSSION

Primary bone tumors in the spine are rare, accounting for only 2.8% - 13% of bone tumors[8], of which OO accounts for only 0.3%, with a prevalence in males (2:1) [9]. It occurs more frequently in long bones with histological characteristics of osteoblasts with immature bone tissue, usually small, benign, and self-limiting tumors[10].

Regarding the radiological presentation, it is usually an isolated lesion with osteosclerotic characteristics, with or without the presence of a nidus, and may present an area of surrounding sclerosis, and on MRI showing low intensity on T1 and T2 weightings[11,12]. Angiographic studies of the spine and the use of contrast in exams are not very specific, not having a well-defined propaedeutic role[12].

Although small, the OO usually generates a significant pain condition due to the local production of prostaglandins E2 (PGE2)[11]. As there is a predominance of the location of these tumors in the posterior elements of the spine, which is the site of emergence of the nerve roots, there may be compression or irritation of these roots causing neuropathic pain[11,12].

The low incidence of cases associated with nonspecific symptoms such as back pain and lower back pain end up delaying early diagnosis. Symptoms are generally alleviated with the use of NSAIDs, classically with acetylsalicylic acid[11,12].

Differential diagnoses should include aneurysmal bone cyst, osteoblastoma, giant cell tumor, osteosarcoma, Ewing's sarcoma, enchondromas, osteochondroma, chondrosarcoma, and osteomyelitis. Metastases should be taken into account, especially in elderly patients[12]. Although the image is often quite characteristic of OO, the definitive diagnosis can only be made through a histopathological examination[12].

The histopathological examination shows osteoblasts around immature osteoid tissue interspersed in hypervascularized connective tissue, with varying degrees of sclerotic reaction around the lesion[11,12]. Classically, these tumors are primarily classified by their size, with lesions smaller than 1.5 cm being considered OO and other lesions considered osteoblastomas[14]. Raskas et al.[13] proposed a classification that defined osteoblastomas as tumors with neuronal and adjacent tissue involvement, thus prioritizing biological behavior over lesion size[13].

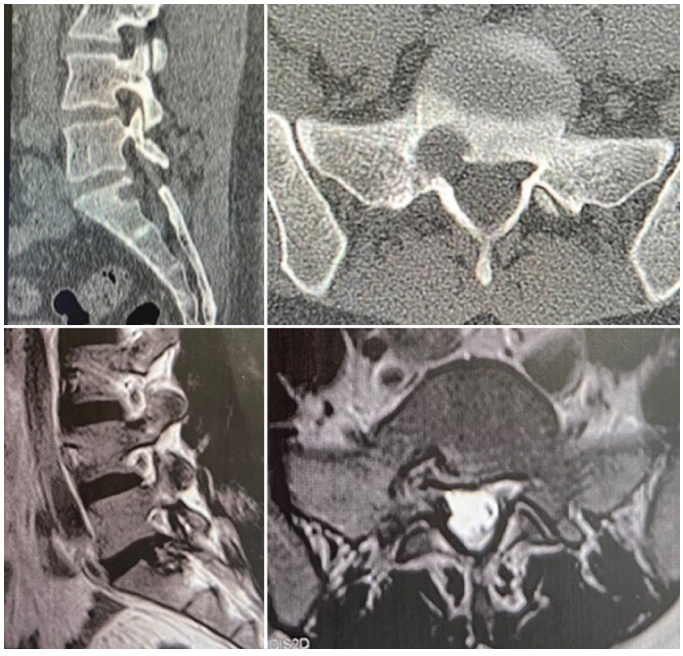

Figure 3. Postoperative CT and MRI showed total resection of the lesion.

Patients without neurological impairment and with good symptom control can be managed with observation and symptomatic treatment[12]. Surgical indication for the treatment of OO should be considered in cases of progression of the clinical condition with functional loss, deformities, tumor growth, and diagnostic doubts[14].

Conventional surgical techniques allow for the anatomopathological confirmation and resection of the lesion, but they are associated with the possibility of iatrogenic instability, secondary injuries, and inadequate resection of the lesion[12,14], as well as the possibility of prolonged absence from physical and work activities[15,16].

CT-guided radiofrequency ablation has been used as a minimally invasive alternative in the approach to OO with smaller incisions and less tissue damage than tubular retractors and working cannulas, however, with two major disadvantages: first, the inability of CT to directly visualize the lesion, which can lead to ablation of the wrong site and the possibility of ablation of neural structures; as well as the inability to ablate tumors very close to neurological structures[17,18].

Given the limitations of classical techniques, endoscopy has emerged as a therapeutic option for the resection of benign tumors in the spine, with the advantage of allowing direct visualization of lesions and adjacent structures, minimal incisions, shorter hospitalization and rehabilitation time, greater preservation of bone and ligament structures, reducing the need for arthrodesis. However, this technique requires specific anatomical knowledge, meticulous preoperative planning, and a long learning curve[7,19,20].

Fully endoscopic surgeries have been widely used for the treatment of degenerative diseases such as disc herniation and lumbar stenosis, and as this case report demonstrates, they are also emerging as a good option for resection of bone tumors in the spine[21,22]. Tianhang Xie et al.,[19] in a series of 11 cases, demonstrated good symptom control, shorter hospitalization time, and recovery in the 3-year follow-up of benign lesions in the lumbar and sacral spine, resected by purely endoscopic technique[19]. Bergamaschi et al.[23] reported a case of endoscopic resection of OO in the dorsal spine in a 9-year-old patient, with good results[23].

Regardless of the chosen technique, the outcome of surgical resection of OO in the literature is quite favorable, with good clinical results achieved in more than 90% of patients in most literature reviews[24-27]. Even so, we must consider that the good results of endoscopic surgery are directly related to the technical capacity of the team and an adequate learning curve[28]. Therefore, this case report aims merely to highlight endoscopic surgery as a good minimally invasive therapeutic option with lower morbidity for the treatment of OO, and not as the only option, and it should be used in cases favorable to the technique and with a trained team.

CONCLUSION

The case report demonstrated a fully endoscopic resection of an OO in the S1 vertebra, symptomatic and refractory to conservative treatment, with a description of the endoscopic surgical technique, with favorable clinical and radiological evolution, without intraoperative complications and without complications in the follow-up for 18 months. Therefore, fully endoscopic techniques for OO resection, although quite promising, require further studies with larger case series and longer follow-ups to confirm their effectiveness and safety.

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

CONTRIBUTIONS OF THE AUTHORS: Each author contributed individually and significantly to the development of this article. DCA, KOT, JPMB: planning and performing the surgery; RSG, BBC, MBSB: data analysis and manuscript preparation; MMB, FW, JPMB: article review and submission to the journal.

REFERENCES

1. Ren X, Yang L, Duan XJ. Three-dimensional printing in the surgical treatment of osteoid osteoma of the calcaneus: A case report. Int J Med Res. 2017;45(1):372-80. doi: 10.1177/0300060516686514.
2. Gasbarrini A, Cappuccio M, Bandiera S, Amendola L, van Urk P, Boriani S. Osteoid Osteoma of the Mobile Spine: Surgical Outcomes in 81 Patients. Spine (Phila Pa 1976). 2011;36(24):2089-93.
3. Sergi C, Zwerschke W. Osteogenic sarcoma (osteosarcoma) in the elderly: Tumor delineation and predisposing conditions. Exp Gerontol. 2008;43(12):1039-43. doi: 10.1016/j.exger.2008.09.009.
4. Hosalkar HS, Garg S, Moroz L, Pollock A, Dormans JP. The Diagnostic Accuracy of MRI versus CT Imaging for Osteoid Osteoma in Children. Clin Orthop Relat Res. 2005;(433):171-7.
5. Azouz EM, Kozlowski K, Marton D, Sprague P, Zerhouni A, Asselah F. Osteoid osteoma and osteoblastoma of the spine in children. Pediatr Radiol. 1986;16(1):25-31. doi: 10.1007/BF02387501.
6. Masciocchi C, Zugaro L, Arrigoni F, Gravina GL, Mariani S, La Marra A, et al. Radiofrequency ablation versus magnetic resonance guided focused ultrasound surgery for minimally invasive treatment of osteoid osteoma: a propensity score matching study. Eur Radiol. 2016;26(8):2472-81. doi: 10.1007/s00330-015-4111-7.
7. Wu PH, Kim HS, Jang IT. A Narrative Review of Development of Full-Endoscopic Lumbar Spine Surgery. Neurospine. 2020;17(Suppl 1):S20-3. doi: 10.14245/ns.2040116.058.
8. Kelley SP, Ashford RU, Rao AS, Dickson RA. Primary bone tumours of the spine: a 42-year survey from the Leeds Regional Bone Tumour Registry. Eur Spine J. 2007;16(3):405-9. doi: 10.1007/s00586-006-0188-7.
9. Jackson RP, Reckling FW, Mants FA. Osteoid osteoma and osteoblastoma. Similar histologic lesions with different natural histories. Clin Orthop Relat Res. 1977;(128):303-13.
10. Lichtenstein L. Benign osteoblastoma; a category of osteoid-and bone-forming tumors other than classical osteoid osteoma, which may be mistaken for giant-cell tumor or osteogenic sarcoma. Cancer. 1956;9(5):1044-52. doi: 10.1002/1097-0142(195609/10)9:5<1044::aid-cncr2820090523>3.0.co;2-o.
11. Pourfeizi HH, Tabrizi A, Bazavar M, Sales JG. Clinical findings and results of surgical resection of thoracolumbar osteoid osteoma. Asian Spine J. 2014;8(2):150-5. doi: 10.4184/asj.2014.8.2.150.
12. Kan P, Schmidt MH. Osteoid osteoma and osteoblastoma of the spine. Neurosurg Clin N Am. 2008;19(1):65-70. doi: 10.1016/j.nec.2007.09.003.
13. Raskas DS, Graziano GP, Herzenberg JE, Heidelberger KP, Hensinger RN. Osteoid osteoma and osteoblastoma of the spine. J Spinal Disord. 1992;5(2):204-11. doi: 10.1097/00002517-199206000-00010.
14. Ropper AE, Cahill KS, Hanna JW, McCarthy EF, Gokaslan ZL, Chi JH. Primary vertebral tumors: a review of epidemiologic, histological, and imaging findings, Part I: benign tumors. Neurosurgery. 2011;69(6):1171-80. doi: 10.1227/NEU.0b013e31822b8107.
15. Jiang L, Liu XG, Yuan HS, Yang SM, Li J, Wei F, et al. Diagnosis and treatment of vertebral hemangiomas with neurologic deficit: a report of 29 cases and literature review. Spine J. 2014;14(6):944-54. doi: 10.1016/j.spinee.2013.07.450.
16. Tomasian A, Wallace AN, Jennings JW. Benign Spine Lesions: Advances in Techniques for Minimally Invasive Percutaneous Treatment. AJNR Am J Neuroradiol. 2017;38(5):852-61. doi: 10.3174/ajnr.A5084.
17. Martel J, Bueno Á, Nieto-Morales ML, Ortiz EJ. Osteoid osteoma of the spine: CT-guided monopolar radiofrequency ablation. Eur J Radiol. 2009;71(3):564-9. doi: 10.1016/j.ejrad.2008.04.020.
18. Osti OL, Sebben R. High-frequency radio-wave ablation of osteoid osteoma in the lumbar spine. Eur Spine J. 1998;7(5):422-5. doi: 10.1007/s005860050101.
19. Xie T, Xiu P, Song Y, Zeng J, Huang S. Percutaneous Endoscopic Excision and Ablation of Osteoid Osteoma of the Lumbar Spine and Sacrum: A Technical Note and Outcomes. World Neurosurg. 2020;133:121-6. doi: 10.1016/j.wneu.2019.09.039.
20. Yoshioka K, Matsuda E, Murakami H, Tsuchiya H. Microendoscopic Excision of Osteoid Osteoma in the Pedicle of the Third Lumbar Vertebra. Asian Spine J. 2015;9(6):958-61. doi: 10.4184/asj.2015.9.6.958.
21. Kim KH, Joo YC, Ok WK, Baik SH, Kim HJ, Kwon OS. Removal of a Vertebral Metastatic Tumor Compressing the Spinal Nerve Roots via a Single-Port, Transforaminal, Endoscopic Approach Under Monitored Anesthesia Care. Pain Physician. 2012;15(4):297-302.
22. Konakondla S, Sofoluke N, Xia J, Grant R, Telfeian AE, Hofstetter CP, et al. Transforaminal Endoscopic Approach for Large-Sample Tumor Biopsy using Beveled Working Channel for Core Technique: A Technical Note. World Neurosurg. 2020;141:346-51. doi: 10.1016/j.wneu.2020.05.096.
23. Bergamaschi JPM, Costa CAM, Sandon LH. Full-Endoscopic Resection of Osteoid Osteoma in the Thoracic Spine: A Case Report. Int J Spine Surg. 2021;14(s4):S78-86. doi: 10.14444/7169.
24. Xie TH, Zeng JC, Li ZH, Wang L, Nie HF, Kiamg HS, et al. Complications of Lumbar Disc Herniation Following Full-endoscopic Interlaminar Lumbar Discectomy: A Large, Single-Center, Retrospective Study. Pain Physician. 2017;20(3):E379-87.
25. Quraishi NA, Boriani S, Sabou S, Varga PP, Luzzati A, Gokaslan ZL, et al. A multicenter cohort study of spinal osteoid osteomas: results of surgical treatment and analysis of local recurrence. Spine J. 2017;17(3):401-8. doi: 10.1016/j.spinee.2016.10.010.
26. Kirwan EO, Hutton PA, Pozo JL, Ransford AO. Osteoid osteoma and benign osteoblastoma of the spine. Clinical presentation and treatment. J Bone Joint Surg Br. 1984;66(1):21-6. doi: 10.1302/0301-620X.66B1.6693472.
27. Pettine KA, Klassen RA. Osteoid-osteoma and osteoblastoma of the spine. J Bone Joint Surg Am. 1986;68(3):354-61.