

Multiple spinal cavernous malformations in Klippel-Trenaunay-Weber syndrome

Mnogie naczyniaki jamiste rdzenia kręgowego w zespole Klippela-Trenaunaya-Webera

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Abstract

Klippel-Trenaunay-Weber syndrome (KTWS) is a rare, congenital vascular disorder characterized by cutaneous haemangiomas, venous varicosities, and hypertrophy of the osseous and soft tissue. Various vascular anomalies of the central nervous system have been described in this syndrome. Two previous associations between KTWS and spinal cord cavernous malformations have been reported in the English literature. In this report, we present a patient in whom multiple cavernous malformations located in the conus medullaris region and cauda equina were associated with KTWS. General physical examination as well as neuroradiological and operative findings are described.

Key words: spinal cord, cauda equina, cavernous malformation, Klippel-Trenaunay-Weber syndrome.

Introduction

Klippel-Trenaunay-Weber syndrome (KTWS) is defined as a congenital vascular disorder characterized by cutaneous haemangiomas, venous varicosities, and hypertrophy of the osseous and soft tissue. Vascular anomalies of the central nervous system, such as spinal and cerebral arteriovenous malformations (AVM), cavernous malformations, venous angioma, angiomyo-

Streszczenie

Zespół Klippela-Trenaunaya-Webera (ZKTW) to rzadkie, wrodzone schorzenie naczyniowe, w którym stwierdza się naczyniaki skóry, żyłaki oraz przerost kości i tkanek miękkich. W przebiegu zespołu obserwowano różnorodne nieprawidłowości naczyniowe ośrodkowego układu nerwowego. W piśmiennictwie anglojęzycznym opisano wcześniej dwukrotnie związek ZKTW z obecnością naczyniaków jamistych rdzenia kręgowego.

W niniejszej pracy przedstawiono przypadek pacjenta, u którego w przebiegu ZKTW występowały mnogie naczyniaki jamiste okolicy stożka rdzeniowego i ogona końskiego. Omówiono wyniki badania klinicznego, badań obrazowych i nieprawidłowości stwierdzone w czasie leczenia chirurgicznego.

Słowa kluczowe: rdzeń kręgowy, ogon koński, naczyniak jamisty, zespół Klippela-Trenaunaya-Webera.

lipoma, venous varicosities and aneurysms, have been described in this rare syndrome [1]. Two previous associations between KTWS and medullary cavernomas have been reported in the English literature [1,2]. Cavernous malformations of the cauda equina are very rare, with only 13 reported cases in 2007 [3]. We present a unique case of multiple cavernous malformations located in the conus medullaris region and cauda equina associated with KTWS.

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Case report

A 49-year-old man presented with low back pain radiating to both lower extremities. His symptoms had been increased progressively for three months. Family history did not show any significant finding. Neurological examination revealed left distal lower limb muscle power of 1/5. There was no genitourinary dysfunction or abnormal deep tendon reflexes. In general physical examination, multiple, grape-like, skin-coloured, reddish or purple, firm subcutaneous nodules on the dorsum of the foot were noted. Similar purple nodules with bleeding ulcers and port-wine stains were also seen on the left calf. There were multiple reddish or purple nodules and port-wine stains on the left buttock (Fig. 1A-C). These typical findings were consistent with KTWS.

Spinal magnetic resonance imaging (MRI) revealed two lesions with a maximum diameter of 2 cm. The first

lesion was located in the spinal cord at the Th12-L1 level. This lesion was moderately hyperintense on T2-weighted sequences with peripheral low signal (hemisiderin) (Fig. 2A). After injection of gadolinium, the lesion showed heterogeneous enhancement. The second lesion, located in the cauda equina at the L5 level, was hyperintense both on T1- and T2-weighted images (Fig. 2B). T2-weighted sequences showed a peripheral rim and there was intense enhancement after gadolinium injection. MRI studies of brain, cervical and thoracic spine were normal. Computed tomography (CT) scans of the thorax and abdomen did not show any lesion in visceral organs.

The patient was operated on with laminectomy at the L5 level and after opening the dura mater, a 20 mm red-purple tumour was observed. The tumour originated from a nerve root in the cauda equina and was resected en bloc after cutting this root. There were also



Fig. 1. Multiple, grape-like, skin-coloured, reddish or purple, firm subcutaneous nodules on the dorsum of the foot (A). Similar purple nodules with bleeding ulcers and port-wine stains on the left calf (B). Multiple reddish or purple nodules and port-wine stains on the left buttock (C)

many punctate lesions spreading along the root (Fig. 3A-B). Histopathological features were consistent with cavernous angioma. Postoperatively, pain was regressed but weakness of the distal left lower extremity remained unchanged. The other lesion, located in the conus medullaris region, showed typical cavernous

malformation characteristics on T2-weighted MR images. The patient was informed of the possible benefits and risks of spinal cord surgery and because this lesion was thought to be asymptomatic, it was decided to follow the patient without intervention.

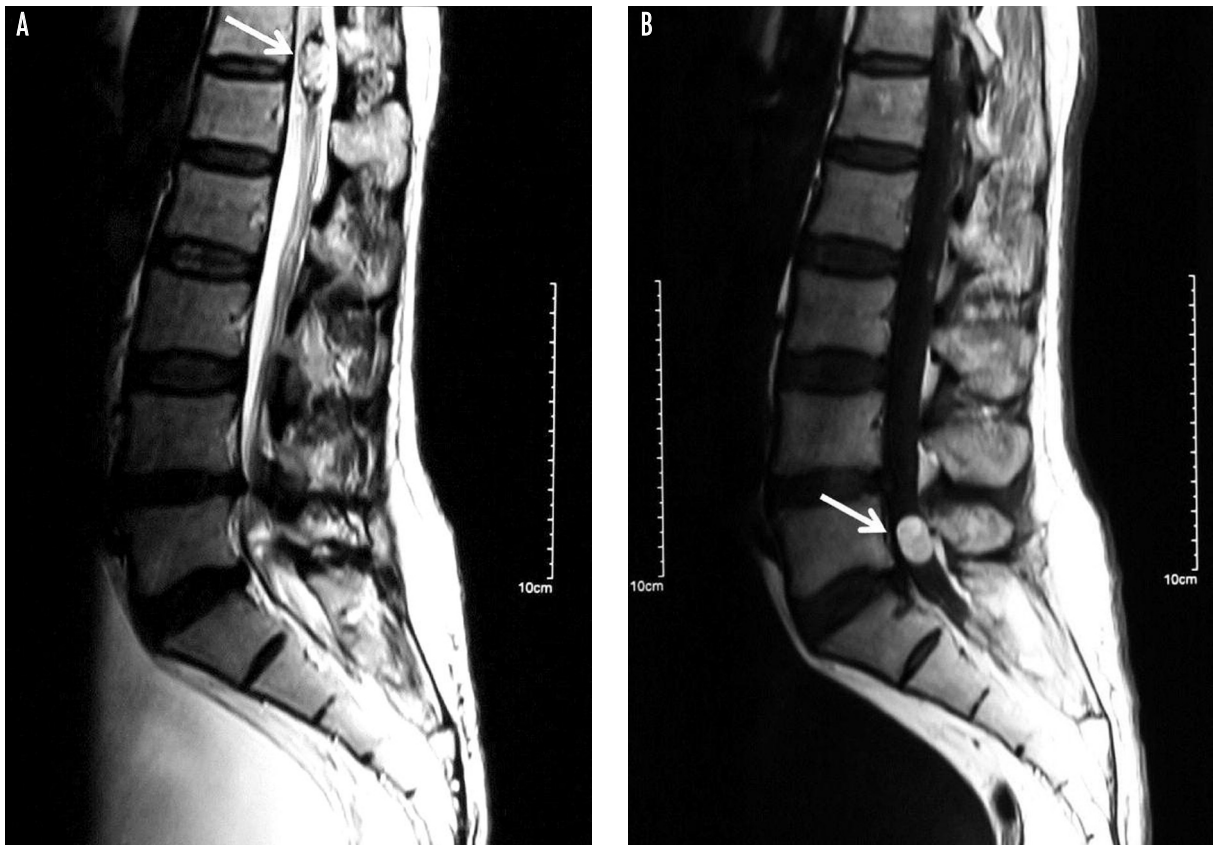


Fig. 2. (A) Sagittal T2-weighted MR shows hyperintense lesion (arrow) with peripheral low signal in the spinal cord at Th12-L1 level. (B) Sagittal T1-weighted MR shows hyperintense lesion (arrow) in the cauda equina at L5 level

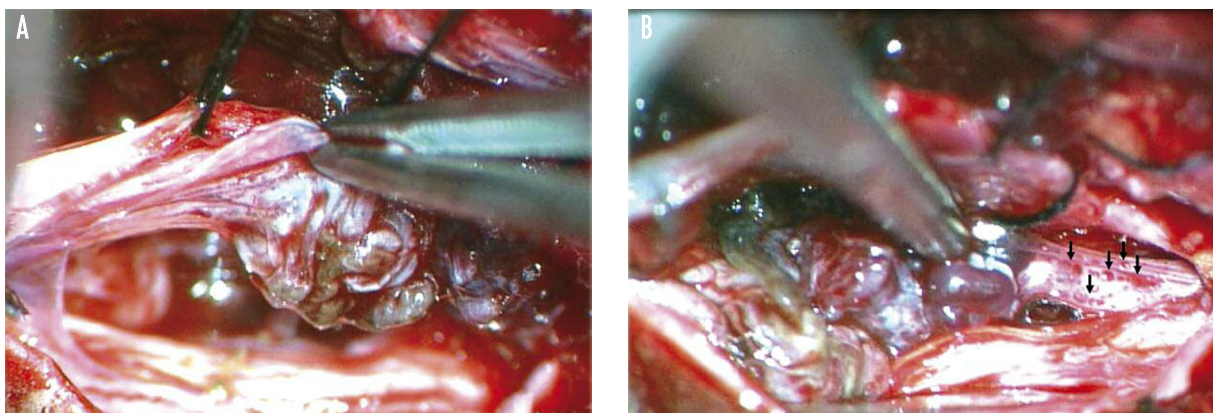


Fig. 3. Intraoperative photographs show a red-purple lesion with rostral (A) and caudal (B) relationships with the nerve roots. There are also many punctate lesions (arrows) spreading along the nerve root

Discussion

Klippel-Trenaunay-Weber syndrome is a complex malformation of capillary, lymphatic and venous structures associated with overgrowth of the affected extremity. Capillary malformations (also known as port-wine stains) occur in 98% of patients and can be present on any part of the body. Venous malformations occur in 72% of patients and may involve the extremities and visceral organs. Hypertrophy of the extremity, most commonly in lower limbs, occurs in 67% of patients. Lymphatic malformations can also be accompanied by this syndrome in 11% of patients [4]. Klippel-Trenaunay-Weber syndrome generally occurs sporadically, following a somatic mutation model. However, in some cases, clinical manifestations have been found in family members, suggesting an autosomal dominant trait [5]. Translocation at chromosome 5 and 11 increases expression of the *AGGF1* (angiogenic factor with G patch and FHA domains 1) gene and angiogenesis. Increased angiogenesis is a suggested molecular mechanism for the pathogenesis of KTWS [6,7]. *RASA1* gene mutations have also been responsible for pathogenesis. Mutations in this gene are associated with abnormal angiogenic remodelling of the capillary structure [8]. *KRIT1* (Krev interaction trapped 1), a gene mutated in cerebral cavernous malformation, encodes a protein which may help determine endothelial cell shape and function in response to cell-cell and cell-matrix interactions by guiding cytoskeletal structure [9]. The products of these two genes interact with the same molecular pathways.

Spinal cord AVM with KTWS were reported in 22 cases between 1949 and 2002 [10]. However, just two previous associations between KTWS and medullary cavernous malformations have been reported in the English literature to our knowledge [1,2].

The conus medullaris region and cauda equina are rare locations for spinal cord cavernous malformations. The clinical symptoms of cavernous malformations located within the cauda equina were related to compression, subarachnoid haemorrhage and hydrocephalus [3].

In the present case, the lesion located in the cauda equina was hyperintense on both T1- and T2-weighted MR images, regarded as early subacute haemorrhage. Such a haemorrhage may cause stretching or compression of the adherent nerve root and explain the symptoms. En bloc resection of the tumour and nerve root was inevitable because of two reasons. Firstly, the lesion was strongly adherent to the root, and secondly, there

were many small lesions which might potentially grow on the root surface. Resection of the nerve root did not bring any additional neurological deficit and pain regressed postoperatively.

Retained symptoms can be attributed to tumour in the conus medullaris. However, painful radiculopathy with no genitourinary dysfunction or abnormal deep tendon reflexes was essentially thought to be associated with cauda lesion. The patient was also informed of the possible benefits and risks of spinal cord surgery and we decided to follow the patient without intervention.

In conclusion, KTWS is a rare vascular syndrome sometimes associated with neurovascular lesions. The association between KTWS and spinal cord cavernous malformations is also a very unusual entity. In our unique case, multiple cavernous malformations located in the conus medullaris region and cauda equina were associated with KTWS. The treatment policy of such lesions does not differ from any spinal cord or cauda equina cavernous malformations. Future genetic studies of vascular anomalies will provide insights into the molecular mechanisms of vascular morphogenesis and possible therapeutic strategies.

Disclosure

Authors report no conflict of interest.

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