

## Endoscopic spine surgery for cervicothoracic spine neurofibroma: a case report



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### ABSTRACT

**Introduction:** Spinal tumors are rare lesions. The incidence of spinal tumors is about 0.5-2.5 cases per 100,000 population per year.<sup>1</sup> Thirty percent of spinal tumors are located intradural. Twenty to thirty percent of intradural tumors are schwannoma and spinal neurofibroma.<sup>2</sup> Surgery is the leading choice for schwannomas and neurofibromas that grow progressively or cause neurological deficits.<sup>2,3,4</sup> Currently, minimally invasive surgery is developing rapidly, including minimally invasive surgery on spine surgery. Better outcomes are expected in endoscopic spine surgery compared to conventional spine surgery techniques. This paper aims to provide an overview of endoscopic procedures for the surgical removal of spinal tumors.

**Case description:** A 59-year-old man presented paraplegia of both lower limbs. The patient complained difficulty walking for nine months before admitted to the hospital. The patient also complained of difficulty moving both of his legs, burning pain sensation, pain and numbness sensation that radiates from chest region to both of his toes, he felt that his chest was tied, and he complained hard to breathe when he feels pain. Complaints are getting worse until the patient was unable to walk. We found intra-dural extramedullary lesion from the MRI that was suspicious of a nerve cell sheath tumor. The patient underwent surgical treatment for tumor removal with an endoscopic technique, the cancer was complete. From the histopathology, the tumor was a neurofibroma tumor.

**Conclusion:** Neurofibroma is one of the most frequently intradural extramedullary spinal tumors. Good imaging can guide the diagnosis and a good plan for manage patients with spinal tumors. Complete tumor resection provides a better prognosis in patients with neurofibromas. With endoscopic techniques, total spinal tumor removal surgery can be performed. The surgical procedure for spinal tumors using an endoscopic approach may be an option for spinal neurofibromas patients.

**Keywords:** spine, surgery, neurofibroma.

**Cite This Article:** Sartika, D., Risdianto, A., Saputro, A., Brotoarianto, H.K., Priambada, D., Muttaqin, Z., Andar, E.B.P.S., Arifin, M.T., Prihastomo, K.T., Bakhtiar, Y. 2021. Endoscopic spine surgery for cervicothoracic spine neurofibroma: a case report. *Bali Medical Journal* 10(1): 373-376. DOI: 10.15562/bmj.v10i1.2184

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Received: 2021-01-13

Accepted: 2021-04-20

Published: 2021-04-30

### INTRODUCTION

Spinal tumors are rare lesions. The incidence of spinal tumors is about 0.5-2.5 cases per 100,000 population per year.<sup>1</sup> Sixty percent of spine tumors are extradural lesions. Thirty percent of it are intradural lesions. And only 10% of spine tumors are intramedullary lesions.<sup>1,2</sup> Twenty to thirty percent of intradural spine tumors are schwannomas and spinal neurofibromas.<sup>2</sup> Surgery is the leading choice for schwannomas and neurofibromas that grow progressively or cause neurological deficits.<sup>4</sup> Total tumor resection in spine neurofibromas patients gives good outcome.

Currently, minimally invasive surgery is developing rapidly, including minimally invasive spine surgery.<sup>5</sup> In endoscopic spine surgery, tissue dissection, trauma to the skin, muscles, the amount of bleeding, damage to the epidural blood supply that occurs are less than conventional surgical techniques (open surgery), and consequently less epidural fibrosis and scarring, shorter hospital length of stay, early functional recovery and improved quality of life and better cosmetics. Postoperative pain is also reduced in patients with endoscopic spine surgery compared to conventional spine surgery.<sup>5,6</sup> This paper aims to provide an overview of endoscopic techniques for surgical removal of spinal tumors.

### CASE DESCRIPTION

A 59-year-old man presented paraplegia of both lower limbs. The patient complained walk difficulty since 9 months before admitted to the hospital. The patient also complained hard to move his legs, burn pain sensation, pain and numbness sensation that radiates from chest region to the tips of both toes, he felt that his chest feels like being tied, pain at the back, and the pain was getting worse when the patient did a lot of activity or lay down. The patient also complained hard to breathe. The patient walked with help from his family. The patient also had erectile dysfunction. Then the patient went to the hospital, the doctor said that he had a pinched nerve.



**Figure 1.** Thoracolumbar X-ray of the patient. There weren't any widening of intervertebral foramen, narrowing of interdisc space, or any destruction of the bone that showed on the x-ray. There was thoracolumbar spondylosis (black arrow), with normal density of bone.

Five days before admission to the hospital the patient was unable to walk. The pain was getting worse. The patient complained of burn pain sensation and numbness from both toes to the chest area. The patient felt like being tight in chest. The patient was difficult to defecate, and he must strain when urinating. Then the patient was hospitalized.

There wasn't family history of suffering from malignancy. The patient was work as unskilled labor. The patient had history of lifting heavy weights for approximately 20 years and had stopped smoking 25 years ago.

Based on the physical examination, when the patient entered the Hospital (June 26, 2020) the patient appeared to be moderately ill with full awareness, blood pressure 130/90 mmHg, pulse 88x/minute, regular breath frequency 20x/minute, and axillary temperature was 36.4-degrees Celcius. The examination of the head and neck were within normal limits. Cranial nerve examination was within normal limits. On motor examination, it was found that each of the

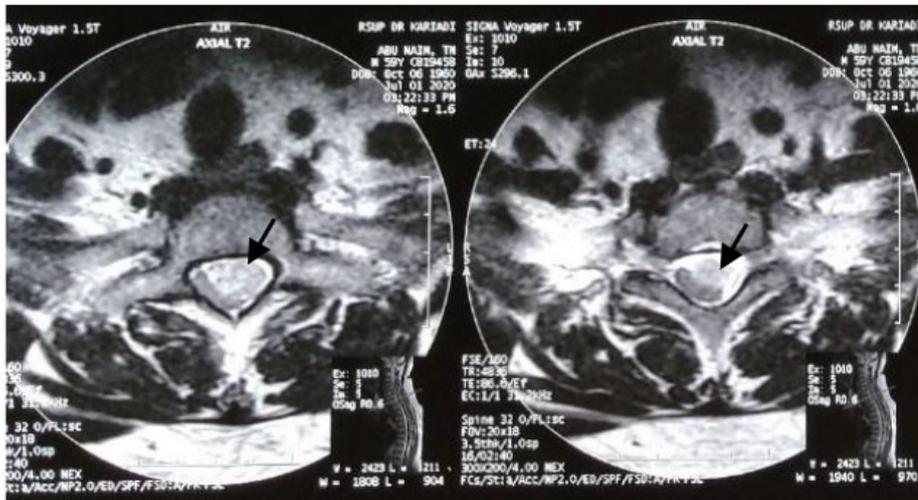


**Figure 2.** MRI of the patient. Myelogram (A), sagittal cut plain T1 sequence of MRI (B), sagittal cut T1 MRI with contrast MRI (C), and sagittal cut of T2 MRI sequence (D).

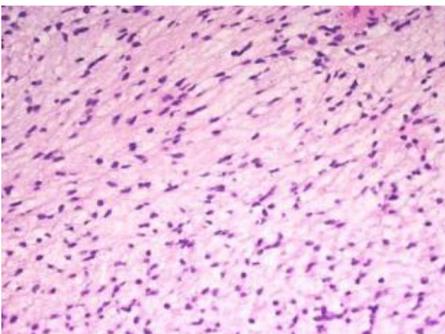
superior extremities strength was 5 in all segments, and 0 strength in all parts of the inferior limbs. Hypesthesia was obtained from the tips of both of the feet to the Th1-2 dermatomes on sensory examination. There were increased physiological reflex and Babinsky's pathological reflex in both inferior extremities, normal muscle tone in all extremities, and no clonus. For examination of the patient's chest, pulmonary region, heart, and abdomen within normal limits.

There was thoracolumbar spondylosis from the thoracolumbar vertebral X-ray, with average density and without destruction at bone, no narrowing at inter disc space, and no widening of intervertebral foramen (Figure 1).

From the MRI, the myelogram showed compression to medulla spinalis at lower cervical region. There was an oval-shaped lesion with a clear border with location at intradural-extramedula at the level of the C7-T1 vertebrae with 1.2 x 1.6 x 2.7 cm size which pushed the spinal cord to the



**Figure 3.** The axial cut of T2 MRI sequence. An inhomogeneous hyperintense mass pushed the spinal cord to the right posterolateral (black arrow).



**Figure 4.** Microscopically showed proliferation of fusiform spindle cells with some wavy nuclei.

right posterolateral, with an isointense image on T1 sequence, hyperintense on T2 sequence, and there is an enhancement of the lesion after contrast administration, no dural tail was seen on MRI. We suggest that the lesion was a neural sheath tumor, dd/ schwannoma, dd/ neurofibroma (Figure 2 & 3).

Then the patient underwent endoscopic spine surgery. The tumor was taken piecemeal and was removed 100%. Postoperative the patient was treated at ward. At day 1 operation, the patient still complained pain and numbness from both toes to the Th1-2 dermatome and postoperative pain. On postoperative day 3, the pain was much reduced, with numbness also reduced, but the lower extremity motor strength was still 0 in all

five segments. The patient went home on day 7 after surgery due to improvement of electrolyte imbalance and bladder training.

From the histopathological examination, there was a proliferation of spindle cells that arranged fusiform, with some wavy nuclei, fine chromatin in the stroma of swollen fibrous connective tissue (Figure 4). There were no signs of malignancy in the tissue. We concluded that the tumor was a neurofibroma.

## DISCUSSION

Spinal tumors are rare tumors.<sup>1</sup> The incidence of spinal tumors is 0.5-2.5 per 100.000 population.<sup>1</sup> Based on their location, 60% of spinal tumors are located in the extradural, most of which originate from the spine. Most of the extradural spinal tumors were metastatic tumors. Thirty percent of spinal tumors were located extramedullary intradural, which 80-90% were meningiomas and nerve sheath tumors. And 10% of spinal tumors are located intramedullary.<sup>1,2</sup>

Thirty percent of intradural extramedullary spinal tumors are nerve sheath tumors, consisting of schwannomas and neurofibromas.<sup>1,2</sup> Thirty-five until forty-five percent of spinal nerve sheath tumor is neurofibroma.<sup>1,2</sup> The peak incidence of spinal neurofibroma is in the mid-decade.<sup>2</sup>

The patient had a progressive

paralysis of both lower limbs indicating compression of the spinal cord's anterior segment. The patient also complained that being tight at the T1-2 dermatome might reduce the T1-2 segment of the spinal roots. Numbness from the toe to the area of the T1-2 dermatome indicates possible compression of the anterior and lateral spinothalamic tracts. The loss of proprioceptive sensation in the right and left lower limbs in this patient also indicates a suspicion of a lesion in the patient's fasciculus gracilis. This was confirmed by physical examination. These represent a total lesion of the spinal cord in the T1-2 segment, which may be due to external compression of the spinal cord or an intramedullary mass on its own. Where the mass presses the spinal cord and spinal radix nervi T1-2 segment. Chronic progressive complaints lead to a malignancy process.

From radiological examination, on the thoracolumbar X-ray, there was no abnormality. This describes a process that is most likely located in the spinal canal and the mass was not large.<sup>1</sup> And there was not bone destruction nor a change of bone mass density, so the possibility of metastasis can be excluded.<sup>1,7</sup> The examination was followed by a thoracic MRI examination. On MRI examination, an indentation on the myelogram shows an intra-dura extramedullary mass in the spinal cord of the upper thoracic segment. On plain T1 sequence MRI, an isointense mass was shown with lobulated form, well-defined, regular edge at 7<sup>th</sup> cervical to 1<sup>st</sup> thorax vertebrae. The mass enhanced with contrast application without any dural tail appearance. On T2 sequence MRI the mass appeared hyperintense. Suspect a spinal neurofibroma. Most spinal neurofibromas are located intradural extramedullary in the thoracic segment.<sup>1,3,4</sup> Surgery is choice for spinal neurofibroma that grows progressively and/or causes neurological deficits.<sup>4</sup>

In this patient, endoscopic spine surgery was performed to remove the tumor. The endoscopic spine surgery was chosen because with endoscopic technique is safer than conventional technique. With endoscopic technique there are minimal injuries to patients, minimal incisions, less trauma to the skin, fascia and muscle

tissue, less amount of bleeding (which bleeding is one of the complications of spinal surgery that often happen in conventional technique). Because of the less muscle trauma, postoperative pain is less than conventional technique. After surgery (who underwent endoscopic spine surgery), patient mobility is faster and has shorter length of stay in the hospital.<sup>5,6</sup> In this patient a complete resection of the tumor with an endoscopic approach was done.

In neural sheath tumors, total resection gives a better prognosis.<sup>3,4</sup> Whereas in patients who have total resection the recurrence rate is better than patients who do not have total resection. The recurrence rate in the patient who had total tumor resection was 0 to 5.8%. Whereas in patients with subtotal removal of tumors, the recurrence rate was 50-55%.<sup>4</sup> Therefore, it is very important for neurosurgeons not to leave any residual tumor at the surgery time.

Another thing that needs to be considered at the time of surgery is whether there is an invasion of the nerve tissue or spinal nerve roots.<sup>2</sup> If there is an invasion of tumor to the nerve tissue, sacrificing the involved spinal nerve may be an option.<sup>2</sup> This is due to the high recurrence (50-55%) in patients who undergo subtotal tumor removal.<sup>4,5</sup> In general, for tumors in the thoracic segment that invade the spinal nerves, sacrificing the spinal nerves is an option because the complications caused by spinal nerve sacrifice are generally tolerable. However, if the spinal nerves invade by the tumor have motor function in the extremities, it certainly requires special consideration.<sup>2,4</sup> For this reason, it is essential to assess the patient's function before the procedure.

Other prognostic factors for patients with nerve sheath tumors are age and neurological deficits in the patient. Patients with older age have a worse prognosis than younger patients.<sup>4</sup>

Neurologic deficits in patients are an essential prognostic factor in patients with neurofibromas. Severe neurological deficit is a poor prognosis in the patient.<sup>4</sup>

There was proliferation of fusiform spindle-shaped cells, some wavy nuclei, and fine chromatin in the stroma of swollen fibrous connective tissue from the histopathological examination. From this description, it was found that the tumor was a neurofibroma, there was no malignancy appearance. In nerve sheath tumors, 4-11% of neurofibromas can be malignant.<sup>1,2,7</sup>

## CONCLUSION

Neurofibroma is a spinal tumor that is often found intradural extramedular. Good imaging can guide the diagnosis and a good plan of action and management in patients with spinal tumors. Complete tumor resection provides a better prognosis in patients with neurofibromas. The surgical technique for spinal tumors using an endoscopic approach may be an option for patients with spinal neurofibromas

## FUNDING

No specific funding was provided for this article.

## CONFLICTS OF INTEREST

There are no conflicts of interest in this article.

## AUTHOR CONTRIBUTIONS

Dewi Sartika is the corresponding author and collected data, searched literature, wrote draft preparation, and editing the manuscript. Ajid Risdianto was concepting idea, operator, reviewing and editing the manuscript. Abdi Saputro was the assistant operator of the operation. Happy Kurnia Brotoarianto, Yuriz Bakhtiar,

Dody Priambada, Erie BPS Andar, Zainal Muttaqin, Krisna Tsaniadi P., M. Thohar Arifin was in charge of reviewing and editing the manuscript.

## ACKNOWLEDGMENTS

This work was supported by Department of Neurosurgery, Faculty of Medicine, Diponegoro University.

## ETHICAL STATEMENT

The patient had received signed written informed consent regarding publication of their medical data in journal article.

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