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Case report

Intraspinal periosteal chondroma in upper thoracic spine causing cord compression and myelopathy: A case report

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ABSTRACT

Introduction: Chondromas are slow-growing cartilage-forming benign tumors, rarely occurring in the spine. Generally, most spinal chondromas are asymptomatic; however, with slow progressive growth, these lesions may enlarge and expand and cause compressive neurological symptoms, resulting in radiculopathy or more commonly myelopathy due to direct neural compression.

Presentation of case: A 15-year-old male adolescent presented to Emergency Department with history of fall (slippage) on concrete ground while playing three months back. On neurological examination, the motor power in bilateral upper limbs was 5/5 while it was 1/5 in both lower extremities. Some muscle wasting was noted in the lower limbs. The planter reflexes were upgoing; and the sensory loss was below T6 spinal level. CT scan of dorsolumbar spine demonstrated a well-defined high-density lesion in lateral aspect of spinal canal at T2-T3 vertebral level adjacent to left T2-T3 facet joint. MRI of dorsal spine revealed a $3 \times 2 \times 1$ cm^3-sized, well-defined, non-enhancing T1 low to isointense and T2/STIR heterogeneous hyperintense lesion with osseous and cartilaginous components in the left lateral aspect of spinal canal at T1-T3 level, causing compression and contralateral displacement of spinal cord. The patient was then subjected to posterior laminectomy, complete excision, followed by laminoplasty using minicranial plates and screws. Histopathology of the mass showed bony trabeculae with hematopoietic elements and attached lobules of hyaline cartilage, chondroid matrix and lobules of mature chondrocyte and myxoid changes. Postoperatively his power was improved slightly and he was able to stand up with some assistance. On six-month follow up, patient showed significant neurological improvement. He was able to walk independently with minimal assistance. He was able to control bowel and bladder functions.

Discussion: Chondromas occurring in the spine are rare, accounting for only about 3% of all chondromas. Spinal chondromas are commonly encountered in the thoracic spine as in our case.

Conclusion: Complete en bloc surgical excision is generally recommended as the treatment of choice for cases with local and/or neurological symptoms.

1. Introduction

Chondromas are slow-growing cartilage-forming benign tumors, rarely occurring in the spine [1]. Histologically, they consist of benign nests of hyaline cartilage within the cancellous bone that resulted from failed migration of chondrocytes. Usually, the chondrocytes are arranged in a pseudolobular fashion and may be associated with ossified foci [2] Generally, most spinal chondromas are asymptomatic; however, with slow progressive growth, these lesions may enlarge and expand and cause compressive neurological symptoms, resulting in radiculopathy or more commonly myelopathy due to direct neural compression [3].

Careful preoperative diagnosis and total removal of the tumor is of utmost importance as up to one tenth residual tumor may transform into malignancy if complete resection is achieved. Spinal chondroma has been noted to be commonly encountered in the dorsal spine [1]. Dahlin's series of benign bone tumors reported that chondromas make up 11.2% of benign bone tumors; and only 4% of these lesions present as spinal tumors [4]. The work has been reported in line with the SCARE 2020 criteria [5].

Herein, we report a 15-year-old male adolescent, presenting with

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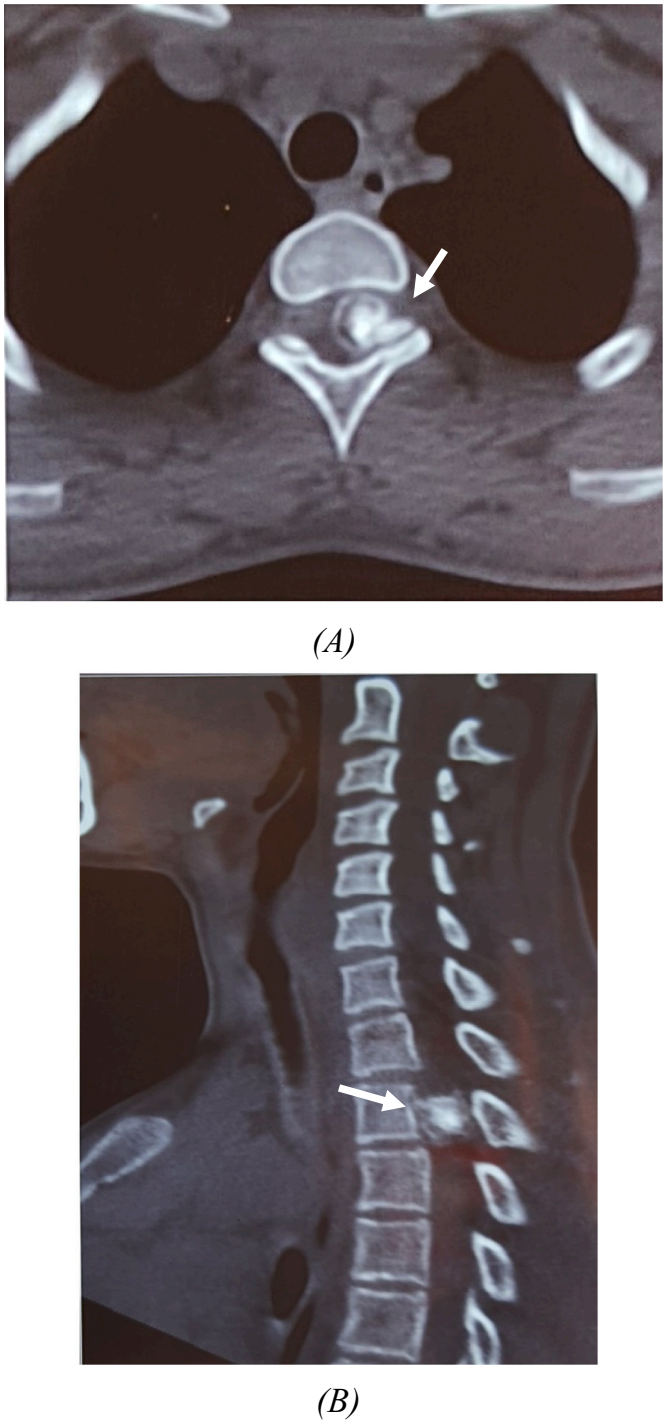


(A)

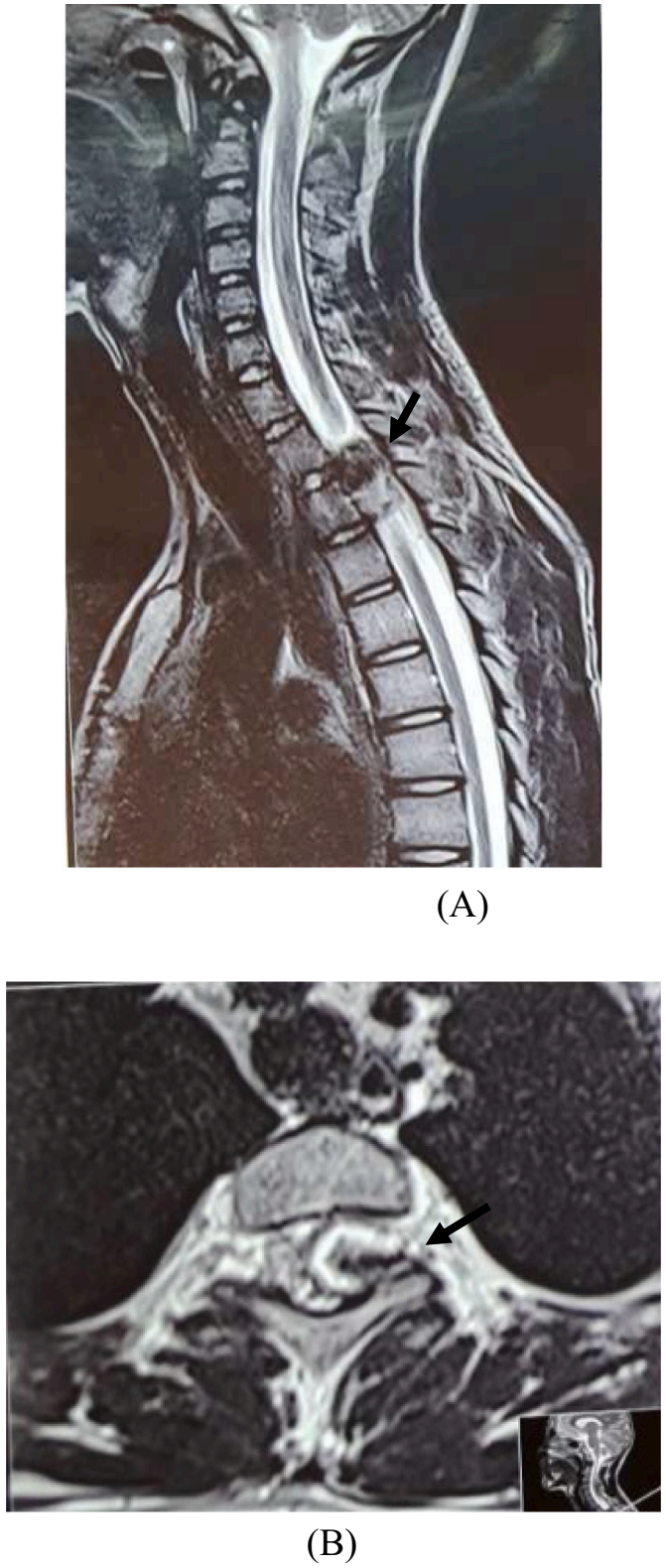
(B)

Fig. 1. CT scan showing a well-defined high-density lesion (white arrow) within the lateral aspect of spinal canal at T2-T3 vertebral level adjacent to left T2-T3 facet joint causing spinal canal compromise and cord compression, (A) axial and (B) sagittally-reconstructed images.

pain in upper back and progressive gait disturbance and weakness in lower limbs and diagnosed as intraspinal thoracic chondroma arising from left facet joint of T2–3 level and causing cord compression and presenting with myelopathic symptoms.

2. Case summary

A 15-year-old male adolescent presented to Emergency Department of Tribhuvan University Teaching Hospital, Kathmandu, Nepal, with



(A)

(B)

Fig. 2. MRI demonstrating a well-defined, non-enhancing heterogeneous signal lesion (black arrow) with osseous and cartilaginous components in left lateral aspect of spinal canal at T1-T3 level with compression and contralateral displacement of spinal cord. (A) sagittal and (B) axial sequences.

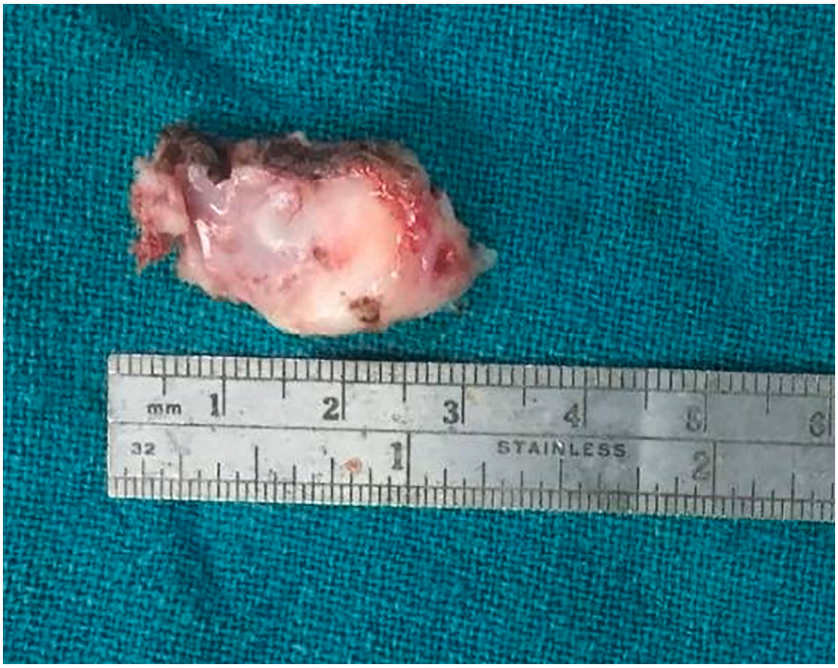


Fig. 3. Intraoperative specimen showing whitish-reddish cartilaginous lesion. Note the fibrous tissue covering.

history of fall (slippage) on concrete ground while playing three months back. Following that, he developed pain in the upper back and progressive gait disturbance and bilateral lower limb weakness. He was bedridden and was unable to walk after two and half months following the trivial trauma.

On neurological examination, the motor power in bilateral upper limbs was 5/5 while it was 1/5 in both lower extremities. Some muscle wasting was noted in the lower limbs. The planter reflexes were upgoing; and the sensory loss was below T6 spinal level. In regards to digital rectal examination, the anal tone and superficial and deep anal sensation was intact. Bulbocavernous and anocutaneous reflexes were absent.

Regarding neuroradiological evaluation, CT scan of dorsolumbar spine demonstrated a well-defined high-density lesion in lateral aspect of spinal canal at T2-T3 vertebral level adjacent to left T2-T3 facet joint. The lesion seems to arise from median aspect of the left inferior articular process of T2 vertebra, significantly compromising the spinal canal (Fig. 1). MRI of dorsal spine revealed a $3 \times 2 \times 1$ cm^3-sized, well-defined, non-enhancing T1 low to isointense and T2/STIR heterogeneous hyperintense lesion with osseous and cartilaginous components in the left lateral aspect of spinal canal at T1-T3 level, causing compression and contralateral displacement of spinal cord. Posteriorly, the lesion is abutting T2-T3 left facet joint. There are few T1/T2 low signal intensity areas within, which is most likely calcification with T2 high peripheral areas. No obvious neuroforaminal widening was noted on the same level; and there were no radiological evidences of trauma (Fig. 2A, B).

Preoperatively, the patient was diagnosed as intraspinal cartilaginous tumor in dorsal spine with myelopathy. The patient was then subjected to posterior laminectomy, complete excision, followed by laminoplasty using minicranial plates and screws. The patient was turned on prone position and posterior midline incision was made. Standard zip laminectomies of T2-T4 were performed via standard conventional posterior approach using NSK neuro-electric drill. Intraoperatively, there was a well-delineated, whitish-reddish cartilaginous mass, measuring $3 \times 2 \times 2$ cm^3 (Fig. 3), rising from the median margin of the left inferior articular process of T2 vertebra. It was covered with a fibrous layer and was relatively avascular but mildly adherent to the dura. The lesion was significantly comprising the spinal canal and displacing the thecal sac and cord to the contralateral side. There was a clear plane between the mass and dura. The mass was meticulously dissected off the dura and left T2 and T3 nerve root sleeves; and, using curette and fine double-action Leksell rongeur, the lesion was removed *en bloc*. Protecting the corresponding nerve roots and the thecal sac, partial facetectomy was performed, including drilling of the originating base of the tumor using small diamond burr. Gross total resection of tumor was achieved. Using titanium 2-hole minicranial plates and screws on all cut-laminas on both sides, laminoplasty was achieved by placing the T2–4 laminectomized specimen in its original position. Finally, the incision was closed in layers.

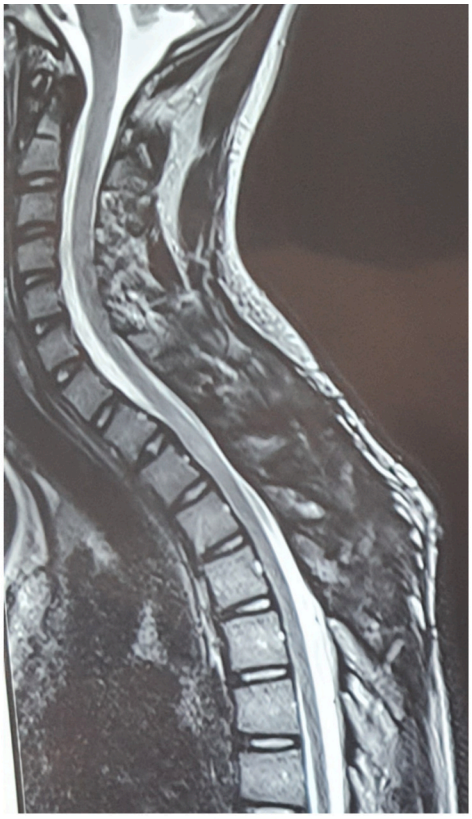
Postoperative course was uneventful. Postoperatively his power was improved slightly and he was able to stand up with some assistance. However, he persistently had bowel and bladder incontinence and remained on in-dwelling Foley catheter until discharge on postoperative day five (POD #5) to spinal rehabilitation center for continuous physiotherapy and gait training. On six-month follow up, patient showed significant neurological improvement. He was able to walk independently with minimal assistance. He was able to control bowel and bladder functions.

Postoperative MRI done during six-month follow up demonstrated complete removal of the intraspinal lesion and excellent decompression of the cord at T2/3 level with good spinal alignment after laminoplasty (Fig. 4A, B).

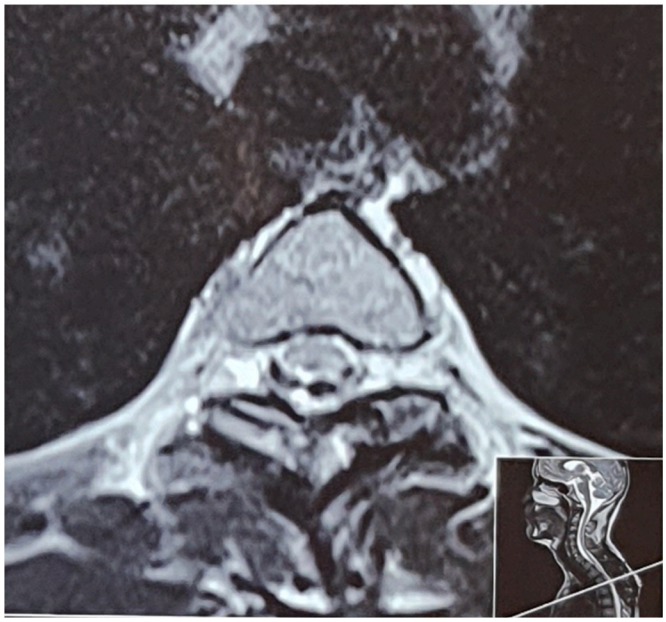
Histopathology of the mass showed bony trabeculae with hematopoietic elements and attached lobules of hyaline cartilage, chondroid matrix and lobules of mature chondrocyte and myxoid changes. There were no atpyia and mitosis. The aforementioned findings were consistent with chondroma (Fig. 5).

3. Discussion

Chondromas are benign cartilaginous tumor. They may present either as a single lesion or as multifocal lesions [6]. In regards to gender predilection, they are twice as common in men as in women, with the incidence rate being highest in 20- to 40-year-old adult age group [4]. Our case was a young 15-year-old adolescent male, who was asymptomatic initially but become symptomatic with progressive weakness and incontinence after a trivial fall while playing.



(A)



(B)

Fig. 4. Postoperative MRI (T2-weighted images) showing some postoperative changes without any residual or recurrence and good decompression with acceptable spinal alignment.
(A) Sagittal and (B) Axial sequences.

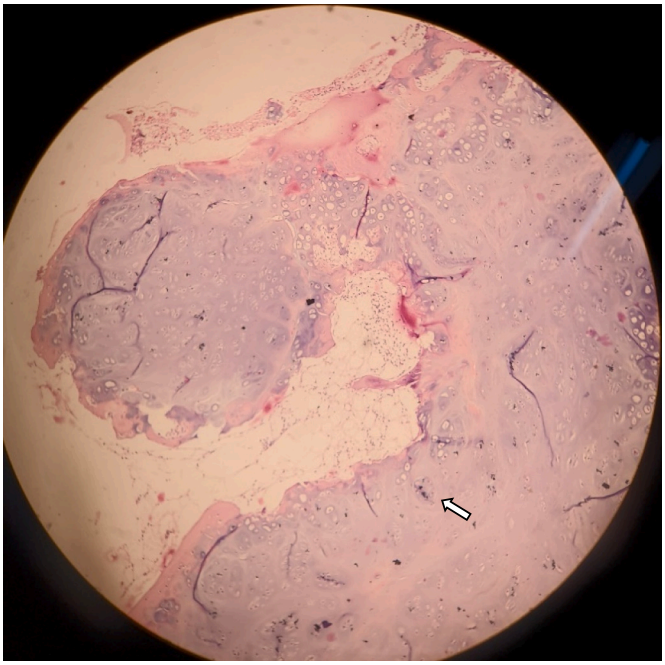


Fig. 5. Histopathology: bony trabeculae with hematopoietic elements and attached lobules of hyaline cartilage, chondroid matrix and lobules of mature chondrocyte and myxoid changes.

In regards to the location, the most common sites of origin are said to be the long tubular bones of the hands and feet. At times, these lesions may be observed in the ribs, pelvis, and rarely intracranial bones [7,8]. Similarly, chondromas occurring in the spine are rare, accounting for only about 3% of all chondromas [7]. Spinal chondromas are commonly encountered in the thoracic spine as in our case [9]. It is postulated that these spinal lesions are derived from hyperplasia of immature spinal cartilage with migration outside the spinal axis or from metaplasia of the connective tissue in contact with the spine or the annulus fibrosus [9].

Based on histological classification, these benign cartilaginous tumors are divided into four subtypes: chondroma, osteochondroma, chondroblastoma, and chondromyxoid fibroma [7,10–12]. Among them, chondroma is the most common, consisting 5% of all bone tumors [7]. According to their site of origin, chondromas are divided into enchondroma and periosteal types. Enchondromas originate from the medullary cavity, usually expand inside the bone without cortex penetration and produce an expansile growth pattern [13,14]; whereas periosteal chondromas arise from the surface of periosteum and grows in an exophytic fashion [6]. In our case, there was an exophytic growth within the spinal canal causing cord compression, which was consistent with periosteal chondroma. There were no evidences of involvement, intramedullary expansion or deformity of posterior elements radiologically and intraoperatively on gross inspection.

Chondroma can involve at any part of the vertebra including the body, pedicle, lamina and spinous process. Literature review suggested that neural arch was the most common affected location in the lumbar spine. In our case, the lesion originated from the posterior element namely the left facet joint and compromising the spinal canal and causing myelopathy. However, the exophytic growth did not compromise the neural foramina nor did patient have any radiculopathy.

Regarding neuroradiological imaging, CT scan is the recommended preoperative diagnostic tool which is able provide to exact location and extent of the lesion including the relationship with adjacent structures. On the other hand, MRI may be able to demonstrate involvement of soft tissue and spinal cord and distinguish malignancy from benign pathology. Usually, CT scan reveals a radiolucent, erosive lesion with stippled

or scattered patterns of calcification within the tumor. On MRI scans, most chondromas show intermediate signal intensity on T1-weighted images and high signal intensity in the central part of the mass on T2-weighted images [15]. In our case, T1-weighted images showed heterogeneously low to isointense signal while T2/STIR-weighted images demonstrated heterogeneous hyperintensity. There were also features of calcification on MRI scans.

On gross macroscopic appearance, these lesions are lobulated and cartilaginous with thick fibrous periosteal tissue [16]. Histologically, enchondroma is composed of neoplastic chondrocytes dispersed within an abundant hyaline or myxoid background [17,18], which was consistent with our finding.

Complete en bloc surgical excision is generally recommended as the treatment of choice for cases with local and/or neurological symptoms [1]. Chondromas, being benign pathology, seldom recur; and recurrence is usually associated with incomplete resection [2,6,11]. Following complete resection, the recurrence rate of chondromas is less than 10% [3]. According to Nora et al. (1983) [19], recurrence of a chondroma always results in cases of incomplete removal. Regarding other modalities of treatment strategy, chemotherapy is ineffective; and the lesions are not responsive to radiotherapy [4]. Radiotherapy is only considered for patients with unresectable tumors [20]. Malignant transformation is uncommon, occurring in only about 10% of solitary lesions and usually associated with syndromes such as Ollier's or Maffucci's [21].

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Ethical approval

The study is exempt from ethnical approval in our institution.

Consent

Written informed consent was obtained from the patient for 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 on request.

Studies on patients or volunteers require ethics committee approval and fully informed written consent which should be documented in the paper.

Registration of research studies

This is a case report so it does not require registration.

Guarantor

Dr. Rabi Khadka, MS resident.

CRediT authorship contribution statement

S. N.	Full name of authors	Authorship role	Full Qualification	Institute and Email	Research concept	Research design	Literature review	Data collection	Data analysis	Statistical analysis	Manuscript preparation
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2	Asim Gurung	Co-author	MCh Neurosurgery resident (Second-Year)	Department of Neurosurgery, Tribhuvan University Teaching Hospital	✔	✔	✔	✖	✔	✔	✖
3	Dipendra Kumar Shrestha	Co-author	Teaching Assistant	Department of Neurosurgery, Tribhuvan University Teaching Hospital	✔	✔	✔	✖	✔	✔	✖
4	Sushil Krishna Shilpakar	Co-author	Professor	Department of Neurosurgery, Tribhuvan University Teaching Hospital	✔	✔	✔	✖	✔	✔	✖

Declaration of competing interest

None.

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