



Spinal MRI is not a Complete Replacement for Spinal Cord Angiography, a Rare Case of Spinal Canal Neoplasia in the Spinal Canal that Causes Paralysis: Case Report and Literature Review

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Abstract

Objective: One case of acute spinal cord injury was confirmed by spinal myelography, and the application of spinal angiography in patients with special spinal cord injury was explored.

Methods: One patient with acute spinal cord injury and severe low back pain was unable to lie supine and could not be examined with MRI and CT of the spine. The cause and location of the injury could not be determined; spinal angiography had to be performed; spinal angiography showed cerebrospinal fluid circulation disorder; emergency surgery showed thoracic spine Intraductal Schwannoma with hemorrhage.

Results: Schwannoma with hemorrhage.

Conclusion: The patient had acute lower back pain with paraplegia of both lower extremities. Because of severe lower back pain, he could only take a seat and could not lie supine. He could not complete MRI and CT examinations and could not clearly identify the location and nature of the lesion; spinal cord nerves were progressively worsened and spinal cord was given for spinal cord surgery. Spinal angiography showed that cerebrospinal fluid in the spinal canal was blocked, suggesting that there was a space occupying lesion in the spinal canal. Emergency surgical exploration was performed to remove the occupying schwannomas. In the diagnosis and treatment of spinal diseases in modern medicine, magnetic resonance is often the gold standard, but Spinal vertebral angiography still has an irreplaceable status in some special conditions.

Keywords: Schwannoma; Hemorrhage; Spinal cord injury; MRI; CT; Cerebrospinal fluid

Introduction

MRI has been used more and more in clinical medical examination because of its safety, non-invasive, and clear image, especially in the spinal and neurological aspects. Then, some primitive spinal puncture methods were ignored or even forgotten. For example: Spinal vertebral angiography, because of a certain risk of spinal canal angiography; however, when the patient is unable to receive MRI examination for some reason, the vertebral angiography becomes very important. Here is a case of paralysis caused by sudden hemorrhage of schwannoma in the spinal canal. The leading cause of spinal Subarachnoid Hemorrhage (SAH) is trauma or vascular malformations [1]. Spinal SHA is very rare that was caused by complicated spinal tumors [2]. According to the reports its incidence rate is about 0.05% to 1.5% [3-5]. From the histology, the most common tumor type was ependymoma; other neoplasms, such as neurinomas and gliomas, were rarer [4]. According to our knowledge and literature review, there are only a few cases were reported, many of them have neurological symptoms from schwannoma before hemorrhage of schwannoma [5-10].

We report a very rare case, which previously asymptomatic, of spinal schwannoma hemorrhage, manifested as extreme back pain and paraplegia.

Case Presentation

A 51-year-old man with a complaint of extreme back pain and rapidly progressing unable to walk after stood up from the sofa 3 days ago. He became paraplegia and incontinent on admission.

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Figure 1: There are no obvious abnormalities in the lumbar spine X-ray film.

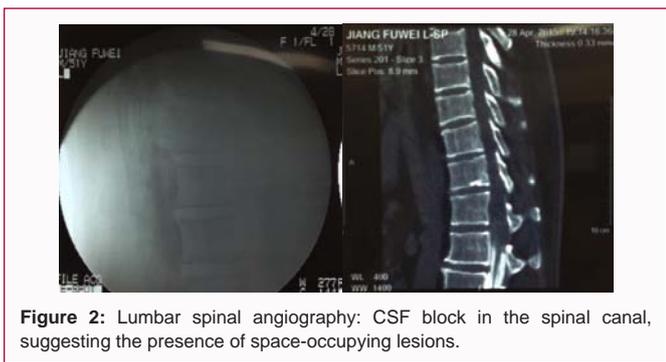


Figure 2: Lumbar spinal angiography: CSF block in the spinal canal, suggesting the presence of space-occupying lesions.



Figure 3: After decompression of the lamina: The dura mater appears blue-purple.



Figure 4: After incision of the dura mater, space-occupying lesions gushed out.

The patient had to keep compulsive sitting position and could not lie down even for one second because of severe back pain. Neurological examination revealed muscle weakness (G0 level) of lower limbs and without feeling below the 2 cm under the navel level; lower abdominal reflex, anal reflex and deep tendon reflexes were absent; pathologic reflex has not drawn out. Platelet levels, bleeding and coagulation times were unremarkable. Cerebrospinal fluid was xanthochromia liquid with high pressure, examination of cerebrospinal fluid showed

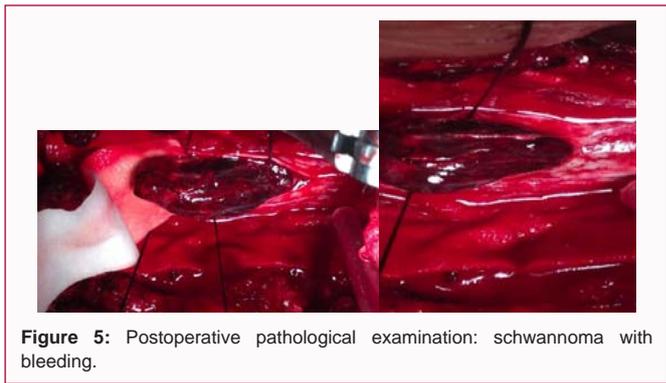


Figure 5: Postoperative pathological examination: schwannoma with bleeding.

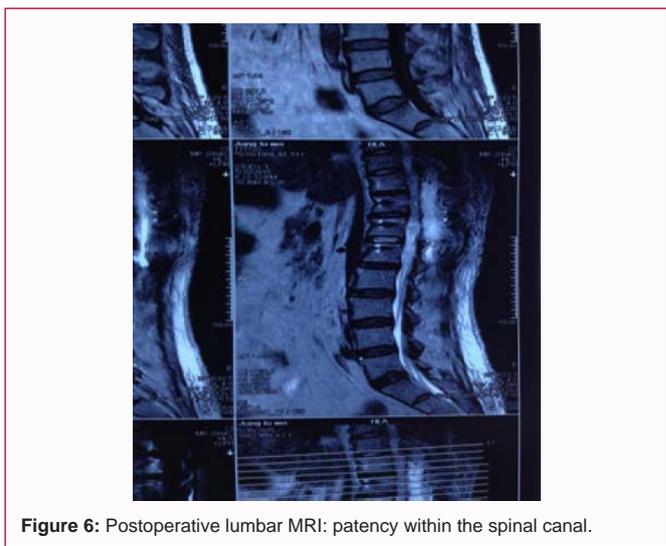


Figure 6: Postoperative lumbar MRI: patency within the spinal canal.

white blood cell: $910 \times 10^6/L$ and qualitative protein: Positive.

The radiograms of the thoracic and lumbar spine were normal (Figure 1). Patient could not take Magnetic Resonance Imaging (MRI) examination because supine position would cause unbearable back pain even use opium analgesics, so we only did lumbar myelography and thoracolumbar Computed Tomography (CT) myelography in lateral position. After we injected a little contrast medium, patient complained intolerable back pain. Lumbar myelography and CT myelogram revealed a complete block at T12 (Figure 2).

Because of severe neurological dysfunction patient underwent emergency laminectomy and surgically intradural exploration. A T11-L1 laminectomy revealed the endorhachis did not pulsate and appeared tense; opened the endorhachis and arachnoidea carefully and the deep purple huge mass bulged out with intact capsule (Figure 3). A turgid, large, vein was found from the ventral of mass. Ligated the root of vein then taken out the mass completely (Figure 4). The mass was approximately 2 cm × 7 cm. Operation was performed smoothly. After the operation, the back pain disappeared immediately, and the patient could keep supine position without any discomfort. So we did MRI scan and excluded other space occupying disease. Histopathological examination of the excised mass was diagnosed schwannoma with macroscopic hemorrhage (Figure 5). At follow-up 9 months later, the patient sensory functions were normal, but lower limbs myodynamia still was not normal (G2 level).

Discussion

In general spinal tumors are grow slowly; local pain and slow,

Table 1: Literature Review of the Cases with Spinal Schwannoma Hemorrhage [2,4-10,12-35].

Year	Author	Site	Histological type of the tumor	Clinical Presentation
1930	André-Thomas et al. [12]	L2-L3	Neurinoma	Spinal
1947	Krayenbuhl H [22]	cauda equina	Neurinoma	Spinal
1947	Krayenbuhl H [22]	T12	Neurinoma	Spinal
1951	Fincher EF [19]	T12-L1	Neurinoma	Spinal
1968	Fortuna et al. [20]	cauda equina	Neurinoma	Spinal
1975	Grollmuss J	T8-L1	Neurinoma	Spinal
1978	Djindjian et al. [2]	L1	Neurinoma	Spinal
1978	Luxon et al. [34]	cervical	schwannoma	Intracranial
1980	Muhtaroglu et al. [24]	L1-L2	Neurinoma	Intracranial
1981	Motomochi et al. [8]	T8-T11	Neurinoma	Spinal
1985	Smith RA [21]	C5-7	Neurilemmoma	Spinal
1985	De Divitiis et al.	C4	Schwannoma	Intracranial
1990	Clalif et al.	C1-C2	Schwannoma	Intracranial
1992	Kopera M et al. [29]	cervical	Schwannoma	Spinal
1993	Mills B et al. [6]	C7-T1	Degenerate schwannoma	Intracranial
1994	Vazquez-Barquero et al.	C5-7	Schwannoma	Spinal
1996	Corriero et al. [31]	C7-T1	Schwannoma	Intracranial
1998	Uemura et al. [9]	T12	Schwannoma	Spinal
1999	Cordan T et al.	cauda equina	Schwannoma	Spinal
2000	Cohen et al.	T11-T12	Schwannoma	Spinal
2001	Ng [14]	C7	Schwannoma	Spinal
2002	Tanaka et al. [33]	T9-T12	Schwannoma	Spinal
2003	Liang et al.	C1-C2	Neurinoma	Spinal
2004	Parmar et al. [27]	T11-L1	Schwannoma	Intracranial
2009	Ichinose T et al. [18]	T12-L1	Schwannoma	Spinal
2010	Ji C et al. [35]	C1-C2	Schwannoma	Intracranial
2014	Jianhui Zhao et al. [13]	L4	Schwannoma	Spinal
2014	Yang Han et al. [10]	T11-T12	cellular schwannoma	Spinal
2014	Kukreja et al. [28]	T12-L2	Schwannoma	Intracranial and Spinal
2015	Ranjan Kumar Sahoo	C3-C5	Schwannoma	Spinal
2015	Jenkins AL et al. [32]	cauda equina	Schwannoma	Spinal
2015	Zhang HZ [7]	T10-T11	Schwannoma	Spinal

progressive neurological symptoms are main reasons to see a doctor. Shin et al. [11] retrospectively analyzed 419 spinal cord tumors of the thoracolumbar junction; about 13.8% (58/419) were intradural extramedullary tumors. Spinal tumors cause acute spinal SAH with rapid neurological deterioration are very rare, furthermore acute SAH caused by schwannoma is much rarer. Schwannoma also called neurilemmoma and neurinoma. According to our knowledge and literature review, only 32 cases (include 2 cases from Chinese database) [2,4-10,12-35] were reported since André-Thomas et al. [12] first reported (Table 1).

Up to now, the exact mechanism of acute hemorrhage in schwannomas is still not clear. Kasantikul et al. [36] reported that notable increase in vascularity is obvious in almost 60% of neural tumors larger than 2 cm, which are more vulnerable to rupture with the increase of fragility. Motomochi reported spontaneous spinal SAH from a thoracic neurinoma, and hemorrhage considered due to anticoagulation therapy [8]. The contribution of coagulation disorders

to the pathogenesis of spinal schwannoma intratumoral hemorrhage was still unclear. Alcoholic could result poor coagulation function even when results of blood coagulation indexes appear normal. Two theories are accepted by most scholars. One hypothesis proposed that the hyalinized ectatic vessels of schwannoma occurs spontaneous thrombosis lead to distal tumor necrosis and hemorrhage. Another theory supposes that mechanical movement stretches tumor vasculature traction causes hemorrhage [4,6,14]. Divitiis et al. [4] reviewed 12 cases of spinal schwannoma resulting SAH, and before the hemorrhagic event, all patients experienced head and body flexion. As far as we know, the lesion occurs primarily in cervical and thoracolumbar junction (Table 1). Symptoms of our patient just result of changed his body position and the lesion was situated at T11-L1, the thoracolumbar segment represents more flexible, which is the one of the great transitions from the less mobile thoracic cage to the lumbar spine [37]. So we speculated the latter one may be the primary factor of spinal SAH in our case.

Neurological examination is beneficial to localization of disease. Spinal SAH usually begins with severe pain at the site of the hematoma [5]. In our case, we conjectured supine position will reduce the spinal canal volume, aggravate partial obstruction, and further exacerbate the back pain. Decompression operation completely relieved back pain; our patient can fall asleep in supine position, which confirmed our surmise. However, neurological symptoms are related to the level of the hematoma and the amount of hemorrhage. Massive hemorrhage causes rapidly progressive severe clinical symptoms, otherwise small bleeding can be responsible for minor, transient symptoms. Imaging examination is also necessary for diagnosis. Only a few cases reported widening of the neural foramina of plain films [16,21]. Well-known cranial CT is the preferred method in diagnosis of intracranial SAH, but in discrimination the contents of the spinal canal, CT scan is inferior to MRI [11]. We reviewed the literature, this method rarely used for the diagnosis of the spinal SAH from spinal tumor. MRI is highly sensitive for hemorrhagic spinal cord tumors [15]. The type of hemorrhage and duration after bleeding are major facts influenced the signal intensity of spinal SAH [7]. Uemura et al. [9] found on T1-weighted images, intracystic hemorrhage may show iso-intense signals in the very early stage. In early subacute hemorrhage, T1-weighted and T2-weighted show hypointense signal. In late subacute and chronic bleeding stage, T1W respectively express hyperintense signal and hypointense signal. This phenomenon also found in T2W [18]. Unfortunately, our patient could not take MRI scan, and he did not complain any symptom before, so the diagnosis of this disease is very difficult. We just did lumbar myelography and CT myelography, then found the contrast medium was complete blocked at T12 (Figure 1). Cerebrospinal fluid with high protein and high pressure suggested subarachnoid circulation disorder [5,6,31]. Combined with the result of routine examination, an intradural space-occupying focus was highly suspected. In our case, the significant value of myelography was reflected again. Myelography was the main imageology examination of spinal diseases, until the MRI was invented. MRI scan is widely used in the diagnosis of hemorrhagic spinal schwannomas (15 previous cases, it is a large number of a rare disease). But our case reminded us an important tip, when doctors meet special disease, like our case which cannot be able to take an MRI scan, or in primary-level hospital without MRI scanner, myelography should be an indispensable examination (Figure 6).

The histopathological diagnosis is schwannoma of our case; schwannomas are benign neoplastic lesions [38]. Because the patients with hemorrhage from spinal tumor showed acute spinal cord compression, emergency decompression operation may benefit for releasing the symptom of spinal cord compression and resection of the tumor and envelope is necessary that could reduce the risk of recurrence. Because of the development of surgical technique, we reviewed 13 cases of hemorrhage from intradural schwannoma since 2000, except 1 case did not mentioned; the symptoms in all cases were improved after operation, even if there is a still residual neurological symptom in some cases. In our case, because of severe neurological injury and paraplegia for 3 days, lower limbs strength recovery is not satisfied. However, operation is still beneficial to improve the symptoms of our patient.

Conclusion

Spontaneous spinal SAH from schwannoma is very rare, which will cause severe pain, neurological symptoms and even irreversible damage to the spinal cord. MRI of spine are beneficial for diagnosis.

But in our case which cannot be able to take an MRI scan, myelography played a very important role in diagnosis. Early diagnosis and surgical treatment will reduce the risk of disability.

References

- Walton JN. Subarachnoid haemorrhage of unusual aetiology. *Neurology*. 1953;3(7):517-43.
- Djindjian M, Djindjian R, Hurth M, Lounnon J, Houdart R. Les hémorragies méningées spinales tumorales: à propos de 5 cas artériographiés. *1978;134:685-92.*
- Bruni P, Esposito S, Oddi G, Hernandez R, Mastines F, Atricolo A. Subarachnoid hemorrhage from multiple neurofibromas of the cauda equina: Case report. *Neurosurgery*. 1991;28(6):910-13.
- Divitis ED, Maiuri F, Corriero G, Donzelli R. Subarachnoid hemorrhage due to a spinal neurinoma. *Surg Neurol*. 1985;24(2):187-90.
- Halpern L, Feldman S, Peyser E. Subarachnoid hemorrhage with papilledema due to spinal neurofibroma. *AMA Arch Neurol Psychiatry*. 1958;79(2):138-41.
- Mills B, Marks PV, Nixon JM. Spinal subarachnoid haemorrhage from an 'ancient' schwannoma of the cervical spine. *Br J Neurosurg*. 1993;7(5):557-9.
- Zhang HZ, Li Y, Han Y, Wang X, She L, Yan Z, et al. Spontaneous acute hemorrhage of intraspinal canal cellular schwannoma with paraplegia: A case report. *Br J Neurosurg*. 2015;29(3):425-7.
- Motomochi M. Spinal subarachnoid hemorrhage due to a thoracic neurinoma during anticoagulant therapy. A case report. *Neurol Med Chir (Tokyo)*. 1981;21(7):781-4.
- Uemura K, Matsumura A, Kobayashi E, Tomono Y, Nose T. CT and MR presentation of acute hemorrhage in a spinal schwannoma. *Surg Neurol*. 1998;50(3):219-20.
- Han Y, Zhang H, Wang X, She L, Yan Z. Intraspinal canal cellular schwannoma hemorrhage cause paralysis: A case report. *Chin J Neurosurg Dis Res*. 2014;13(6):558-9.
- Shin DA, Kim SH, Kim KN, Shin HC, Yoon DH. Spinal cord tumors of the thoracolumbar junction requiring surgery: A retrospective review of clinical features and surgical outcome. *Yonsei Med J*. 2007;48(6):988-93.
- André-Thomas F, Scaeffler H, De Martel T. Syndrome d'hémorragie méningée réalisé par une tumeur de la queue de cheval. *Paris Med*. 1930;77:292-6.
- Zhao J, Gu R, Wang Z, Zhao J. Traumatic Schwannoma hemorrhage cause acute cauda equina syndrome. *Chinese J Laboratory Diagnosis*. 2014;18(02):321-4.
- Ng PY. Schwannoma of the cervical spine presenting with acute hemorrhage. *J Clin Neurosci*. 2001;8(3):277-8.
- Chalif DJ, Black K, Rosenstein D. Intradural spinal cord tumor presenting as a subarachnoid hemorrhage: Magnetic resonance imaging diagnosis. *Neurosurgery*. 1990;27(4):631-4.
- Sahoo RK, Das PB, Sarangi GS, Mohanty S. Acute hemorrhage within intradural extramedullary schwannoma in cervical spine presenting with quadriparesis. *J Craniovertebr Junction Spine*. 2015;6(2):83-5.
- Bernell WR, Kepes JJ, Clough CA. Subarachnoid hemorrhage from malignant schwannoma of the cauda equina. *Tex Med*. 1973;69(10):101-4.
- Ichinose T, Takami T, Yamamoto N, Tsuyuguchi N, Ohata K. Intratumoral hemorrhage of spinal schwannoma of the cauda equina manifesting as acute paraparesis-case report. *Neurol Med Chir (Tokyo)*. 2009;49(6):255-7.
- Fincher EF. Spontaneous subarachnoid hemorrhage in intradural tumors of the lumbar sac. *J Neurosurg*. 1951;8(6):576-84.

20. Fortuna A, La Torte E. Neurinoma della cauda son emorrhagia subarahnoida circoscritta. *Lab Neuro-psychiatr.* 1968;43:1157-64.
21. Smith RA. Spinal subdural hematoma, neurilemmoma, and acute transverse myelopathy. *Surg Neurol.* 1985;23(4):367-70.
22. Grollmus J. Spinal subarachnoid hemorrhage with schwannoma. *Acta Neurochirurgica.* 1975;31(3-4):253-6.
23. Krayenbuhl H. Spontane spinale Subarachnoidalblutung und akute Rückenmarkskompression bei intraduralem, spinalem NeuRinom. *Schweiz Med Wochenschr.* 1947;77:692-4.
24. Muhtaroglu U, Strenge H. Rezidivierende Subarachnoidalblutung bei spinalem Neurinom. *Neurochirurgia (Stuttg).* 1980;23:151-5.
25. Prieto A, Cantu RC. Spinal subarachnoid hemorrhage associated with neurofibroma of the cauda equina. *J Neurosurg.* 1967;27(1):63-9.
26. Vázquez-Barquero J, Pascual F, Quintana J, Figols Izquierdo JM. Cervical schwannoma presenting as a spinal subdural haematoma. *Br J Neurosurg.* 1994;8(6):739-41.
27. Parmar H, Pang BC, Lim CC, Chng SM, Tan KK. Spinal schwannoma with acute subarachnoid hemorrhage: A diagnostic challenge. *AJNR Am J Neuroradiol.* 2004;25(5):846-50.
28. Kukreja S, Ambekar S, Sharma M, Nanda A. Cauda equina schwannoma presenting with intratumoral hemorrhage and intracranial subarachnoid hemorrhage. *J Neurosurg Spine.* 2014;21(3):357-60.
29. Kopera M, Majchrzak H, Bierzyńska-Macyszyn G, Idzik M. Hemorrhage in neurinoma of the cervical segment of the spinal canal. *Neurol Neurochir Pol.* 1992;26(2):253-6.
30. Yumin L, Mingzhu Z, Jingwei Zh, Weidong Liu. Upper cervical neurinoma with hemorrhagic onset: a case report with literature review. *Chin J Neuromed.* 2003;2(6):471-2.
31. Corriero G, Iacopino DG, Valentini S, Lanza PL. Cervical neuroma presenting as a subarachnoid hemorrhage: Case report. *Neurosurgery.* 1996;39(5):1046-9.
32. Jenkins AL, Ahuja A, Oliff AH, Sobotka S. Spinal Schwannoma presenting due to torsion and hemorrhage: Case report and review of literature. *Spine J.* 2015;15(8):e1-4.
33. Tanaka H, Kondo E, Kawato H, Kikukawa T, Ishihara A, Toyoda N. Spinal intradural hemorrhage due to a neurinoma in an early puerperal woman. *Clin Neurol Neurosurg.* 2002;104(4):303-5.
34. Luxon LM, Harrison MJ. Subarachnoid hemorrhage and papilledema due to a cervical neurilemmoma: Case report. *J Neurosurg.* 1978;48(6):1015-8.
35. Ji C, Ahn JG, Huh HY, Park CK. Cervical schwannoma presenting with acute intracranial subarachnoid hemorrhage. *J Korean Neurosurg Soc.* 2010;47(2):137-9.
36. Kasantikul V, Netsky MG, Glasscock ME, Hays JW. Acoustic neurilemmoma: Clinicoanatomical study of 103 patients. *J Neurosurg.* 1980;52(1):28-35.
37. Wood KB, Li W, Lebl DR, Ploumis A. Management of thoracolumbar spine fractures. *Spine J.* 2014;14(1):145-64.
38. Conti P, Pansini G, Mouchaty H, Capuano C, Conti R. Spinal neurinomas: Retrospective analysis and long-term outcome of 179 consecutively operated cases and review of the literature. *Surg Neurol.* 2004;61(1):34-43.