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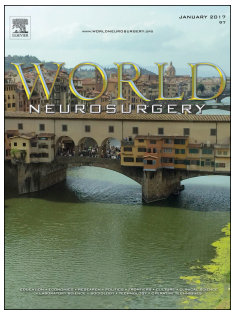

Awake intradural spinal tumour resection

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Awake intradural spinal tumour resection

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Conflict of interest

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Abstract:

Background:

Meningioma is a common slow growing spinal tumour with a predilection for intradural occurrence. Patients usually present with pain followed by ataxia and sensory and sphincter problems. The gold standard treatment in these cases is gross total microsurgical resection under general anaesthesia. However, there exist high anaesthetic risk patients unsuitable for general anaesthesia. Performing spinal surgeries under local anaesthesia and sedation has been reported albeit rarely for mostly minimally invasive procedures but not for open intradural pathologies.

Case description: We report a 63-year-old woman with critical aortic stenosis, coronary artery disease and severe chronic obstructive airways disease (COAD) who presented with ten months' history of worsening back pain and bilateral leg pains, ataxia, hyperreflexia in lower limbs as well as altered lower limb sensation. Magnetic resonance imaging (MRI) revealed a contrast enhancing intradural lesion at T6/7 with severe spinal cord compression. However, the patient was ASA class IV and her cardiac disease was not amenable to intervention. She underwent thoracic laminectomy and excision of the tumour under local anaesthesia and sedation with no significant complications and clinical improvement.

Conclusion: Our illustrative case and literature review suggest that utilising local anaesthesia and sedation to perform spinal surgeries including intradural tumours is possible even in high-risk patients with good outcome. Our ASA class IV patient tolerated the surgery well with gross total tumour resection and subsequent resolution of the symptoms.

Keywords: Meningioma. Intradural. Local anaesthesia. Sedation. Analgesia.

Introduction:

Spinal tumours represent 2%–4% of central nervous system tumours and can be intramedullary, intradural extramedullary, or extradural[1]. Approximately 40%-50% of spinal tumours are intradural lesions and the vast majority are extramedullary [2]. About 25%-46% of the intradural spinal tumours are Meningiomas[3, 4]. The peak incidence is in the fifth and sixth decade age group with female predominance[5, 6]. Patients most commonly present with pain followed by gait disturbances, sensory changes and sphincter problems[5]. Meningiomas are slowly growing benign lesions and therefore the gold-standard treatment is complete resection. To achieve this goal, surgical approach has been addressed thoroughly in literature ranging from more than one level laminectomies to minimally invasive endoscopic procedures[7]. However, all these procedures are carried out under general anaesthesia. Although minimally invasive spinal surgeries have been reported under local anaesthesia and sedation[8-10], the literature is scarce regarding resection of intradural tumours under local anaesthetic and sedation.

Herein, we report a case of thoracic intradural meningioma in a patient who presented with back and leg pain and gait disturbance and was found to have critical aortic stenosis, coronary artery disease and severe (COAD). She had her operation successfully under local anaesthesia and sedation with significant improvement. We discuss the clinical presentation, imaging, and the operative and anaesthetic procedures.

Case Report:

A 63-year-old female ex-smoker presented with ten months' history of back pain and worsening bilateral leg pains. She had unremitting, progressively worsening pain that did not respond to maximal analgesic therapy. She reported reduced mobility over that period but no sphincter disturbances. Despite unsteadiness and ataxic gait on examination, she had normal power throughout her legs but altered light touch sensation and reduced joint position sense in her lower limbs, exaggerated patellar and ankle jerk reflexes, upward plantar reflexes and several beats of clonus bilaterally. MRI demonstrated a T6/7 intradural extramedullary enhancing lesion with severe spinal cord compression (Figure 1 A-D). Her medical history included severe COAD and a murmur was found on auscultation. She was referred for an urgent echocardiogram which revealed critical aortic stenosis (100 mm Hg gradient and 0.4 cm^2 surface area). Her coronary angiogram demonstrated in addition to the severe aortic valve stenosis, moderate to severe multiple coronary artery disease. She was reviewed by our cardiothoracic multidisciplinary team who felt that neither her critical aortic stenosis nor coronary artery disease were amenable to intervention. Her ASA grade was class IV. Following discussion of the risk and benefits associated with the surgery and general anaesthesia, the patient chose to proceed with surgery under local anaesthesia and sedation with the plan to stop if she was unable to tolerate the surgery. She did not want to proceed under general anaesthesia due to the risks. The patient received an arterial line, a urinary catheter was inserted and routine anaesthetic monitoring attached. She was positioned prone on a Montreal mattress on a standard operating table, with her head turned to the side and resting on a pillow and nasal oxygen delivered at a rate of 2litres/minute with capnography monitoring. The patient was immobilised with straps. X-ray level check was carried out by laying spinal needles on the skin using AP rather than lateral X-rays. She was given 1 mg of midazolam and infusions of remifentanil using a target controlled infusion rate of 1-2 ng/ml

and ketamine bolus 0.5 mg/kg followed by an infusion of 0.2 mg/kg/hour throughout the procedure.. The incision site and underlying muscles were generously infiltrated with 20 ml lignocaine 1% with 1:2000000 adrenaline. T6/7 laminectomy was performed using a Diamond drill to minimise bleeding and potential pain from Rongeuring of bone. Bleeding was controlled with haemostatic agents (Surgicel and Surgiflo). The dura was lined with cottonoid patties all around the entry zone. Patties soaked in local anaesthetic were also placed on the dura before opening it. At this stage, the patient had a 30 second apnoeic episode that may have been related to placing a lignocaine soaked patty on the dura. This did not require any intervention, but surgery was stopped to ensure she had recovered from this episode. Once recovered, a midline linear longitudinal durotomy was then performed with a primary sharp incision of 3-4 mm and extended in a blunt manner with miniature hook instruments. A microscope was not used to enable surgical movements to adapt to the patient's natural thoracic breathing movements. The dural edges were tacked to the lateral and medial incision walls with 3-0 vicryl. CSF drainage was useful to gain manoeuvring space to safely start debulking the tumour. Blunt dissection using micro instruments with soft curvature, and diathermy where required with bipolar forceps and suction were essential to complete the tumour resection. The dura matter was coagulated (Simpson Grade II resection) with subsequent histopathology demonstrating WHO grade I meningioma. The dura was sutured with 5-0 Prolene, Tisseal dural sealant overlaid and primary closure with no drain performed. A second temporary apnoeic episode also occurred following further local anaesthetic application to the dura and she required hand-ventilation with a face mask for a few breaths only. During resection of the tumour, the patient's sedation was reduced to assess her leg movements.. The patient tolerated the surgery very well and did not complain of pain or discomfort during the procedure. She had a five-day stay in hospital after surgery with periods of mild hypotension and desaturation requiring oxygen. Her blood haemoglobin was

9.0 g/dl, which subsequently improved. Her back and leg pain has improved significantly after surgery and she returned to her usual activities two months after surgery. Six months after surgery she reported a full recovery at clinic follow-up and was extremely satisfied with her surgery[11]. She had normal mobility and no signs or symptoms of spinal cord compression and MRI demonstrated no recurrence (Figure 2 A-B).

Discussion:

Complete excision is the surgical aim of intradural spinal meningioma that causes spinal cord compression. The surgery is usually performed under general anaesthesia on an urgent or semi-elective basis depending on the presenting symptoms and signs. However, rare patients may co-present with multiple comorbidities that may make general anaesthesia high risk or even contraindicated. Performing the surgery under local anaesthesia and sedation is an alternative option. Literature is lacking studies describing the efficacy and safety of local anaesthesia in such scenarios. There have been a number of case reports and published small series describing various minimally invasive spinal procedures under sedation and local anaesthesia [7-10, 12-14]. None in the last nine decades described excision of intradural tumour. Almost all the spinal surgery cases that were performed under local anaesthesia were described in healthy individuals, apart from Khan et al[10] who reported performing laminectomies under local anaesthesia in high risk anaesthetic patients. In 1926, Towne described 3 cases of laminectomies for spinal tumours including a meningioma under local anaesthesia solely for the purpose of avoiding respiratory depression due to cord compression in the case of cervical meningioma and to reduce the risk of haemorrhagic shock[15]. Our patient had severe cord compression from benign pathology and surgery was the only option to prevent further neurological deterioration, however her cardiac issues precluded general anaesthesia (23% estimated mortality rate according to the American Society of Anaesthesiology (https://www.asahq.org)) and the only option was to perform the surgery

under local anaesthesia and sedation. Should there be airway issues, our plan was to hand-ventilate the patient with a facemask and if intubation is required, our plan was to proceed no further and close. The patient's position with head turned to one side resting on a pillow enabled access to her airway and face mask ventilation. Overall, the procedure was satisfactory with no significant intra-operative, anaesthetic or post-operative complications. Laminectomy can be painlessly carried out after infiltrating the incision and wound with adequate local anaesthesia. Likewise, exploration of all aspects of the cord, and removal of extramedullary tumours, can be painless, provided spinal cord and nerve root manipulation is minimal. In our neurosurgery centre, we have undertaken lumbar and cervical laminectomies under local anaesthesia and sedation in a small number of cases with high risk anaesthetic patients, but never intradural surgery. This case is the first intradural surgery we carry out under local anaesthesia and sedation. Furthermore, awake surgeries allow regular assessment of the patient's neurology and thus obviate the need for electrophysiological monitoring of the spinal cord during the procedure. We reduced the level of sedation during the tumour resection and assessed the patient's lower limbs neurology. There was no need to use electrophysiological monitoring. The use of adrenaline mixed with the local anaesthesia decreases blood loss. Spontaneous breathing in local anaesthetic procedures reduces intrathoracic pressures and thus bleeding[16]. Although the risks of toxicity and venous air embolism have been reported, they are quite rare and spinal procedures can be performed safely under local anaesthesia with no such complications even in high-risk anaesthetic patients [9, 10, 17]. In agreement with these reports, our patient did not develop such complications; in addition, the risk of air embolism is higher when the patient head is up during surgery, which was not the situation in our case here.

In conclusion, this case illustrates an interesting and important approach to intradural spinal tumours where the procedure can be performed under adequate local anaesthesia and sedation

with good outcome. Although the main indication was to avoid the general anaesthetic risks, this approach may also be considered in healthy individuals where neurological assessment can be used as alternative route to neurophysiological monitoring.

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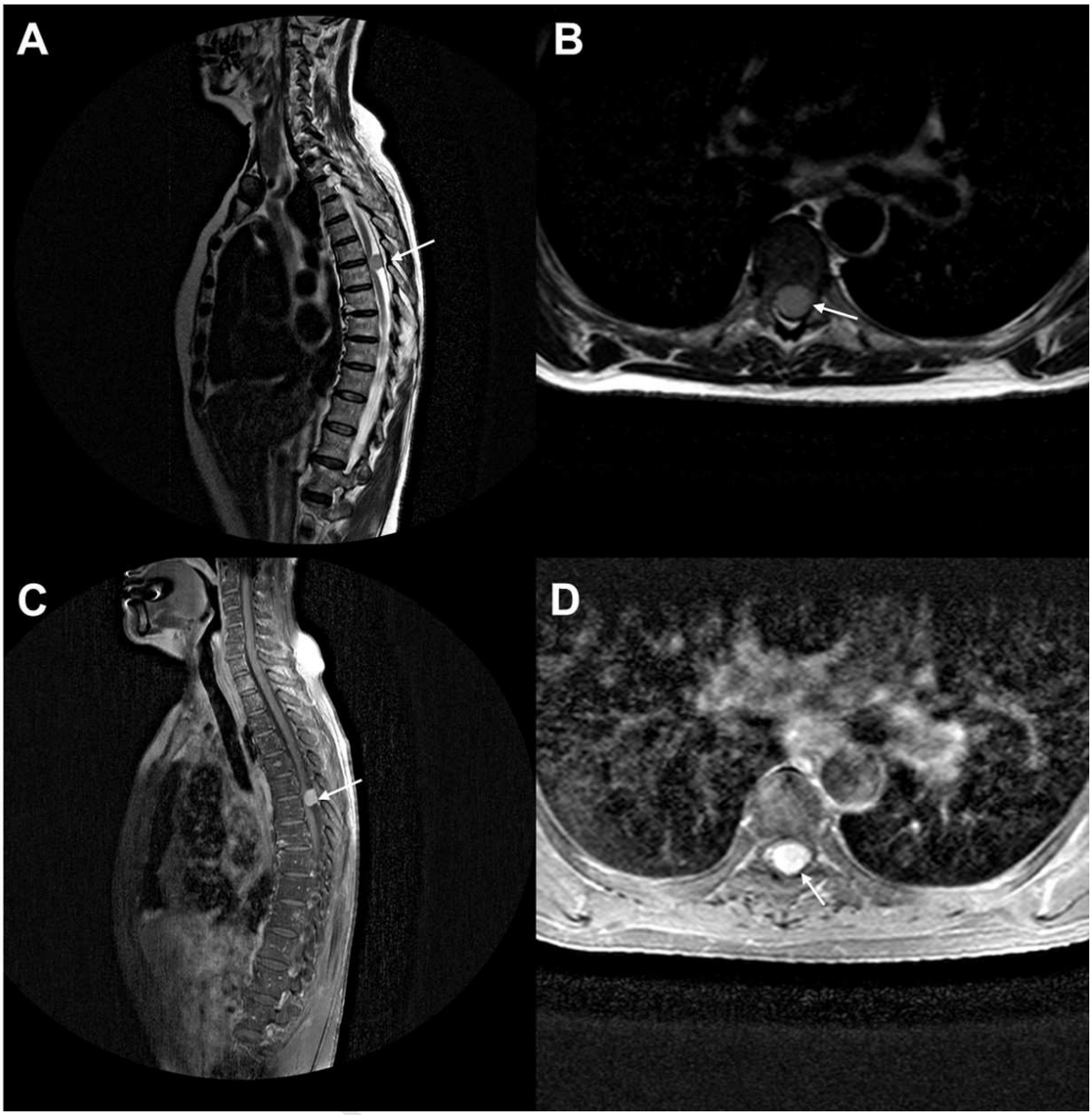
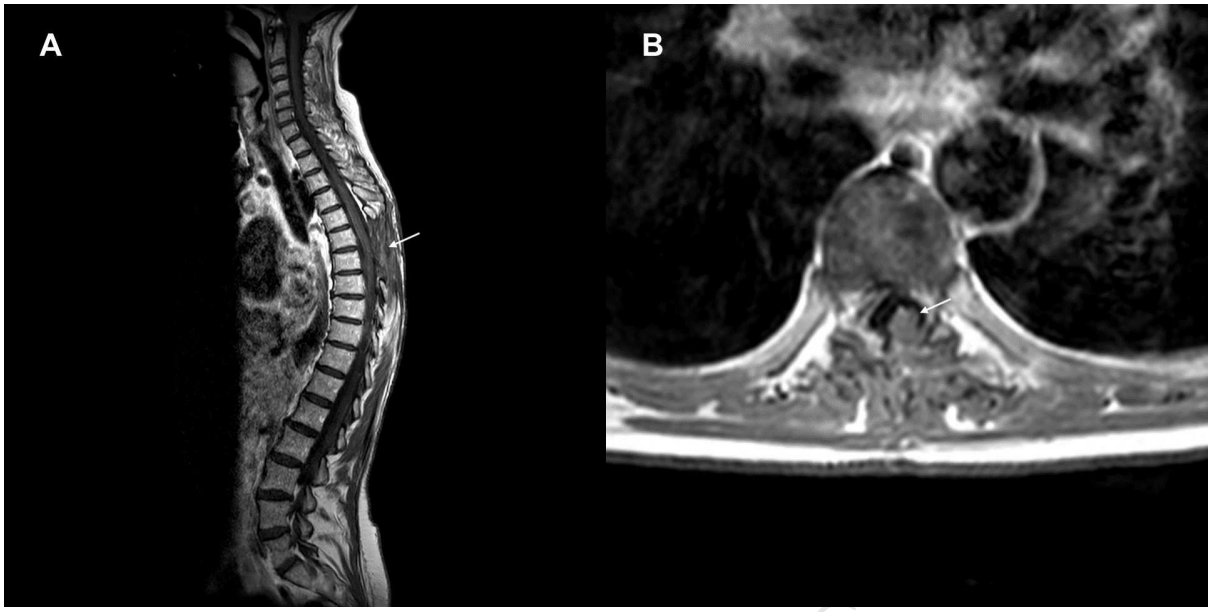
Figure legends

Figure 1 Diagnostic MRI images. A T2W sagittal MRI image reveals the intradural lesion with severe cord compression (arrow). B An axial T2W image at T6/7 level showing the meningioma (arrow). C Post gadolinium T1W sagittal MRI image reveals the intradural lesion (arrow). D An axial post gadolinium T1W image at T6/7 level demonstrating the intradural meningioma (arrow).

Figure 2 6 month post-operative follow up MRI scan. A Post gadolinium T1W sagittal MRI image reveals the surgery site with no recurrence (arrow). B An axial post gadolinium T1W image at T6/7 level demonstrating the decompressed spinal cord with no enhancement (arrow).





Highlights:

Manuscript title: Awake laminectomy and resection of intradural thoracic spinal meningioma

Manuscript type: Case report and Literature Review

- Intradural spinal meningioma with cord compression in an ASA class IV patient.
- Excision of intradural spinal meningioma under adequate local anaesthesia and sedation.
- Patient was assessable neurologically during the surgery.
- The patient tolerated the operation well with subsequent resolution of symptoms and signs.

Abbreviation in this article:

COAD: Chronic obstructive airways disease.

Magnetic resonance imaging: MRI

T2 weighted imaging: T2WI

T1 weighted imaging: T1WI

Thoracic: T

ASA: American Society of Anaesthesiologists

CSF: Cerebrospinal fluid

WHO: World Health Organisation