Case Report

Granular cell tumors of the spinal canal: intramedullary case report and a review of the literature

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Introduction

Granular cell tumors (GCTs) are rare tumors that most commonly occur in the tongue, other areas of the head and neck, and the skin of the upper limbs and trunk. GCTs of the nervous system arise from peripheral nerves and the central nervous system (CNS), however only 11 cases have been reported in the spine (1-10). We here present the case of a 13-year-old girl with a GCT of the right C5 nerve root within the C4/5 foramen and review the published cases of spinal GCT.

Case presentation

A 13-year-old girl presented to the neurosurgical outpatient department with a one-year history of neck and right shoulder pain associated with paresthesia. She reported the pain was exacerbated by injury one month prior to review and described limited abduction of her right shoulder associated with temporary sensory disturbance in the C5 dermatome which resolved spontaneously within a week. There was no family history of neurofibromatosis and the patient was previously well with no regular medications. Examination revealed reduced power (4+/5) of right shoulder abduction and reduced sensation to touch and pinprick over the right epaulette region. The rest of the neurological examination was normal. Magnetic resonance imaging (MRI) (*Figure 1*) demonstrated a mildly enhancing mass in the right C4/5 foramen extending up to the central canal. Expansion of the neural foramen suggested a chronic process and the lesion was thought to represent a sporadic benign peripheral nerve sheath tumor. As the patient's symptoms failed to respond to conservative management surgical decompression of the nerve root was planned. A right C4/5 foraminotomy and core biopsy of the tumor was carried out and the tumor appeared to arise from the C5 nerve root. There were no postoperative complications and the patient reported improved right shoulder pain, however right shoulder abduction remained weaker. She was discharged on day 5 after surgery.

On histopathology (*Figure 2*), the biopsy specimen showed large, round to oval cells arranged in vague nests, showing abundant eosinophilic granular cytoplasm with intensely stained phagolysosomal globules frequently seen. The tumor cells were positive for S100 (diffuse), neuron-specific enolase (diffuse) and CD68 (patchy) (*Figure 3*). The findings were consistent with a GCT and the presence of nerve twigs and ganglion cells suggested a neural/ganglion origin. A decision was made against resection of the tumor given concerns about postoperative neurological deficit and a plan was made for conservative management with regular clinical review.

Discussion

GCTs are rare tumors that have a broad anatomical distribution, most commonly occurring in the head and neck (approximately 50% of all GCTs), particularly in the tongue (approximately 25%) (11). GCTs of the nervous system are rare, and may arise from peripheral nerves or the central nervous system (CNS). In the CNS, lesions have been reported in the cerebral hemispheres, cranial nerves and spinal cord, but most often occur in the

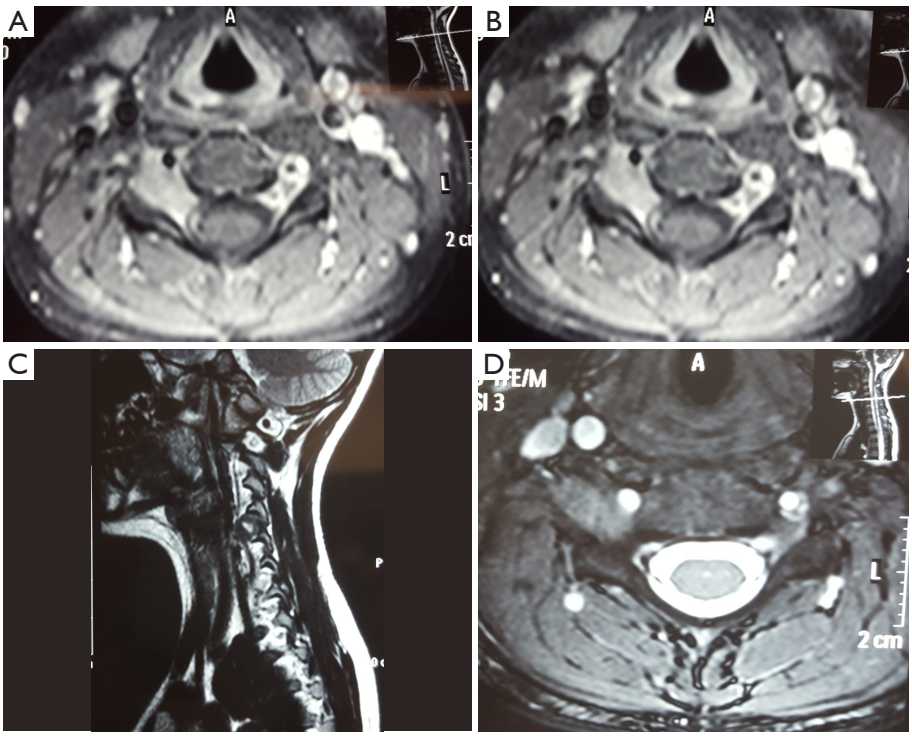

Figure 1 (A) T1 axial MRI demonstrating lesion in the right C4/5 foramen displacing vertebral artery anteromedially; (B) T1 MRI with contrast axial MRI, showing minimal contrast enhancement; (C) T2 sagittal MRI; (D) T2 axial MRI. MRI, magnetic resonance imaging.

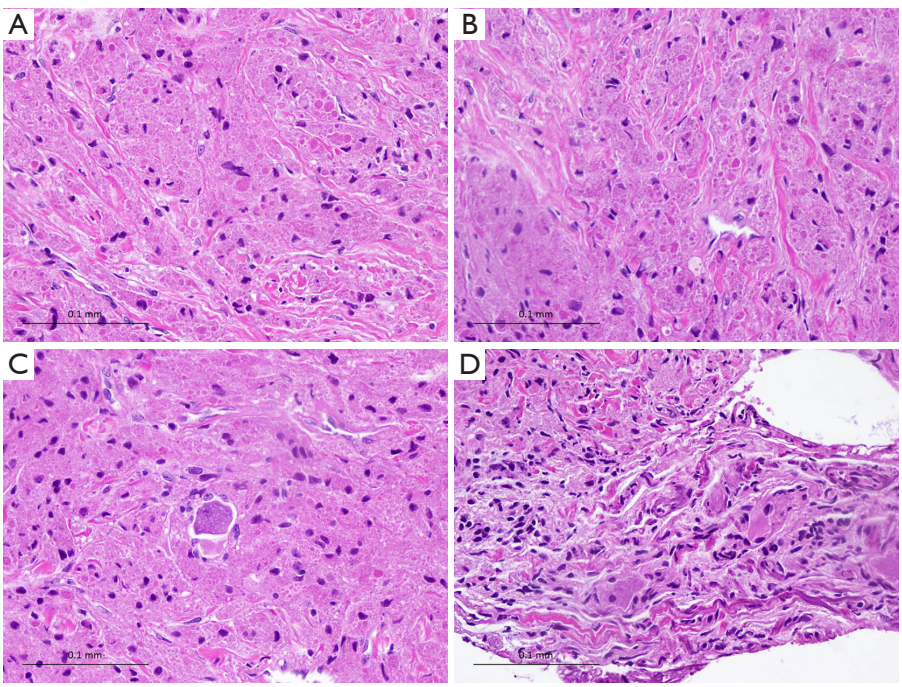

Figure 2 Histological analysis of the biopsy specimen (hematoxylin and eosin staining). Large, round to oval tumor cells are arranged in vague nests (A) with intensely eosinophilic phagolysosomal globules seen (B). Residual small nerve twigs are identified within the tumor (C) and present most prominently peripherally in association with grouped ganglion cells (D).

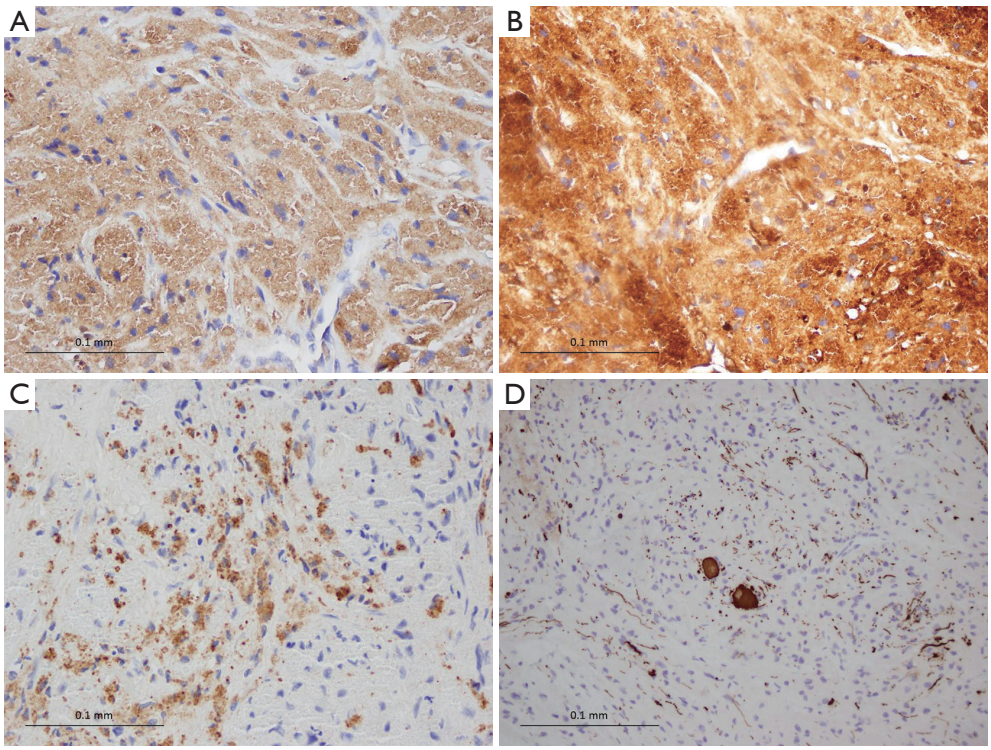

Figure 3 Immunohistochemical staining of the biopsy specimen. The tumor cells are positive for S100 (A), neuron-specific enolase (B) and CD68 (C). The ganglion cells are highlighted by neurofilament protein (D).

neurohypophysis or infundibulum (12,13). GCTs arising in the spine are particularly rare and only 12 cases have been reported, including the patient presented above (1-10). Within this small subset of GCTs, there is variation in location of lesions with respect to the spinal cord, nerve roots and meninges. Nine cases (75%) involved the spinal nerve root and one case involved a dumbbell tumor of the C5/6 foramen. In one case partial nerve resection of small motor rootlets was required (8), while at least three cases required complete sacrifice of one or more nerves (5,6,9). Seven tumors were intradural-extramedullary with minimal or no involvement of the spinal cord itself, including the case reported above (1,6-10). In contrast, five tumors, appeared to originate from the nerve root or spinal cord itself (2-5). Some authors have suggested that an intramedullary component may represent extension of Schwannoma cell cytoplasm into the cord at the dorsal root zone (3), while others described an exophytic intramedullary tumor (4). The distinction between extramedullary tumors and those with intramedullary extension (or origin) may be clinically important and could help to define tumors that are amenable to resection without risk of neurological deficit.

In light of the limited literature to guide the management of this rare presentation, the optimal management of this case was not clear. However, due to concerns about postoperative neurological deficit, particularly as the lesion appeared to arise from within the C5 spinal nerve root, the plan was for conservative management with regular clinical review. Nerve root sacrifice has been studied in the context of spinal schwannoma surgery with variable rates of neurological morbidity, and these reports are limited to small case series (14-16). While it may be appropriate to manage extramedullary GCTs in a similar way, we would be reluctant to apply these findings to this case with a different tumor biology.

Debate regarding the cellular origin of GCTs continues. Despite being originally thought to be of muscular origin, GCTs are now considered a benign nerve sheath tumor on the basis of more recent immunohistochemical studies (17-19). Although this evidence suggests a Schwann cell origin, some authors propose that GCTs arising in the neurohypophyseal region of the CNS may be of pituicyte origin (8,12,13,20). In contrast, cerebral hemisphere lesions tend to be positive for glial fibrillary acidic protein (GFAP)

which, in addition to ultrastructural features, is consistent with astrocytic origins (11,21-23). Granular cell change has been reported in various benign and malignant tumors of the CNS, such as granular cell astrocytomas, and should be distinguished from the 'pure' GCT due to different tumor biology and therefore clinical implications (12). GCT cells, typically polygonal or rounded, are arranged in nests or sheets, characteristically stain positive for S-100 protein, neuron-specific enolase and laminin, and the typical eosinophilic phagolysosomal granules express CD68 (24). The vast majority are benign neoplasms, with less than 2% found to be malignant, which have some characteristic morphological differences (17).

GCTs of the spine are intradural tumors that tend to involve one or more nerve roots. Lesions may be extramedullary and completely confined to the leptomeninges, while some have an intramedullary component and may arise from within the spinal cord or nerve. The latter may present a management challenge due to concerns about postoperative neurological deficit. All cases of GCT in this rare location should be contributed to the literature to help develop further understanding of this rare tumor.

Acknowledgements

None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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