Cervical Dumbbell: Ganglioneuromas Causing Myelopathy in a Case of Neurofibromatosis Type-I: Case Report and Literature Review

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Abstract

Background Data: Ganglioneuromas are rare benign tumors arising from the sympathetic nervous system. They occasionally grow in a dumbbell fashion extending into the spinal canal extradurally. However, ganglioneuromas of the cervical spine with intradural extension or multiple locations or in association with neurofibromatosis type-I are rare.

Purpose: Our aim is to describe a man with cervical compressive myelopathy at C2 level caused by dumbbell shaped intradural extramedullary ganglioneuroma and multilevel spinal lesions (ganglioneuromas) associated with neurofibromatosis type-I with genetic predisposition.

Study Design: Case report and review of the literature.

Patient and Method: Twenty eight year-old man with NF-I presented with acute history of progressive quadriparesis. Magnetic resonance imaging showed bilateral dumbbell masses at the C2 level compressing the spinal cord. A systemic imaging survey of the patient showed numerous asymptomatic foraminal and extraforaminal tumors at all neuroforamina of the spine.

Results: Surgical decompression of the spinal cord by resections of bilateral tumors at the C2 level alleviated patient symptoms. Histopathological diagnosis was ganglioneuroma. The patient was heterozygous in the NF-I gene for a sequence variant defined as c.970T>C, and predicted to result in the amino acid substitution p.Cys324Arg.

Conclusion: The case reported here is very unusual because of its type, its location as dumbbell spinal ganglioneuroma at level of 2nd cervical spine, being associated with other ganglioneuromas at other spinal levels and being associated with NF-I molecular mutation. (2017ESJ143)

Keywords: Ganglioneuroma, Cervical myelopathy, Extra medullary tumors, Neurofibromatosis
Introduction

Ganglioneuromas are rare, slow-growing benign tumors that usually develop from the sympathetic nervous system, of which 60% occur in children and young adults. Ganglioneuromas are most commonly found in the posterior mediastinum or in the abdomen, in the lumbar and pelvic retroperitoneal space. Occasionally, they grow into the spinal canal extradurally and become dumbbell shaped. Cervical ganglioneuromas are also rare, and only 11 cases have been reported. In cervical ganglioneuromas, the bilateral symmetric dumbbell type is even rarer, comprising only three reported cases. The purpose of this report was to present an additional case with bilateral dumbbell shaped ganglioneuroma of the 2nd cervical vertebra and multilevel spinal lesions (ganglioneuromas) in a patient with Neurofibromatosis type-I who has genetic predisposition.

Patient and Methods

Case Report

Clinical Presentation:
Twenty eight year-old man, known to have neurofibromatosis type-I (which was diagnosed 3 years before presentation) came to the emergency department complaining of gait imbalance, back pain radiating to lower limbs, bilateral upper limbs weakness and bilateral shoulder pain. Also he had history of urine incontinence and constipation. Clinical examination showed: quadripareisis with weakness more in the upper limbs (Grade 3/5 in upper limbs, 4/5 in lower limbs), hyperreflexia, spasticity, positive Hoffman’s sign, positive Babinski sign and bilateral clonus. The patient has multiple café au lait spots, multiple cutaneous and subcutaneous neurofibromas and axillary freckling.

Neuroimaging:
Coronal and sagittal whole spine magnetic resonance images showed multilevel bilateral well demarcated enhancing intradural extra medullary spinal nerve root masses extending from the level of C2 through the sacral region with compression at the level of the C2 by dumbbell shaped tumors. Tumors showed high signal intensity in T2 weighted images, low signal intensity in T1 weighted images and heterogeneous mild enhancement in Gadolinium-enhanced T1 weighted images. (Figures 1,2)

Operative Treatment:

Microscopic surgery started by C1 posterior arch excision, C2 lamina were drilled carefully, the rest of the laminar plate was resected with a 2 mm Kerrison rongeur and the ligamenta flava was resected at that site to expose the spinal cord. C2 level was confirmed by fluoroscopy.

The pathological mass around the thecal sac and the cord was properly dissected and resected from both sides of the cord. Complete resection of the tumor was done using microsurgical technique. At the end of the procedure, decompression of the thecal sac and the cord was confirmed. Spinal stabilization was done by screw fixation of C1 lateral mass and C2 pedicle. (Figure 3)

No further oncological treatment was offered after extensive board consultation. The patient had improved neurologically after surgery regarding his motor power and urine incontinence.

Histopathology Examination:

Grossly; there was a single fragment of pink-white soft to firm. The tumor is well circumscribed. (Figure 4; A). Microscopically; the tumor is composed of hypo cellular spindle cell component in which haphazardly arranged, cytological dysmorphic ganglion cells are identified (Figure 4; B,C). The ganglion cells are highlighted by S100 and NFP antibodies (Figure 4; D,E). Also the schwannian spindle cell stoma is positive for S100. Molecular Genetic Report; NF-I- related disorders testing via NF-I Gene Sequencing were done. The patient was heterozygous in the NF-I gene for a sequence variant defined as c.970T>C, and predicted to result in the amino acid substitution p.Cys324Arg. This variant has been reported to be potentially causative for Neurofibromatosis Type-I.
Figure 1. Preoperative magnetic resonance images. (A,B) Coronal view T1-weighted MRI of the cervical spine with gadolinium showing intradural extra medullary space occupying lesion opposite the axis cervical as well as the sixth vertebrae.

Figure 2. (A) Coronal view T1-weighted MRI of the cervical spine with gadolinium showing intradural extra medullary lesion opposite the axis cervical vertebrae. (B) Coronal view T1-weighted MRI of the cervical spine with gadolinium showing other lesions at lower levels (C) right side para-sagittal section, revealed a dumbbell mass with expansion of the neuroforamena of C2.

Figure 3. Plain radiographs cervical spine showing stabilization of the spine after tumor excision with C1 lateral mass and C2 pedicle screw fixation.
**Discussion**

Ganglioneuroma is the fully differentiated benign counterpart of neuroblastoma. The majority of ganglioneuromas occur in children older than 10 years of age and is chiefly located in the posterior mediastinum and retro peritoneum. According to report from the Armed Forces Institute of Pathology, among 88 cases of Ganglioneuromas 34 were encountered in the posterior mediastinum, 27 in the retro peritoneum, 19 in the adrenal, 5 in the pelvis, 2 in the cervical area and 1 in the Para pharyngeal space.³

Jiang et al,⁵ reported surgical approach and development of an anatomic classification system in surgical treatment of cervical dumbbell tumors. According to this study the classification covers all tumor types and is easier to remember. It is practical and useful for determining the surgical approach. The recurrence rate decreases significantly after radical tumor resection. Revision surgeries are associated with more complications.

Ganglioneuromas of the cervical spine are also extremely rare, with only 6 pathologically confirmed and previously reported cases.¹³,¹⁵ Surgical treatment is the treatment of choice in these cases with cord compression. Posterior cervical decompression with radical resection of the tumor was the preferred approach in these cases. The main goals of surgery in these patients: is to prevent neurological deterioration and to have tissue diagnosis.

Cervical dumbbell-shaped Ganglioneuromas associated with neurofibromatosis type-I are very rare cases. After literature review, our case is the fifth case to be reported, with bilateral symmetrical dumbbell shaped cervical Ganglioneuroma, and the second one to be associated with NF-I molecular mutation.⁴,⁶,¹⁵

Surgical decompression in cases associated with cord compression is the treatment of choice and posterior approach was the main reported approach in similar cases. Radical tumor resection decreases the recurrence rate and therefore the possible complications associated with revision surgeries.
Conclusion

The case reported here is very unusual because of its type, its location as dumbbell spinal ganglioneuroma at level of axis cervical spine, being associated with other ganglioneuromas at other spinal levels and being associated with NF-1 molecular mutation.

References


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الملخص العربي

ورم عقد عصبي عصبي منتفخ الجانبين بمنطقة الفقرات العنقية يسبب اعتلال النخاع في حالة وجود الورم العصبي الليفي من النوع الأول: تقرير حالة و مراجعه للإبحاث

البيانات الخلفية: ورم العقدالعصبي العصبي هو ورم نادر الحدوث ينشأ من الجهاز العصبي السيمثاوى. احيانا ينمو الورم بطريقة الانتفخ الجانبين خارج الدم الجافيه. وجود هذا الورم بطريقه متعدده في الفقرات العنقية مع وجود الورم العصبي الليفي من النوع الأول هو حالة نادرة الحدوث.

الغرض: عرض حالة نادرة الحدوث لوجود ورم عقدعصبي عصبي منتفخ الجانبين بمنطقة الفقرات العنقية يسبب اعتلال النخاع في حالة وجود الورم العصبي الليفي من النوع الأول

تصميم الدراسة: تقرير حالة و مراجعه للإبحاث

المرضى والطرق: هذه الورق البحثية هي عرض لحالة مريض عمره 28 عاما معروف بوجود الورم العصبي الليفي من النوع الأول اصيب بضعف بالقوة الحركية للطرفين العلويين والسفييين بشكل تدريجي متزايد. تم عمل فحص بالرنين المغناطيسي أوضح وجود كتلة غريبة بجوار نسج الحبل الشوكي في منطقة الفقرات العنقية أمام الفقرة الثانية وتم استئصال الكتلة الغريبة و عمل فحوصات الأنسجة التي أثبتت تحليل كونها ورم العقدالعصبي العصبي

النتائج: حالة نادرة الحدوث لوجود ورم عقدعصبي عصبي منتفخ الجانبين بمنطقة الفقرات العنقية يسبب اعتلال النخاع في حالة وجود الورم العصبي الليفي من النوع الأول. الغريب فيهما تعدد الورم و مناطق الضغط و شكل الورم

الاستنتاج: حالة نادرة الحدوث لوجود ورم عقدعصبي عصبي منتفخ الجانبين بمنطقة الفقرات العنقية يسبب اعتلال النخاع في حالة وجود الورم العصبي الليفي من النوع الأول. الغريب فيهما تعدد الورم و مناطق الضغط و شكل الورم