CASE REPORT

Massive Oculomotor Nerve Enlargement: A Case of Presumed Schwannomatosis

Laura Donaldson^a, Ryan Rebello^b, and Amadeo Rodriguez^{a,b,c}

^aDivision of Ophthalmology, McMaster University, Hamilton, Ontario, Canada; ^bDepartment of Radiology, McMaster University, Hamilton, Ontario, Canada; ^cDivision of Neurology, McMaster University, Hamilton, Ontario, Canada

ABSTRACT

A 45-year-old man presented with a slowly progressive pupil-involving third nerve palsy. Magnetic resonance imaging (MRI) revealed a tubular lesion extending from the interpeduncular cistern through the cavernous sinus and into the left orbit where it branched into a superior and an inferior division, clearly outlining the anatomy of the third cranial nerve. Multiple other, less pronounced, enlarged cranial nerves were noted. The differential diagnosis included chronic inflammatory demyelinating polyneuropathy (CIDP), hereditary motor and sensory neuropathy (HMSN), neurofibromatosis (NF), and schwannomatosis. The absence of other muscle weakness and of sensory symptoms combined with normal peripheral nerve conduction studies effectively ruled out the hypertrophic polyneuropathies and pointed to a syndromic cause of multiple benign peripheral nerve sheath tumours (PNSTs). The authors are treating this case as presumed schwannomatosis, a syndrome similar to NF2 with much lower frequency of acoustic neuromas.

ARTICLE HISTORY

Received 6 January 2017
Revised 17 January 2017
Accepted 18 January 2017

KEYWORDS

Oculomotor nerve; MRI;
schwannomatosis

A 45-year-old man presented to the neuro-ophthalmology clinic in 2011 with a complaint of left-sided ptosis. He was first assessed by an ophthalmologist in 2005 for the same complaint and had noted slow progression over the past several years. Although he was unaware of it at the time, the asymmetry in his eyes could be detected upon reviewing his wedding photographs from 17 years earlier. His only past medical history was hypertension, controlled on three medications. On examination, his visual acuity was 20/20 and 20/30. Colour vision and visual fields were normal. The right pupil was reactive from 4 mm in the dark to 2 mm in bright light; the left was reactive from 5 to 4 mm. There was no relative afferent pupillary defect (RAPD) and no response to accommodation. A pronounced left exotropia was present in primary gaze with complete absence of left supraduction, infraduction, and adduction. He had normal intraocular pressures. Slit-lamp examination revealed no Lisch nodules and no evidence of sphincter muscle denervation. There was no enlargement of the corneal nerves. Examination of the fundus was unremarkable. Facial movements and sensation were normal, and no hearing loss or tinnitus was reported.

The patient was diagnosed with an oculomotor nerve palsy and was sent for a contrast-enhanced magnetic resonance imaging (MRI) of the brain and orbits. This revealed fusiform enlargement of the left oculomotor nerve involving the cisternal and cavernous segments and passing through the superior orbital fissure into the intraconal portion of the orbit. This was markedly hyperintense on T2 and STIR (short-tau inversion recovery) images. Throughout most of its course, the left oculomotor nerve was more than 10 times larger than its counterpart on the right. There was mild enhancement after administration of contrast. Within the intraconal space, the lesion could be clearly seen to branch into superior and inferior divisions (Figures 1, 2) This anatomy is consistent with a tumour or hypertrophy of the oculomotor nerve. Fortunately, the patient had a number of prior studies available for comparison dating back to 2005, which revealed minimal change in the appearance of this lesion.

The differential diagnosis for this marked enlargement of the oculomotor nerve included schwannoma, neurofibroma, and intraneural perineurioma. The slowly progressive nature of

Figure 1. Curved reformatted images along the path of the left oculomotor nerve from a 3D fat-saturated FLAIR (fluid attenuation inversion recovery) sequence post gadolinium contrast enhancement. The arrow marks a slight waist within the grossly enlarged oculomotor nerve as it passes through the superior orbital fissure. The intraorbital segment of the nerve is well depicted with delineation of the superior and inferior branches.

Figure 2. Coronal STIR (short-tau inversion recovery) image through the posterior orbits shows the grossly enlarged and hyperintense divisions of the left oculomotor nerve. The small open arrow shows the branch to the superior rectus/levator palabrae muscle complex, whereas the solid white arrow demonstrates the division supplying the medial and inferior rectus muscles.

the lesion was consistent with a benign peripheral nerve sheath tumour (PNST). However, an interesting aspect of this case was the presence of multiple other enlarged cranial nerves

Figure 3. Coronal STIR image at the level of the cavernous sinus shows the enlarged cavernous portion of the left oculomotor nerve (solid black arrow). It also shows an enlarged and hyperintense second division of the left trigeminal nerve (white arrowhead). The inferior alveolar nerves (white arrows) are enlarged and hyperintense bilaterally, as were the main trunk of the third division of both trigeminal nerves (not shown).

(Figure 3): the third (mandibular) divisions of both trigeminal nerves as well as the second (maxillary) branch of the left trigeminal nerve, and equivocally the left trochlear nerve.

The involvement of multiple cranial nerves on imaging was suggestive of chronic acquired demyelinating polyneuropathies, such as chronic inflammatory demyelinating polyneuropathy (CIDP) and hereditary motor and sensory neuropathy (HMSN), including Charcot-Marie-Tooth syndrome. Similar to benign PNSTs, nerves hypertrophied secondary to CIDP and HMSN are hyperintense on T2 and show variable contrast enhancement.¹ The patient denied any numbness, paresthesias, or weakness other than his ophthalmoplegia. He was evaluated at the neuromuscular and neurometabolic disease clinic and found to have normal sensation, muscle strength, and peripheral reflexes. Peripheral motor and sensory nerve conduction studies also did not show any evidence of polyneuropathy. Blood work to investigate for a connective tissue disorder such as Sjögren's or lupus as a cause of polyneuropathy was negative.

Given this clinical context, these lesions were favoured to represent benign PNSTs. The presence of multiple lesions pointed to an underlying genetic predisposition, and, in fact, oculomotor nerve schwannoma is usually associated with neurofibromatosis.² Neurofibromatosis type 1 (NF1) results from a mutation on chromosome 17 and presents with cutaneous and intracranial neurofibromas as well as malignant PNSTs, optic pathway gliomas, and a variety of other less common tumours. In neurofibromatosis type 2 (NF2), the causative mutation is on chromosome 22. More than 95% of individuals with NF2 have vestibular schwannomas. Cranial nerve, peripheral nerve, and cutaneous schwannomas, as well as meningiomas and ependymomas, are also common. A syndrome clinically similar to NF2 is schwannomatosis, most often caused by mutation in the *SMARCB1* tumour suppressor gene. It does not have the same high frequency of vestibular schwannomas.³ Both NF1 and NF2 have other ocular findings that were not found in this case: Lisch nodules or iris hamartomas in NF1 and juvenile posterior subcapsular or cortical cataracts in NF2. This patient did not have any contributory family history. There were also no other ophthalmologic or dermatologic features of neurofibromatosis, although he did report a history of having some unspecified “lumps” removed from his neck a number of years ago.

A lack of histologic confirmation of these lesions as schwannomas means that this patient

does not meet current diagnostic criteria for schwannomatosis.⁴ However, the clinical picture and prominent involvement of the oculomotor nerve with lack of abnormalities in the vestibulocochlear nerves points to this condition as the most likely diagnosis. We will continue to follow this patient with regular ophthalmologic examinations and imaging.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

References

- [1] De Smet K, De Maeseneer M, Talebian Yazdi A, Stadnik T, De Mey J. MRI in hypertrophic mono- and polyneuropathies. *Clin Radiol* 2013;68:317–322.
- [2] Ohata K, Takami T, Goto T, Ishibashi K. Schwannoma of the oculomotor nerve. *Neurol India* 2006;54:437–439.
- [3] Plotkin SR, Blakeley JO, Evans DG, Hanemann CO, Hulsebos TJ, Hunter-Schaedle K, Kalpana GV, Korf B, Messiaen L, Papi L, Ratner N, Sherman LS, Smith MJ, Stemmer-Rachamimov AO, Vitte J, Giovannini M. Update from the 2011 International Schwannomatosis Workshop: from genetics to diagnostic criteria. *Am J Med Genet A* 2013;161A:405–416.
- [4] Blakeley JO, Plotkin SR. Therapeutic advances for the tumors associated with neurofibromatosis type 1, type 2, and schwannomatosis. *Neuro Oncol* 2016;18:624–638.