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CASE REPORT

Ventral and dorsal tethering bands of the spinal cord in the same patient: a case report

Seif Eid[1] · Joe Iwanaga[2] · Marios Loukas[1] · W. Jerry Oakes[3] · R. Shane Tubbs[1,2]

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Abstract

Fibrous bands are one of the causes of tethered cord syndrome and these can be located on the dorsal or more rarely, ventral aspect of the dura mater. We report a case of dorsal and ventral tethering bands in the same patient found at surgery for tethered cord syndrome. Such fibrous bands restrict normal movement of the spinal cord and lead to a variety of neurological symptoms. To our knowledge, we report the first case of dorsal and ventral tethering bands of the spinal cord in the same patient. This case report aims to increase awareness of such anatomical variations and emphasize the importance of meticulous surgical dissection in order to identify such bands.

Keywords Dorsal tethering · Ventral tethering · De-tethering · Spinal cord · Meningocoele manqué

Introduction

Fibrous bands within the spinal cord can lead to tethering of the spinal cord and subsequent neurological deficits. Lassman and James called this pathology meningocoele manqué, in which tethering of the spinal cord and filum terminale occurs due to nerve roots, fibrous bands, or adhesions placing tension on the spinal cord [3]. Such fibrous bands are more commonly found on the dorsal side of the spinal cord, but may rarely appear ventrally. In this report, we present a rare case of dorsal and ventral tethered bands found concurrently during surgery in a patient. To our knowledge, this is the first report of simultaneous intradural spinal dorsal and ventral bands.

Case presentation

A 3-month-old male patient with an uneventful delivery presented to our clinic with a large midline, flat capillary hemangioma (Fig. 1) over the thoracolumbar spine. No other cutaneous stigmata were identified in this patient. This was the second child for this mother who had no medical history such as gestational diabetes are a family history of spina bifida. The patient moved and had sensation in all extremities. MRI of the child's spine revealed a thickened and fatty infiltrated filum terminale and caudally displaced conus medullaris. No other intraspinal abnormalities were seen on MRI, e.g., meningocele manqué. At surgery, following opening of the dura mater, a dorsal band was found leaving the posterior aspect of the distal spinal cord and attaching to the inner surface of the posterior dura mater (Fig. 2). This band was transected. Next, the filum terminale was identified and cut. With anterior dissection through the arachnoid, an additional band was seen emanating from the anterior spinal cord and traveling distally to attach to the inner surface of the ventral dura mater (Fig. 3). This band was also transected. Postoperatively, the child is neurologically intact and at long-term follow-up (greater than 7 years) continues to deny neurological symptoms.

Discussion

Tethering of the spinal cord by fibrous bands, whether ventral or dorsal, can be associated with several conditions and can lead to various neurological symptoms depending on the affected level of the spinal cord. Pang [4] reported differences in

✉ Joe Iwanaga
joei@seattlesciencefoundation.org

[1] Department of Anatomical Sciences, St. George's University, St. George's, West Indies, Grenada

[2] Seattle Science Foundation, 550 17th Ave, James Tower, Suite 600, Seattle, WA 98122, USA

[3] Children's of Alabama, Birmingham, AL, USA

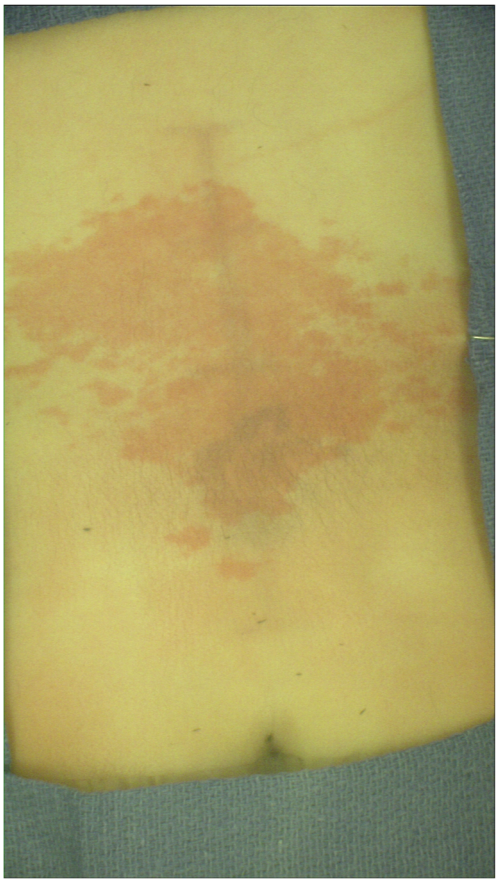

Fig. 1 Skin of patient reported herein with flat capillary hemangioma over the lumbar spine

symptom severity between dorsal and ventral bands in patients with split cord malformations. Pang also reported that neurological signs were more common in patients with ventral tethering compared to dorsal tethering (56% versus 34% of patients, respectively).

Computed tomography (CT) myelography is only partially successful in detecting ventral tethering, which is strongly associated intestinal diverticulum or malrotation, or a dermal sinus tract [4]. Sonography has been used to detect dorsal

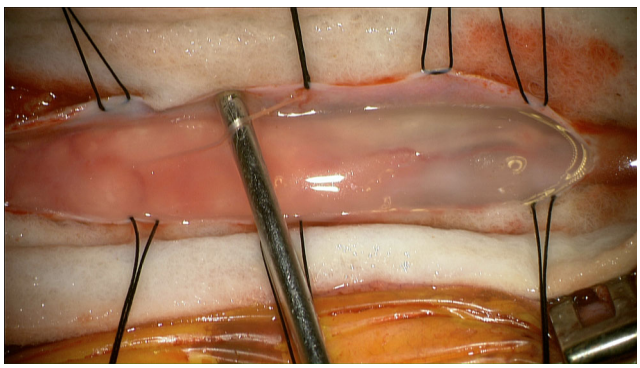

Fig. 2 Intradurally and extra arachnoidally, a dorsal band is seen running over the tip of the suction tip and inserting into the inner surface of the dura mater

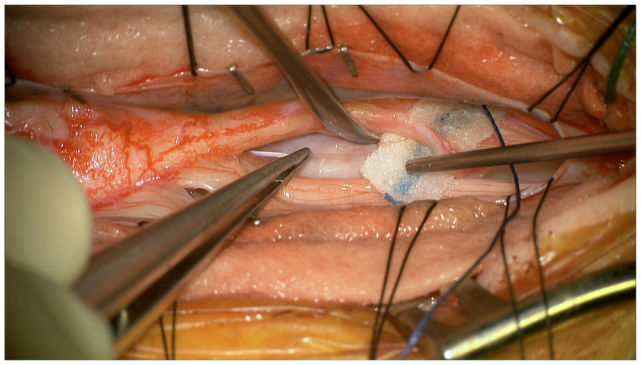

Fig. 3 Ventrally, a fibrous band (held up with forceps) is seen extending from the distal cord and inserting into the inner surface of the ventral dura mater. Also, note the transected fatty filum terminale over the cottonoid

tethering of the lumbosacral spine in neonates [2]. Kaffenberger et al. [1] reported that these dorsal bands appear as a linear filling defect on CT imaging and can be seen extending from the hemicord to the dorsal dura, while on MRI, the bands appear thin with equal intensity to the spinal cord. These authors demonstrated that imaging was successful in identifying these pathologies in 56% of cases, which was later confirmed intraoperatively [1]. On a similar note, Pang [4] revealed that CT myelography is only successful in detecting ventral bands in 50% of patients. Retrospectively, no tethering bands were seen on MRI in our patient.

Fibrous bands leading to tethering of the spinal cord have been associated with several conditions such as split cord malformation, dermal sinus tracts, and lipomyelomeningoceles [1, 3–5]. These fibrous bands can present with varying degrees of symptoms and can include sensory and motor deficits, and urinary dysfunction [5, 6]. Our case was that of only a fatty infiltrated filum terminale and had no symptoms or findings related to the tethering bands.

Conclusion

Fibrous bands restricting the mobility of the spinal cord can occur on the dorsal aspect of the dura, most commonly, on the ventral aspect of the dura, less commonly. These bands can lead to tethering of the spinal cord with a various range of neurological symptoms and variable recovery. We have reported a case of ventral and dorsal tethering bands of the spinal cord in the same patient found during surgery, which, to our knowledge, has not reported previously in the literature. Neurosurgeons should be cognizant of these ventral bands as they may often go unnoticed if not looked for and result in incomplete de-tethering procedures.

Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

1. Kaffenberger DA, Heinz ER, Oakes JW, Boyko O (1992) Meningocoele manqué: radiologic findings with clinical correlation. Am J Neuroradiol 13:1083–1088
2. Kriss VM, Kriss TC, Warf BC (1996) Dorsal tethering bands of the meningocele manque: sonographic findings. Am J Roentgenol 167: 1293–1294. https://doi.org/10.2214/ajr.167.5.8911198
3. Lassman LP, James CM (1977) Meningocoele manqué. Childs Brain 3:1–11
4. Pang D (2001) Ventral tethering in split cord malformation. Neurosurg Focus 10:1–11. https://doi.org/10.3171/foc.2001.10.1.7
5. Solmaz I, Izci Y, Albayrak B, Cetinalp E, Kural C, Sengul G, Gocmez C, Pusat S, Tuzun Y (2011) Tethered cord syndrome in childhood: special emphasis on the surgical technique and review of the literature with our experience. Turk Neurosurg 21:516–521. https://doi.org/10.5137/1019-5149.JTN.4394-11.1
6. Venkataramana NK (2011) Spinal dysraphism. J Pediatr Neurosci 6: 31–40. https://doi.org/10.4103/1817-1745.85707