

Magnetic Resonance Myelography in Congenital Absence of the Cervical Pedicle

Rami Alhazmi, Jean-Pierre Farmer, Christine Saint-Martin

ABSTRACT: Absence of the cervical pedicle is a very rare congenital anomaly, easily misrecognized as a unilateral facet dislocation in a setting of acute trauma or a neoplastic process like a nerve sheath tumor. Although correct diagnosis can be achieved on the cervical radiograph and confirmed by the CT, MRI Myelography is clearly of additional value because shows the specific relationship and orientation of the nerve roots. To the best of our knowledge, this is the first description of MR Myelography findings.

RÉSUMÉ: Utilisation de la myélographie par TDM dans le cas de l'absence congénitale d'un pédicule au niveau d'une vertèbre cervicale. L'absence d'un pédicule au niveau d'une vertèbre cervicale demeure une anomalie congénitale très rare. Elle peut facilement être confondue avec une luxation unilatérale des facettes dans le cas d'un traumatisme sévère ou bien encore avec une affection néoplasique comme une tumeur de la gaine des nerfs. Bien qu'un diagnostic exact puisse être posé au moyen d'une radiographie de la région cervicale et être ensuite confirmé par une tomographie assistée par ordinateur, la myélographie par TDM représente un atout supplémentaire car elle permet d'indiquer les connexions spécifiques entre les racines nerveuses de même que leur orientation. Il s'agit, à notre connaissance, de la première description se penchant sur les résultats de la myélographie par TDM.

Keywords: MRI findings, Absent cervical pedicle, Enlarged neural foramen

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INTRODUCTION

Congenital absence of a cervical pedicle is a very rare incidental imaging finding that accompanies widening of the neural foramen. There are about 70 cases reported in the literature. It is usually discovered incidentally in a context of traumatic injury or a complaint of neck pain. Proper radiological interpretation of this anomaly is crucial to avoid confusion with more clinically significant abnormalities that may lead to inappropriate invasive management. While correct diagnosis can be reached by the radiograph and confirmed by the CT scan, MRI features can help to confirm the diagnosis.

CASE REPORT

A 16-year-old male swimming athlete was referred to the pediatric neurosurgeon due to suspicion of a nerve sheath tumor based on the abnormal X-ray finding of an enlarged right C5-C6 neural foramen. The main complaint was midline back pain in the lower neck and thoracic regions. Physical examination did not reveal any neurological deficit. There was localized tenderness along the lower thoracic facet joints. Laboratory investigations, including inflammatory markers, were unremarkable. The pain was not relieved with pain killers, muscle relaxant, or anti-inflammatory medications. Cervical radiograph (Figure 1) showed widening of the right C5-C6 and C6-C7 neural foramina due to dorsal displacement and hypertrophy of the articular pillar as well as suspicion of absent right C6 pedicle. CT scan (Figure 2) was then performed, confirming that the malformed and enlarged C5-C6 and C6-C7 neural foramina was due to the congenital absence of the right C6 pedicle. MRI (Figure 3) performed with specific myelography sequence showed a common enlarged dural sheath of the right C6 and C7 nerve roots. No intradural or

extradural mass was seen. The final diagnosis of congenital absence of the right C6 pedicle lead to conservative management including pain control, physiotherapy, and further reassuring the patient and his family.

DISCUSSION

Since the first described case of congenital absence of a cervical pedicle by Hadley in 1964,¹ there have been about 70 cases reported in the literature. Most of these cases are identified incidentally during radiological investigation for neck and shoulder pain, or in the setting of trauma.² The largest case review series, performed by Wiener et al., is 55 cases. They established the radiologic criteria with remarkable consistency, which consists of the triad of an enlarged ipsilateral neural foramen due to the absent pedicle; a dysplastic dorsally displaced ipsilateral articular pillar and lamina; and a dysplastic ipsilateral transverse process.³

We are describing the MR features using a three dimensional steady-state MR Myelography T2-weighted sequence (e.g. FIESTA), which illustrates the two adjacent C6 and C7 nerve roots leaving the cord in a common enlarged dural sheath on the side of the bony anomaly compared to the normal separated

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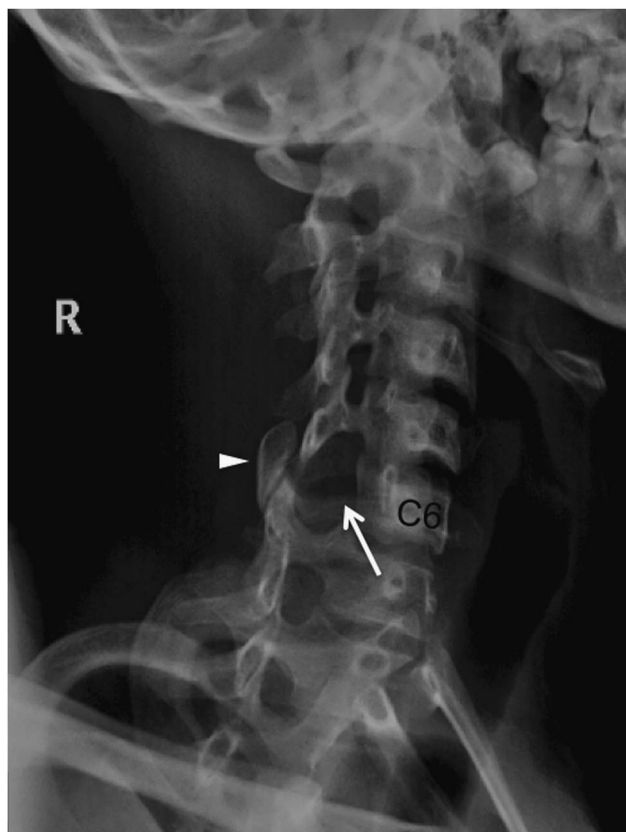


Figure 1: X-ray. Left posterior oblique plain cervical radiograph shows absence of the right C6 pedicle (arrow) with enlargement of C5-C6 and C6-C7 neural foramina. The ipsilateral lamina and articular pillar are dorsally displaced (arrowhead).

contralateral roots and sheaths. These features correspond to the myelographic findings described in few case reports,³⁻⁷ but never reported on MRI. The joining nerve root can be the one above or below the root of the involved level. They have altered orientation compared to the normal contralateral separate nerve roots. The cranial joining nerve root has more vertical course, and the caudal one has horizontal course where it gives the pseudo-thickening appearance in axial plane. Multiplanar reformations of the 3D myelography sequence are essential to properly identify the involved roots and their meningeal sheaths.

C6 is the most common site of involvement, followed by C5. It can be associated with other osseous abnormalities like spina bifida, vertebral segmentation anomaly, and additional hypoplastic pedicle in up to 51% of the cases.³ The differential diagnosis of an enlarged neural foramen seen on plain radiographs includes intradural causes such as nerve sheath tumor and lateral meningocele; extradural paraspinous and dumbbell solid tumors; and osseous causes such as bone tumor, bony erosion by tortuous, or aneurysmal vertebral artery and bone malformation. Congenitally absent pedicle is frequently misdiagnosed as unilateral facet dislocation in the context of trauma, due to the reversed facet appearance. However, the ipsilateral articular facets and lamina have normal morphology and size in the context of traumatic dislocation compared to the dysplastic shape and enlarged size in the context of congenital absence of the pedicle. Conservative therapy is the recommended treatment since it was successful in most of the published cases,^{3,8-10} and there is no associated instability if it is isolated.

In conclusion, awareness of the radiological manifestations of this incidentally found congenital anomaly is crucial to avoid misdiagnosis of more clinically significant abnormality that may lead to inappropriate invasive management. Correct diagnosis can

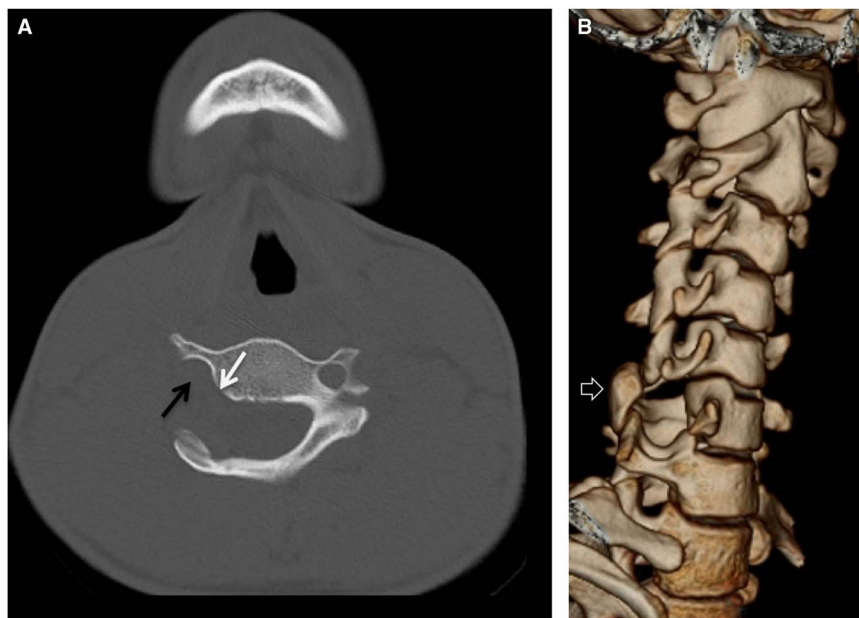


Figure 2: CT scan. (A) Axial image adjusted in bone window shows the absent right pedicle (white arrow) and dysplasia of the ipsilateral transverse process (black arrow). (B) 3D volume rendering reformatted image demonstrates the dorsal displacement of the articular pillar and reversal facet articulation (open arrow) with hyperplasia of the superior and hypoplasia of the inferior articular facets.

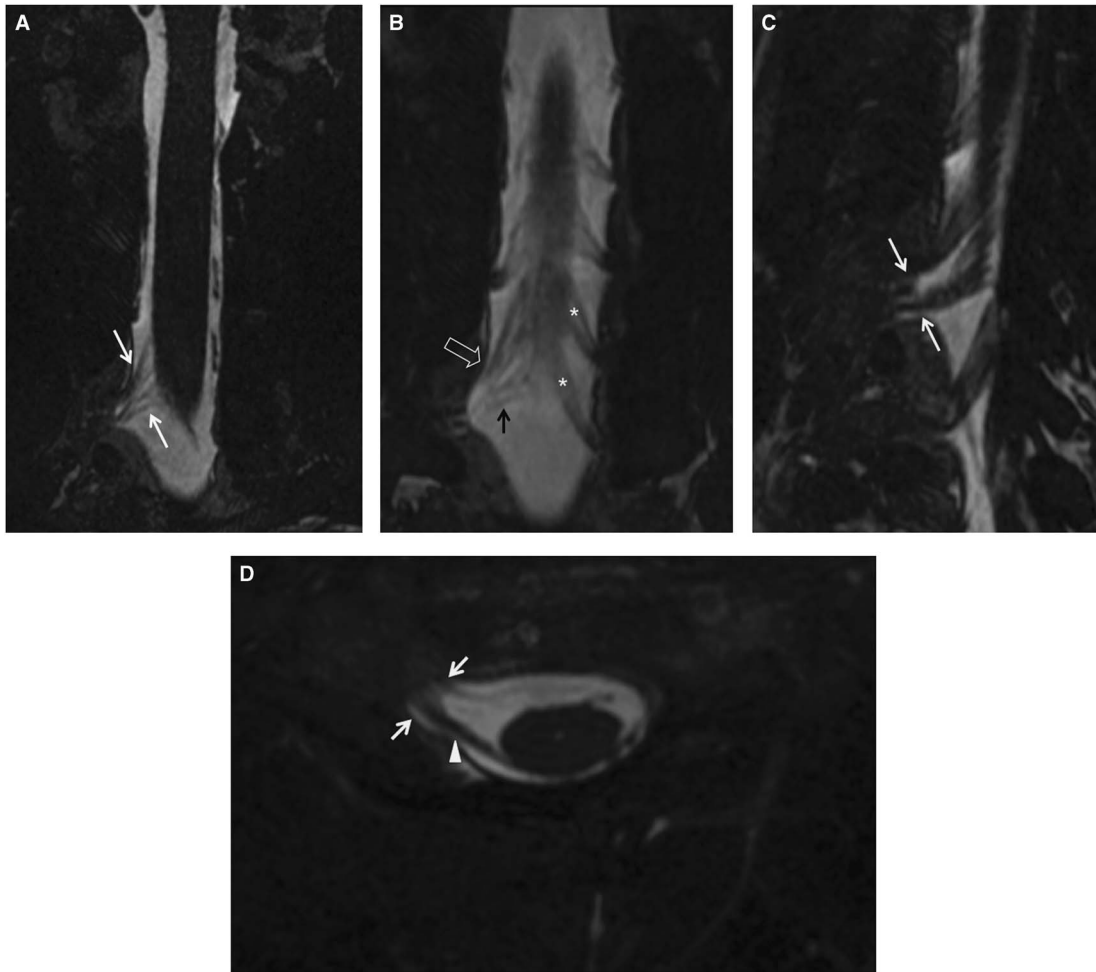


Figure 3: MR myelography (3D FIESTA). Coronal (A & B) and oblique coronal (C) reformatted images show the right C6 and C7 nerve roots exiting together via a common dural sheath (arrows) at the level of the enlarged neural foramen. Note the vertical course of right C6 (open arrow) and the horizontal course of right C7 (black arrow) nerve roots compared to the normal contralateral separate nerve roots (asterisks). Axial image (D) shows the enlarged common dural pouch (arrows) and pseudo-thickening of the right C7 dorsal root (arrow head) due to its horizontal course.

be achieved by a conventional radiography and computed tomography. However, MRI with steady-state myelography sequence provides unique features of definite additional value in reaching the correct diagnosis.

DISCLOSURES

Rami Al Hazmi, Jean-Pierre Farmer, and Christine Saint-Martin do not have anything to disclose.

STATEMENT OF AUTHORSHIP

Rami Al Hazmi, first author. Jean-Pierre Farmer, referring and treating physician, description of the physical examination and review of the final paper. Christine Saint-Martin, supervisor, reviewed the paper at all steps of writing.

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