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Cervicothoracic Non-dysraphism Intradural Lipoma: A Case Report and Surgical Outcome

Thi Bich Phuong Lam[1,2], Van Tan Nguyen[1], Minh Tien Vu[1], Nguyen Trong Huu Phan[1,2], Thien Thanh Le[1,3], Tuan Bao Duong[1,3]

1. Department of Neurosurgery, Buon Ma Thuot Medical University Hospital, Vietnam
2. Department of Surgery, Faculty of Medicine, Buon Ma Thuot Medical University, Vietnam
3. Pleiku City Medical Center, Vietnam

Abstract

Background: Cervicothoracic non-dysraphic intradural lipomas are rare benign spinal tumors that can cause progressive neurological deficits due to spinal cord and nerve root compression. These tumors are challenging to manage due to their dense adhesion to critical neural structures, which often renders complete excision unfeasible. This case demonstrates that subtotal resection can effectively balance symptomatic relief and preservation of neurological function.

Case Presentation: A 24-year-old male presented with a 2-month history of progressive neck pain, hand numbness, and limb weakness. Magnetic resonance imaging (MRI) revealed a cervicothoracic intradural lipoma causing significant spinal cord compression without intramedullary signal changes, suggesting reversible compression. Posterior decompression and subtotal resection were performed using a surgical microscope. The tumor, pale yellow and soft, was adherent to the spinal cord and nerve roots, necessitating the deliberate decision to leave a small residual portion to minimize neurological risks. Postoperatively, the patient demonstrated marked neurological improvement, including reduced pain, resolution of numbness, and full recovery of muscle strength. A follow-up at 20 days confirmed clinical improvement, with MRI showing substantial reduction in spinal cord compression.

Conclusions: Subtotal resection is a safe and effective surgical approach for managing symptomatic cervicothoracic intradural lipomas, particularly when complete excision poses significant risks. This approach allows for significant symptom relief while preserving neurological function. The absence of intramedullary signal changes on preoperative MRI served as a favorable prognostic factor, indicating reversible spinal cord compression. Long-term follow-up is crucial to monitor residual tumor growth and ensure sustained clinical stability. This case highlights the importance of individualized surgical planning and cautious intraoperative decision-making to achieve optimal outcomes.

Keywords: Non-dysraphism intradural lipoma; Spinal lipomas; Benign spinal tumors; Case report; Spinal tumor management

Introduction

Cervicothoracic non-dysraphic intradural lipomas are extremely rare benign spinal tumors, constituting less than 1% of all spinal tumors, and are typically located within the intradural space without any association with spinal dysraphism [1,2]. Unlike dysraphic lipomas, which are frequently linked to congenital anomalies, these tumors are thought to result from abnormal mesenchymal differentiation during neural tube closure, leading to ectopic fat deposition [3,4]. Despite their benign histological nature, intradural lipomas can cause significant neurological deficits as a result of progressive spinal cord and nerve root compression [1,2].

These tumors often remain asymptomatic in their early stages and are usually detected only when they grow sufficiently large to cause mechanical compression. Patients commonly present with a gradual onset of neck or back pain, sensory disturbances, motor weakness, and, in advanced cases, sphincter dysfunction [1,5]. Imaging modalities, particularly magnetic resonance imaging (MRI), play a critical role in the diagnosis. T1- and T2-weighted MRI sequences typically reveal hyperintense lesions consistent with their lipomatous nature, while STIR imaging often shows hypointensity, aiding in differentiation from other spinal lesions [4,6]. Importantly, the absence of intramedullary signal changes on MRI has been associated with reversible spinal cord compression and better surgical outcomes [7].

The management of symptomatic non-dysraphic intradural lipomas is primarily surgical. Complete excision is rarely achievable due to the dense adhesion of these tumors to critical neural structures, such as the spinal cord and nerve roots, which increases the risk of iatrogenic neurological injury [5,8]. Subtotal resection is therefore considered the standard approach, as it provides substantial symptomatic relief while preserving neurological function [8,9]. Although subtotal resection is associated with a risk of tumor recurrence, the indolent nature of these lesions often allows for extended asymptomatic periods, minimizing the need for frequent reoperations [8]. Given their rarity and the challenges associated with their management, this report highlights the clinical presentation, imaging findings, surgical strategies, and outcomes in a patient with a cervicothoracic non-dysraphic intradural lipoma. It underscores the importance of individualized surgical planning and the role of subtotal resection in achieving optimal outcomes in resource-limited settings.

Although non-dysraphic intradural lipomas are histologically benign, their clinical behavior can be complex due to their intimate association with neural structures. Several studies emphasize that these tumors often develop slowly and may remain asymptomatic for extended periods before neurological deficits emerge as a result of progressive spinal cord compression [12]. Advances in magnetic resonance imaging have significantly improved early detection and surgical planning by allowing precise differentiation between lipomatous lesions and other intradural tumors based on characteristic signal intensities [13]. Furthermore, previous reports indicate that surgical management should prioritize neurological preservation rather than radical excision because these tumors frequently adhere tightly to the spinal cord and nerve roots, making aggressive resection potentially harmful. Consequently, many authors advocate for conservative microsurgical decompression and subtotal removal as the most effective strategy for relieving symptoms while minimizing neurological morbidity [14, 15].

Case Presentation

Patient Information: A 24-year-old male with no significant medical history presented with a 2-month history of progressive neck pain (VAS score of 8/10) and hand numbness. The symptoms worsened one week before admission, with increased limb weakness.

Clinical Examination: Upon admission, the patient exhibited a positive Hoffman sign in both hands, indicative of upper motor neuron involvement. Muscle strength examination revealed a grade of 4/5 in all extremities. Deep tendon reflexes were hyperactive (hyperreflexia), further supporting upper motor neuron involvement. There were

no symptoms of sphincter dysfunction, and the patient reported no prior history of congenital spinal abnormalities. The results of the neurological examination were otherwise unremarkable aside from the aforementioned findings.

Imaging: Magnetic resonance imaging (MRI) of the cervical spine revealed a hyperintense lesion on T1- and T2-weighted sequences, with hypointensity on STIR imaging in the sagittal plane. The lesion was localized to the cervicothoracic region, spanning from C6 to T1, causing significant spinal cord compression. The imaging characteristics are consistent with a lipomatous tumor. Importantly, no intramedullary signal changes were observed, suggesting no irreversible spinal cord damage at the time of imaging (see Figs. 1).

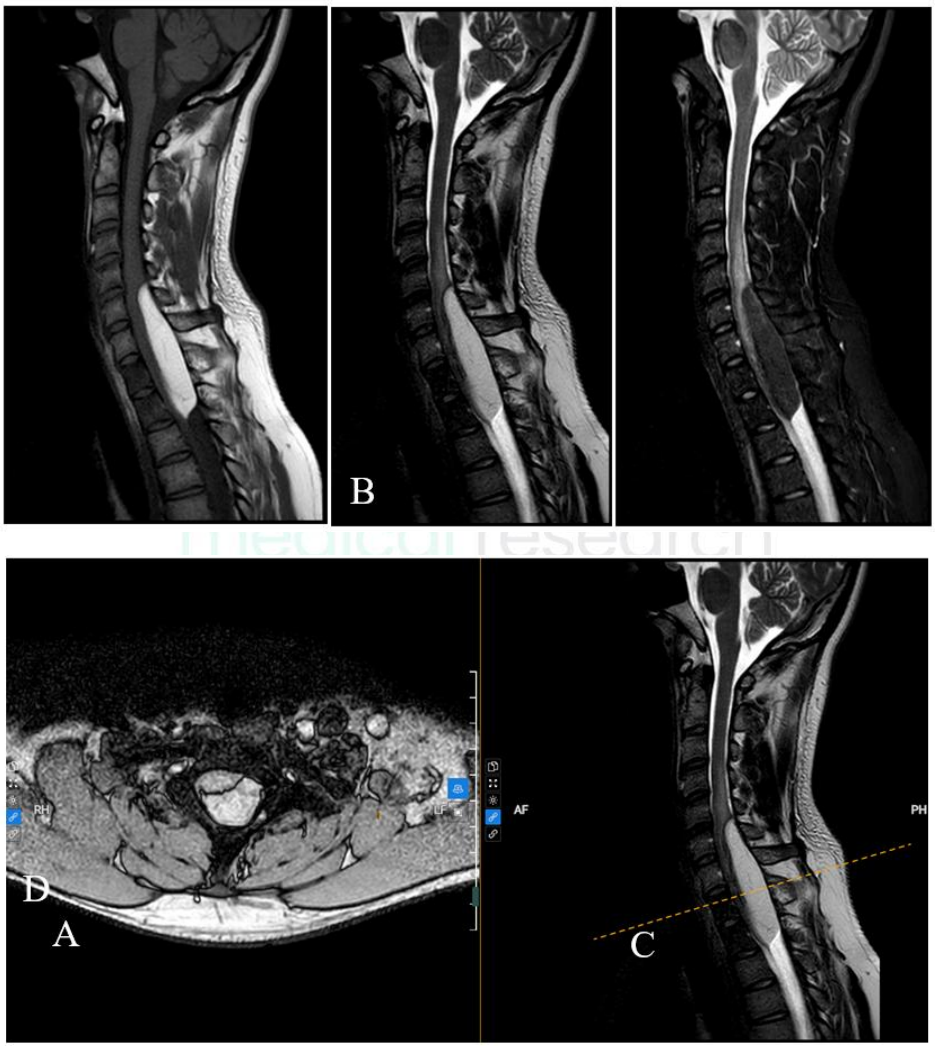

Fig. 1. Preoperative spinal MRI. Hyperintensity on T1 and T2 sequences and hypointensity on STIR in the sagittal plane (**A, B, C**). The tumor is hyperintense on T2 sequences in both the axial and sagittal planes at the same location (**D**)

Intraoperative Findings and Surgical Management: A posterior approach to the cervical spine was chosen to access the lesion. A transverse skin incision was made from C5 to T3, and the laminae from C5 to T3 were exposed and removed bilaterally while preserving the facet joints. With the dura mater fully exposed, no epidural tumor was detected. The dura was then incised and extended from C6 to T3, revealing a subdural tumor approximately 7 cm in size. The tumor appeared pale yellow, soft in texture, with minimal vascular proliferation. It lay beneath the arachnoid membrane, was firmly adherent to the spinal cord and nerve roots, and displaced the spinal cord anteriorly. In accordance with the MRI findings, the tumor was predominantly on the right side, pushing the spinal cord to the left and anteriorly (Fig. 2A).

During surgery, no evidence of tumor infiltration was found within the spinal dura mater, confirming its extramedullary location. The tumor was meticulously dissected from the surrounding neural structures to minimize the risk of damage to critical nerves and the spinal cord. Because the anterior aspect of the tumor was tightly adherent to both the spinal cord and nerve roots, we removed most of the tumor, leaving behind a small residual portion under high magnification using the TIVATO 700 surgical microscope. This approach minimized the risk of neurological injury (see Figs. 2B and C). Hemostasis was carefully achieved to prevent postoperative complications. The dura mater was then closed in a watertight manner, and a surgical drain was placed to manage postoperative fluid collection. Finally, the wound was closed in anatomical layers, ensuring proper alignment and minimizing the risk of infection or wound complications.

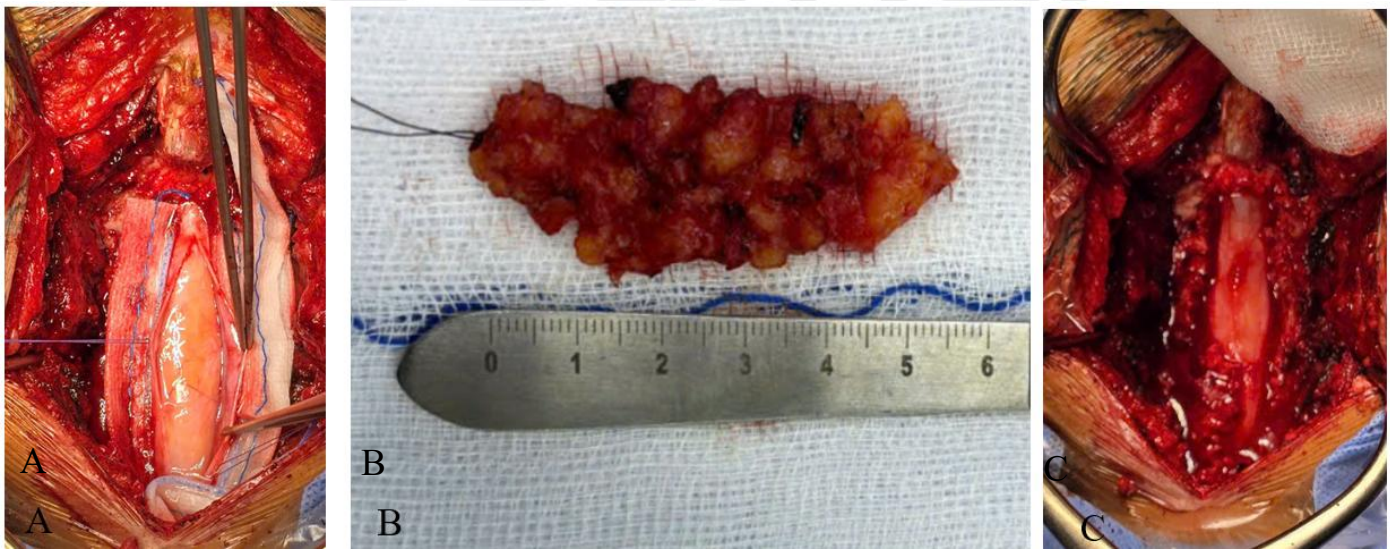

Fig. 2. Intraoperative images. **A** The lipoma is clearly exposed. **B** Partial resection of the lipoma. **C** Posttumor resection.

Histopathology: Histological examination confirmed the diagnosis of a benign lipoma, with the tumor being composed of mature adipose tissue (Fig. 3).

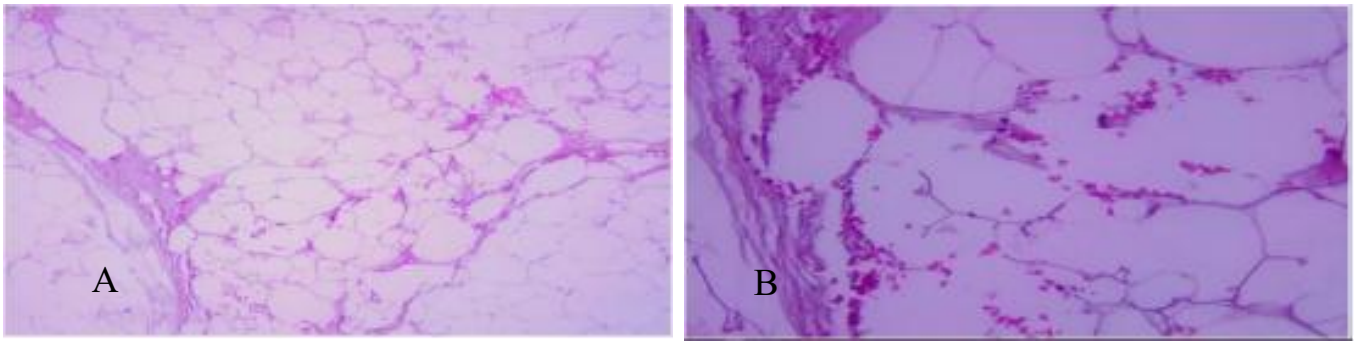

Fig. 3. Pathological report. Results of histopathology: Benign lipoma

Postoperative Course: Postoperatively, the patient experienced significant clinical improvement. His neck pain decreased to a VAS score of 3/10, and hand numbness began to resolve within 24 hours of surgery. Limb strength was fully restored (5/5), and the patient was able to ambulate independently the following day. The patient was discharged 7 days postsurgery without complications, and there was no drainage from the incision site (Fig. 4).

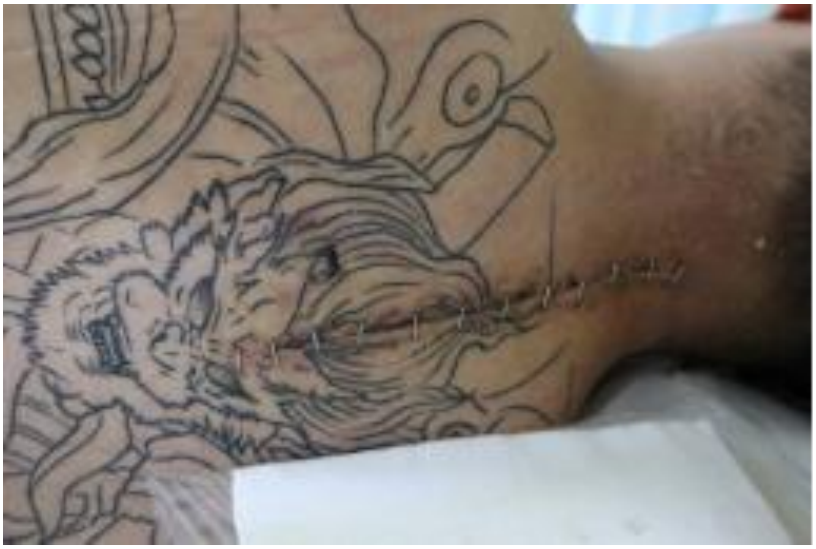

Fig. 4. Stable incision site (5 days postsurgery)

Follow-Up: At the first follow-up appointment, 20 days postsurgery, the patient reported significant improvement, including reduced numbness in both the hands and legs. Muscle strength was fully restored, with no evidence of limb weakness. The surgical incision site remained stable and showed no signs of infection or dehiscence. Follow-up MRI confirmed that a substantial portion of the tumor had been successfully removed, resulting in notable alleviation of spinal cord compression (Fig. 5).

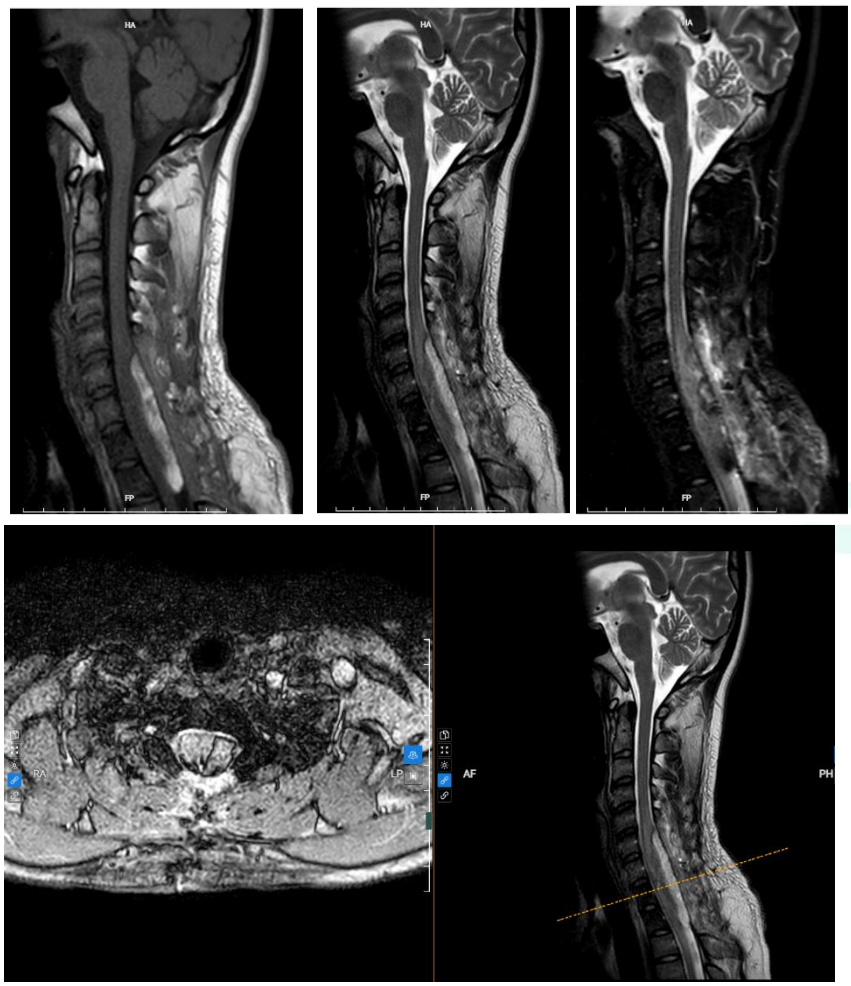

Fig. 5. Postoperative MRI images(**A**,**B**,**C**,**D**)

Discussion

This case highlights the challenges and outcomes associated with managing cervicothoracic intradural lipomas. These tumors, though rare, are clinically significant due to their potential to cause progressive neurological deficits. Similar to findings in prior studies, such as those by Kabir et al. [1], subtotal resection was chosen in this case to balance symptomatic relief with the preservation of neurological function. The deliberate decision to leave a small portion of the tumor adhered to critical neural structures aligns with evidence from Ikeda et al. [5], who demonstrated that subtotal resection minimizes the risk of postoperative complications while providing substantial clinical improvement. MRI played a crucial role in the preoperative planning, with the absence of intramedullary signal changes suggesting reversible spinal cord compression.

This finding correlates with Suri et al.'s observations [7], where patients with similar MRI findings experienced favorable outcomes after decompression surgery. Moreover, the rapid improvement in this patient's symptoms, including full restoration of limb strength and resolution of hand numbness within 24 hours, is consistent with reports highlighting the effectiveness of subtotal resection in achieving neurological recovery [2,3,5]. The surgical approach was meticulously planned to preserve spinal stability while allowing safe resection of the tumor. A posterior approach was chosen to provide adequate exposure and facilitate tumor removal while preserving facet

joints, a strategy critical for minimizing the risk of postoperative spinal instability. The importance of preserving facet joints is well-documented in the literature, as excessive facetectomy (≥50%) has been shown to significantly increase the risk of spinal instability and deformity [10,11]. In this case, careful preservation of the facet joints ensured structural integrity and avoided the need for spinal fusion. While subtotal resection is associated with a potential risk of tumor recurrence, the indolent nature of lipomas often allows for extended symptom-free periods. Recurrence rates for subtotal resections of spinal lipomas have been reported to range between 46% and 52% [2,6], emphasizing the importance of long-term follow-up with serial imaging to monitor residual tumor growth. Despite these challenges, the excellent postoperative recovery observed in this case underscores the value of individualized surgical planning and meticulous execution in achieving favorable outcomes.

Previous literature further supports the strategy of limited resection in the management of non-dysraphic intradural lipomas. A large surgical series by Lee et al. demonstrated that aggressive attempts at complete excision often lead to higher rates of neurological deterioration due to the tumor's intimate integration with spinal cord tissue [12]. Similarly, Nakagawa et al. reported that partial resection combined with decompression provides durable symptom control while maintaining neurological function in most patients [13]. Histopathological studies also confirm that these tumors consist of mature adipose tissue interwoven with neural elements, explaining the difficulty of safe radical excision and reinforcing the importance of microsurgical caution [14]. Moreover, long-term follow-up studies suggest that although residual lipomatous tissue may persist after subtotal resection, clinically significant regrowth is uncommon and often progresses very slowly, allowing patients to remain symptom-free for many years [15]. These findings further validate the surgical decision in the present case to prioritize neurological safety over complete tumor removal.

Conclusion

Subtotal resection of symptomatic cervicothoracic intradural lipomas remains the preferred surgical strategy. Although complete excision is often unfeasible in tumors densely adherent to critical neural structures, meticulous microsurgical techniques and thoughtful intraoperative decision-making can achieve substantial neurological improvement while preserving function and enhancing the patient's quality of life. This approach effectively alleviates symptoms while minimizing the risk of neurological injury. Long-term follow-up is crucial to monitor the growth of residual tumors and ensure timely intervention when necessary. This case underscores the importance of individualized surgical planning, meticulous execution, and prioritization of patient safety and outcomes in managing complex spinal tumors.

References

1. Kabir SMR, Thompson D, Rezajooi K, Casey ATH. Non-dysraphic intradural spinal cord lipoma: case series, literature review and guidelines for management. Acta Neurochir (Wien). 2010 Jul;152(7):1139–44.
2. Raees S, McDougal M, Zaratan A, Chang J, Lui F. Nondysraphic Intradural Spinal Lipoma: A Case Report and Review of Pathogenesis. Cureus. 16(8):e66481
3. Roohollahi F, Sharifi V, Abousaeidi SR, Jouibari MF. Adult nondysraphic cervicomedullary intramedullary lipoma: A case report and literature review. Clin Case Rep. 2023 Apr;11(4):e7239.
4. Chen KY, Osorio J, Rivera J, Chou D. Intramedullary and Extramedullary Thoracic Spinal Lipomas Without Spinal Dysraphism: Clinical Presentation and Surgical Management. World Neurosurgery. 2019 Jan 1;121:156–9.
5. Ikeda N, Odate S, Shikata J, Yamamura S, Kawaguchi S. Surgical strategies and outcomes for intradural lipomas over the past 20 years. J Clin Neurosci. 2019 Feb;60:107–11.
6. Pang D. Surgical Management of Complex Spinal Cord Lipomas : A New Perspective. J Korean Neurosurg Soc. 2020 May 1;63(3):279–313.
7. Suri A, Chabbra RPS, Mehta VS, Gaikwad S, Pandey RM. Effect of intramedullary signal changes on the surgical outcome of patients with cervical spondylotic myelopathy. Spine J. 2003;3(1):33–45.

8. Son DK, Son DW, Choi CH, Song GS. Regrowth of Cervical Intradural Lipoma without Spinal Dysraphism. J Korean Neurosurg Soc. 2014 Aug;56(2):157–61.
9. Klessinger S, Freund W, Karpel-Massler G, Wirtz C, Thal D, Halatsch ME. First Report of Recurrent Intramuscular Lipoma after Decompression Surgery of the Lumbar Spine. J Neurol Surg A Cent Eur Neurosurg. 2016 Jan;77(1):68–72.
10. Noh SH, Takahashi T, Inoue T, Park SM, Hanakita J, Minami M, et al. Postoperative spinal deformity and instability after cervical spinal cord tumor resection in adults: A systematic review and meta-analysis. J Clin Neurosci. 2022 Jun;100:148–54.
11. Sun C, Qu C, Zhou C, Zhu K, Tao H, Ma X. Role of unilateral partial facet joint preservation in postero-lateral approach lumbar interbody fusion for patients with degenerative lumbar spinal stenosis presenting bilateral lower limb symptoms: a retrospective study. Journal of Orthopaedic Surgery and Research. 2024 Sep 3;19(1):537.
12. Lee M, Rezai AR, Abbott R, Coelho DH, Epstein FJ. Intradural spinal lipomas. J Neurosurg. 1995 Jan;82(1):394–400.
13. Nakagawa H, Kubo S, Izumoto S, Fujita T. Surgical treatment of nondysraphic intradural spinal lipomas. Acta Neurochir (Wien). 2001;143(5):459–66.
14. Ammerman BJ, Henry JM, De Girolami U, Earle KM. Intradural lipomas of the spinal cord. J Neurosurg. 1976 Apr;44(4):331–6.
15. McGillicuddy JE, Shucart WA, Kwan ES. Intradural spinal lipomas: surgical management and long-term follow-up. Neurosurgery. 1987 Oct;21(4):465–9.Acar G, Ejraei N, Turkdoğan D, Enver N, Öztürk G, Aktaş G. The Effects of Neurodevelopmental Therapy on Feeding and Swallowing Activities in Children with Cerebral Palsy. Dysphagia. 2022;37(4):800-11.