CASE REPORT

Ossification of the Human Tentorium Cerebelli

R. Shane Tubbs¹, Martin M. Mortazavi¹, Joseph Miller¹, Mohammadali M. Shoja¹,³, Marios Loukas³, Aaron A. Cohen-Gadol⁴

¹Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL, USA
²Medical Philosophy and History Research Center, Tabriz University of Medical Sciences, Tabriz, Iran
³Department of Anatomical Sciences, St. George’s University, Grenada
⁴Goodman Campbell Brain and Spine, Indiana University Department of Neurological Surgery - Indianapolis, IN, USA

ABSTRACT

Anomalous ossification of the intracranial dural partitions is uncommon and when present, usually restricted to the falx cerebri. We report a patient with Chiari II malformation who was found to have ossification of the tentorium cerebelli. Ossification of the tentorium is common in some animals but extremely rare in humans. We believe that this is the first report of such a finding in a patient with Chiari II malformation. The literature germane to tentorial ossification is reviewed. Biomed. Int. 2012; 3: 34-38. ©2012 Biomedicine International, Inc.

Key words: Chiari malformation, cranium, dura mater, meninges, myelomeningocele, spina bifida

INTRODUCTION

Reports of mineralization of the meninges both pachymeninges and leptomeninges are found in the literature.¹,² Ossification of some dural partitions is normally found in many subhuman animals. However, in man, this is seemingly rare and when found, involves only very small portions of usually the anterior most part of the falx cerebri near its attachment onto the crista galli. We report an unusual case of ossification of the tentorium cerebelli and review the literature regarding this rare occurrence in humans.

CASE REPORT

We report a 16-year-old boy born with a lumbosacral myelomeningocele that was repaired two days after birth. Soon after his repair, he developed hydrocephalus and underwent placement of a ventriculoperitoneal shunt. Imaging noted a typical Chiari II malformation. He is paraplegic and attends school and is an average student. Recent imaging of the head for follow up of his shunted hydrocephalus revealed bone formation in the posterior falx cerebri and tentorium cerebelli primarily around the tentorial notch (Figures 1 and 2). The falx cerebri and other dural components appeared normal and the leptomeninges were not involved. At this recent follow up, the patient complained of headache once per day. Comparison imaging from two years earlier did not reveal any dural ossification but did demonstrate moderate enlargement of his ventricular system consistent with shunt failure.

Address correspondence to R. Shane Tubbs, PhD, Pediatric Neurosurgery, Children’s Hospital, 1600 7th Avenue South ACC 400, Birmingham, Alabama 35233, USA. Phone: 001-205-939-9914, Fax: 001-205-939-9972. E-mail: Shane.Tubbs@childrensal.org

Submitted April 11, 2012; accepted in revised form May 5, 2012.
Advance Access Publication June 20, 2012 (see www.bmjjournal.org)
A shunt revision was performed and the patient’s symptoms improved. The patient has no metabolic disorders or health issues unrelated to his spina bifida.

**DISCUSSION**

Reports of ossification of the intracranial dural meninges are a rarity in the extant medical literature. Some earlier descriptions of this phenomenon were clouded by using the term calcification, which is a misnomer perpetuated in many radiology textbooks.3-4 Such
ossification is almost always restricted to the falx cerebri. One study using MRI of 3,000 patients, demonstrated falx cerebri ossification in 12 individuals (0.4%), however, none was found to have complete ossification of the falx but merely small islands of bony tissue. These data may have been confounded by the fact that hyperostosis frontalis interna often has an associated hypertrophic frontal crest (attachment of the anterior falx cerebri) and often, the normal falx is capable of absorbing X-rays sufficiently to cause a shadow as dense as bone. Teir and Ohela in a study of 100 autopsies found 11 cases of anterior falx cerebri bony islands. It is not surprising that the falx cerebri undergoes occasional ossification as it is derived from mesenchymal cells and is thus multipotential in nature. These cells may become osteogenic following degeneration, irritation, hemorrhage, or trauma. This tissue, once ossified, will then act as membranous bone that is found elsewhere in the body and may even be the site of metastatic involvement or leukemic infiltration. Bruyn has defined dural ossification as the production of calcium phosphate to contrast with arachnoidal ossification, which is composed of calcium carbonate.

Some medical disorders appear to have a higher than normal incidence of ossification of the intracranial dural partitions. These include endocrine disorders, basal cell nevus syndrome, brachyolmia Maroteaux type, hypertelorism, and pseudoxanthoma elasticum. Of note, Miaux et al. studied 13 patients with the adult form of myotonic dystrophy and found that the falx cerebri was partially ossified in two. Various neoplasms have also been found to result in ossification of the falx cerebri. Husain et al. have reported a case of a tumor of bone arising from the falx cerebri. Falx ossification may be confused with interhemispheric vascular lesions and mimicked by myelometaplasia, falcine osteosarcoma, dural metastases, and leukemic infiltration. Syphilis, raised intracranial pressure, chronic sinusitis, pregnancy, psychosis, rickets, and epilepsy were all once thought to have a higher incidence of bony island formation within the falx cerebri but these notions have now been dismissed. Increased age does not seem to correlate with bony island formation within the falx cerebri.

Ossification of the tentorium cerebelli in man has been reported rarely (to our knowledge less than five cases) and never, to our knowledge, in a patient with the Chiari II malformation. Interestingly, tentorial ossification is seen in many animal species. For example, ossification of all or parts of this dural partition occurs in cats, dogs and wallabies. Of note, ossification of the tentorium cerebelli includes the posteroinferior aspect of the falx cerebri in the porpoise and dolphin. Klintworth stated that ossification of the tentorium cerebelli in some mammals probably reflects retention of the osteogenic potentialities, which exist in the ectomeminx during the development of the neurocranium. Clinically, humans with this finding would probably be less able to “mobilize” brain tissue with unilateral increases in intracranial pressure such as seen with transtentorial herniation as bone would be less giving than the softer unossified tentorium cerebelli.

Noteworthy, Turgut et al. reported a child with autosomal recessive osteopetrosis who had ossification of the tentorium cerebelli and calvarial hyperostosis. The authors posited that the child’s hydrocephalus was due to acquired aqueductal stenosis caused by such ossification. Dorenbeck et al. reported a case of dural ossification including the tentorium cerebelli due to tertiary hyperparathyroidism from chronic renal failure. Novak et al. reported a 60-year-old female patient with numbness in the face who was found to harbor intracranial ossifications of the falx cerebri, tentorium cerebelli, basal ganglia and choroidplexus. Standefer et al. reported a patient with trigeminal neuralgia secondary to a
discrete intradural ossification within the tentorium cerebelli. This nodule arose from the tentorium cerebelli near the tentorial notch and indented the superior surface of the trigeminal nerve near the brain stem. Following surgical resection of the ossification, the patient’s trigeminal neuralgia symptoms completely disappeared.

CONCLUSIONS

The case presented herein was not symptomatic from their tentorial ossification and did not have any metabolic disorders. To our knowledge, this is the first report of an ossified tentorium cerebelli in a patient with a Chiari II malformation. The etiology of such a finding is unknown.

ACKNOWLEDGEMENTS

The authors confirm that there are no conflicts of interest.

REFERENCES