

# Segmental Schwannomatosis of the Spine: Report of a Rare Case and Brief Review of Literature

**Ranjit Kumar Baruah<sup>(A,B,E)</sup>, Suresh Bora<sup>(B,E)</sup>, Russel Haque<sup>(B,E,F)</sup>**

Assam Medical College, Dibrugarh, India

## **SUMMARY**

To report a case of segmental schwannomatosis involving the dorsal and lumbar spine and describe its excision as well as review of literature on schwannomatosis involving the spine.

Summary of background data: Schwannomas are nerve sheath tumours which usually occur as solitary lesions. Presence of multiple schwannomas suggests a genetic predisposition to tumorogenesis and possible association with neurofibromatosis. However, in very rare cases multiple schwannomas exist without typical features of neurofibromatosis and constitute a clinically and genetically distinct rare syndrome termed schwannomatosis.

A 31-year-old female presented with low back pain with left lower limb radiculopathy and sensory deficit over the L<sub>4</sub>-L<sub>5</sub> dermatome. Auditory and ophthalmologic examinations were normal. MRI showed two discrete intradural masses at D<sub>12</sub>-L<sub>2</sub> and L<sub>3</sub>-L<sub>5</sub>. MRI of the brain was negative for any vestibular schwannoma. The tumours were excised discretely through a single midline incision to improve the symptoms.

HPE of both the tumours revealed them to be schwannomas. Karyotyping from lymphocyte DNA revealed no abnormality. Conclusion: This is the 3<sup>rd</sup> case of schwannomatosis involving the dorsal and lumbar spine, in which excision of the tumours led to resolution of symptoms.

**Key words:** schwannomatosis, multiple schwannomas, multicentric schwannomas, neurofibromatosis, spinal schwannoma

## BACKGROUND

Schwannomas, the most common benign nerve sheath tumours, occurring usually as solitary encapsulated masses, grow slowly from Schwann cells that surround the nerve axons [1,2]. Multiple schwannomas occur rarely, and accompany neurofibromatosis 2 (NF2) in most cases [3]. However, they may also

present with different features that can be categorized into a distinct syndrome of schwannomatosis, a recently recognized rare tumour syndrome characterized by the presence of multiple schwannomas with clinical characteristics and genetic background that differs from neurofibromatosis (NF) type 1 and 2 [2,4]. We report a rare case of segmental schwannomatosis having two spinal schwannomas, each at dorsal and lumbar levels, the third such report to the best of our knowledge.

## CASE REPORT

A 31-years-old female presented with complaints of low back pain with left lower limb radiculopathy for 4 months. It was spontaneous and insidious in onset, gradually progressing and without systemic symptoms. Past medical and family history was insignificant. No history of tinnitus, vertigo or hearing loss was elicited. General examination did not reveal any abnormality including skin lesion. Local examination revealed a left-sided list, restriction of spinal movements, sensory deficit over the L<sub>4</sub>-L<sub>5</sub> dermatome with normal muscle strength and reflexes. A plain x-ray of the spine was normal. An MRI showed two discrete intradural masses, at the D<sub>12</sub>-L<sub>2</sub> and L<sub>3</sub>-L<sub>5</sub> levels, without any intervening connection, hypointense at T1 and hyperintense at T2WI, suggesting schwannomas (Fig 1, 2A, 2B). An MRI of the brain in 3mm slice was negative for any vestibular schwannoma. Pure tone audiometry ruled out any sensori-neural hearing loss. An ophthalmologic test including iris and fundal examination was normal. Karyotyping from lymphocyte DNA revealed no abnormality in number 22



Fig. 1. MRI (sagittal section) showing two discrete intradural masses, at D<sub>12</sub>-L<sub>2</sub> and L<sub>3</sub>-L<sub>5</sub> levels, without any intervening connection

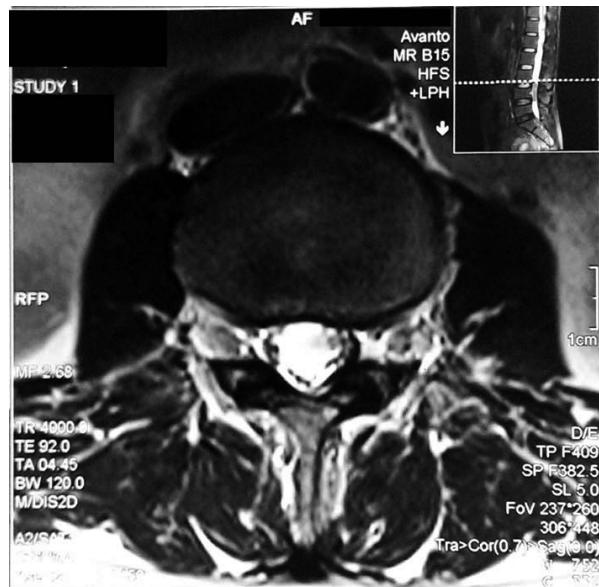
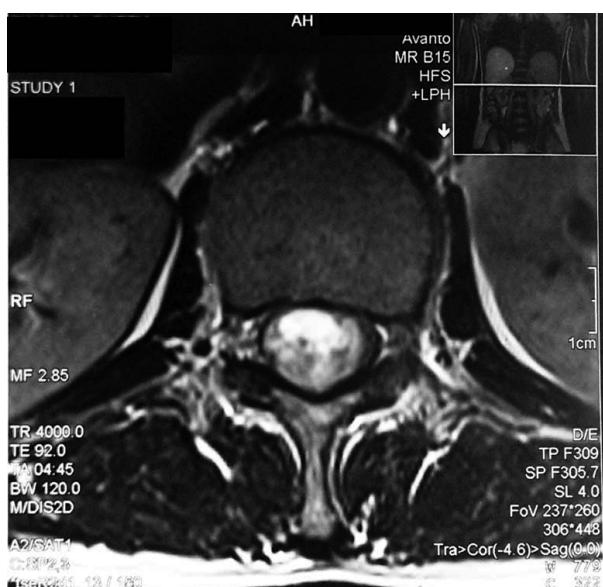


Fig 2A and 2B. MRI (Axial Section) showing intradural masses at two discrete levels

& 17 chromosomes (Fig 3). Due to gradually progressing severe low back pain and the sensory deficit, surgical removal of the tumours was contemplated.

Through a single midline incision, the laminae of the interested levels (D<sub>12</sub>-L<sub>2</sub> and L<sub>3</sub>-L<sub>5</sub>), as confirmed with fluoroscopy, were exposed by two separate exposures through the deep tissues, keeping a virgin musculo-osseous zone in between. Bilateral laminae were excised to expose the dura. Following dural incision, the lesion was excised completely as a single piece by blunt dissection. Dura was closed with

3-0 non absorbable suture. The other lesion was also excised in a similar fashion and the spine was stabilised by pedicle screw-rod fixation (Fig 4). The wound was closed in layers after proper haemostasis.

HPE of both the tumours revealed them to be schwannomas with characteristic findings (Fig 5). Pain improved post-operatively and neurological examination became normal by 6 weeks (Fig. 6). At 1-year follow-up she has no complaints.

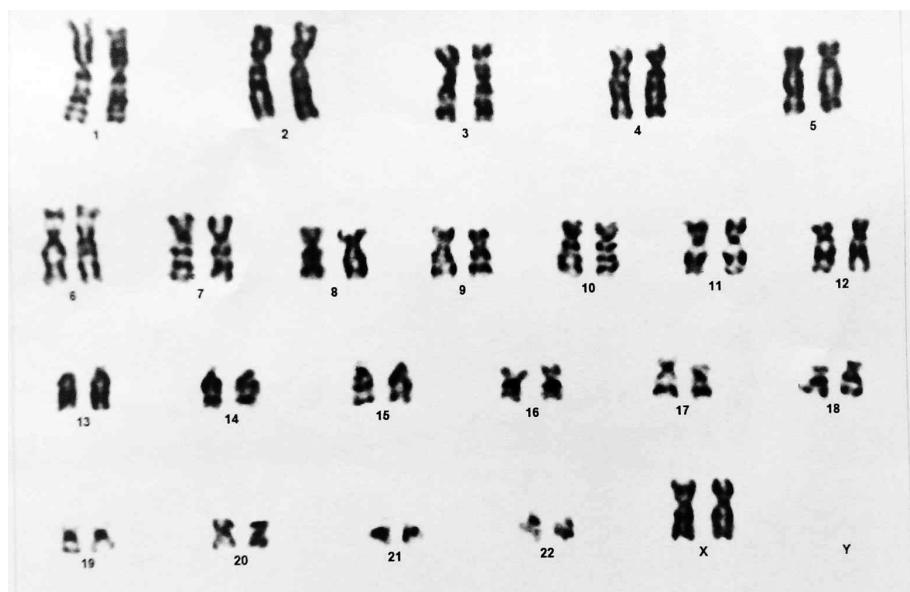


Fig. 3. Karyotyping from lymphocyte DNA showing normal number 22 & 17 chromosomes



Fig 4. Two separate nerve sheath tumours excised

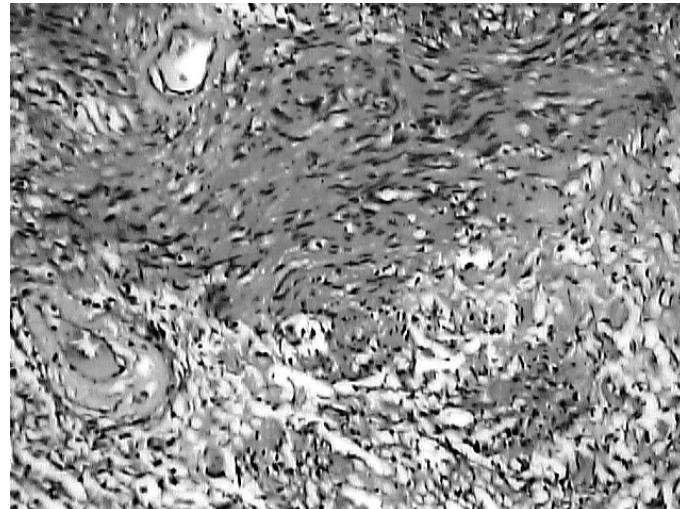


Fig. 5. Photomicrograph showing a tumour with cellular areas (Antoni A) consisting of spindle-shaped cells with focal palisading nuclei and myxomatous areas (Antoni B). Vessels show adventitial thickening. Mitotic figures are uncommon. H&E x 200



Fig. 6. Post-operatively patient became normal neurologically with normal spinal flexion and extension

## DISCUSSION

The presence of multiple schwannomas in a single patient suggests genetic predisposition to tumorigenesis and a possible association with neurofibromatosis mainly type 2 – the diagnostic features of which are given in Tab. 1 [5,6].

Recently it has been recognized that some patients with multiple schwannomas lack vestibular tumors and other relevant features of neurofibromatosis, and constitute a syndrome similar to but distinct from neurofibromatosis which is termed schwannomatosis [3]. Presently there are no NIH diagnostic criteria for schwannomatosis. Earlier presence of multiple schwannomas in the absence of radiological evidence of vestibular schwannoma in patients older than 18 years was considered to be diagnostic to be schwan-

nomatosis [3]. It has been modified by MacCollin et al. (Tab. 2) to differentiate Schwannomatosis from NF2 [4].

The aetiology of schwannomatosis is not known for certain as of now. Germline mutation of *SMARCB1*, the tumour suppressor gene near 22q12 locus, and *CABINI* [8] gene on chromosome 22 have been implicated in the pathogenesis. However molecular or genetic testing for definite diagnosis is still not available [7,8].

Patients with schwannomatosis usually present with pain, whereas patients with NF2 usually present with dysfunction [1]. MRI is the gold standard for detecting these tumours. Surgery is indicated for symptomatic lesions [9]. Excision of painful tumours provides satisfactory results with improvement of neurological status and histological diagnosis [10-12].

Tab. 1. Diagnostic Features of Neurofibromatosis 1 and 2

Neurofibromatosis 1 (NF1)	Neurofibromatosis 2 (NF2)
Commoner; estimated incidence of 1 in 2,500-3,000 [10]	less common; estimated incidence of 1 in 40,000 [11]
Characteristics:	Characteristics:
<ul style="list-style-type: none"> <li>• Cafe au lait skin spots, skin fold freckling,</li> <li>• Cutaneous and plexiform neurofibromas,</li> <li>• Lisch nodules in iris,</li> <li>• Learning disabilities, Risk of malignancy, [4]</li> <li>• Constitutional Mutation in gene: 17q11.1 [10]</li> </ul>	<ul style="list-style-type: none"> <li>• Bilateral vestibular schwannomas (occur in 95% of patients) [11]</li> <li>• Increased incidence of other cranial, spinal, and peripheral nerve schwannomas, meningiomas, and ependymomas</li> <li>• Up to three-fourths of patients with NF2 have ocular manifestations including cataract, retinal hamartoma, or epiretinal membrane</li> <li>• Constitutional mutation in gene: 22q12 [10]</li> <li>• Mutation on gene locus 22q12 occurs in &gt;50 % of cases and causes inactivation of tumour suppressor protein merlin which leads to increased propensity to neural tumorigenesis [12]</li> </ul>

Tab. 2. Diagnostic Criteria of Schwannomatosis (MacCollin et al. [4])

Schwannomatosis		
Definite	Possible	Segmental
<ul style="list-style-type: none"> <li>• Two or more nonintradermal schwannomas</li> <li>• Age &gt; 30 years</li> <li>• No evidence of vestibular schwannomas on high-resolution magnetic resonance (MR) imaging of the brain (preferably less than 5 mm slice)</li> <li>• Without any known constitutional NF2 mutations.</li> </ul>	<ul style="list-style-type: none"> <li>• Two or more nonintradermal schwannomas</li> <li>• Age &gt; 45 years</li> <li>• No symptoms of eighth nerve dysfunction</li> <li>• Without any known constitutional NF2 mutations.</li> </ul>	<ul style="list-style-type: none"> <li>• Meet criteria for either definite or possible schwannomatosis</li> <li>• Schwannomatosis limited to: <ul style="list-style-type: none"> <li>◦ one limb or</li> <li>◦ five or fewer contiguous segments of the spine</li> </ul> </li> </ul>

Tab. 3. Salient Features Diagnostic of Segmental Schwannomatosis in our case

• Age was greater than 30 years,
• Multiple schwannomas were found on MRI at D12-L2 and L3-5 levels.
• No history of tinnitus or difficulty in hearing. Pure tone audiometry showed no evidence of sensorineural hearing loss.
• High resolution MRI of brain in 3mm slice showed no vestibular schwannoma..
• Ophthalmologic consultation ruled out any evidence of lisch nodules of iris, retinal hamartoma/astrocytoma, posterior subcapsular cataract or any other abnormality
• No skin lesions
• Family history was not significant for any genetic disease.
• Genetic analysis by karyotyping revealed no defect in chromosome 22 (for NF2) and 17 (for NF1)

The first report of multiple spinal schwannomas in the absence of neurofibromatosis was done by Dara et al [5]. Subsequently, cases with one intracranial and 3 spinal schwannomas and multiple skin and spinal schwannomas were reported [13,14]. Then there were reports of multiple spinal schwannomas without neurofibromatosis in lumbar and sacral vertebrae, in cervical and lumbar vertebrae, and in the cauda equina [2,6,15,16]. There are 2 reports of multiple schwannomas in the dorsal and lumbar spine without neurofibromatosis: one at the D<sub>11</sub> and L<sub>1</sub> levels [10,12]. The case described here is the third such report of multiple schwannomas in the dorso-lumbar region, with two discrete lesions, one at the D<sub>12</sub>-L<sub>2</sub> level and the other at the L<sub>3</sub>-L<sub>5</sub> level, without any intervening connection (Tab. 3).

## CONCLUSION

Multiple spinal schwannomas may occur as a part of neurofibromatosis 2 or schwannomatosis, each having different clinical, radiological and genetic features. It is important to differentiate between the two so that appropriate genetic counselling can be offered. Since the exact genetic mechanisms causing Schwannomatosis have not been fully recognised, patients should be informed of the possibility of germ-line mutations as familial incidence has also been rarely reported [10]. Asymptomatic lesions can be managed conservatively whereas symptomatic lesions should be surgically removed. Regular as well as long-term follow-up is necessary in both cases.

## REFERENCES

1. Chen SL, Liu C, Liu B, et al. Schwannomatosis: a new member of neurofibromatosis family. Chin Med J 2013; 126(14): 2656-60.
2. Hakan T, Celikoglu E, Aker F, Barisik N. Spinal Schwannomatosis: Case Report of a Rare Condition. Turkish Neurosurgery 2008; 18(3): 320-3.
3. Jacoby L, Jones D, Davis K, et al. Molecular Analysis of NF2 tumour suppressor gene in schwannomatosis. Am J Hum Genet 1997; 61: 1293-1302.
4. MacCollin M, Chiocca E, Evans D, et al. Diagnostic Criteria for Schwannomatosis. Neurology 2005; 64: 1838-45.
5. Daras M, Koppel B, Heise C, Mazzeo M, Poon T, KR D. Multiple spinal intradural schwannomas in the absence of von Recklinghausen's disease. Spine 1993; 18: 2556-9.
6. Kayaoglu C, Sengul G, Aydin IH. Multiple schwannomas of cauda equina in the absence of von Recklinghausen's disease. Saudi Med J 2007; 28(12): 1907-9.
7. Hadfield K, Newman W, Bowers N, et al. Molecular characterisation of SMARCB1 and NF2 in familial and sporadic schwannomatosis. J Med Genet 2008; 45: 332-39.
8. Buckley P, Mantrioragada K, Diaz-de-Stahl T, et al. Identification of genetic aberrations on chromosome 22 outside the NF2 locus in schwannomatosis and neurofibromatosis type 2. Hum Mutat 2005; 26: 540-9.
9. Westhout F, Mathews M, Paré L, Armstrong W, Tully P, Linskey M. Recognizing schwannomatosis and distinguishing it from neurofibromatosis type 1 or 2. J Spinal Disord Tech 2007; 20(4): 329-32.
10. Huang JH, Simon SL, Nagpal S, Nelson PT, Zager EL. Management of Patients with Schwannomatosis: Report of Six Cases and Review of the Literature. Surg Neurol 2004; 62: 353-61.
11. Martuza R, Eldridge R. Neurofibromatosis 2 (bilateral acoustic neurofibromatosis). N Engl J Med 1988; 318: 684-8.
12. Landi A, Dugoni D, Marotta N, Mancarella C, Delfini R. Spinal schwannomatosis in the absence of neurofibromatosis: A very rare condition. International Journal of Surgery Case Reports 2011; 2(3): 36-9.
13. Altinors N, Caner H, Bavbek M. Multiple Schwannomas. J Neurosurg 1999; 91: 351-2.
14. Evans D, Mason S, Huson S, et al. Spinal and cutaneous Schwannomatosis is a variant of type 2 neurofibromatosis: a clinical and molecular study. J Neurol Neurosurg Psychiatry 1997; 62: 361-6.
15. Ahn J, Kwon S, Choi E, Lee B. Multiple Schwannomas. J Korean Neurosurg Soc 2003; 33: 299-301.
16. Kim S, Lee S. Multicentric Spinal Schwannomatosis without any evidence of Neurofibromatosis Type 2. J Korean Neurosurg Soc 2004; 36: 508-9.

Liczba słów/Word count: 1660

Tabele/Tables: 3

Ryciny/Figures: 6

Piśmiennictwo/References: 16

Adres do korespondencji / Address for correspondence

Dr Russel Haque

Department of Orthopaedics, Assam Medical College, Barbari, Dibrugarh, PIN – 786 002  
Assam, India, Telephone: +91 8471894161, e-mail: russelhaq@gmail.com

Otrzymano / Received 10.01.2016 r.  
Zaakceptowano / Accepted 10.02.2016 r.