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Ultrasound and MR imaging of fibromatosis colli (sternomastoid tumor of infancy)

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Abstract The sonographic and CT findings of fibromatosis colli (sternomastoid tumor of infancy) have been described, but the MRI appearance has been reported in only one case in which the mass resolved over time. This case describes the detailed MRI findings in a biopsy-proven case of fibromatosis colli; the signal intensity of the mass on T2-weighted images was slightly less than on gradient-recalled T1-weighted images, consistent with the presence of some fibrous tissue within the muscle mass. The involved portion of the muscle was better defined on MRI than sonography. MRI was helpful in demonstrating the signal characteristics of the mass; localizing the mass to within the sternocleidomastoid muscle; and demonstrating clear surrounding fascial planes with lack of associated lymphadenopathy, airway compression, vascular encasement, bone involvement or intracranial/intraspinal extension associated with other neck masses.

Introduction

Fibromatosis colli (sternomastoid tumor of infancy) is an uncommon though well-described, benign fusiform mass associated with torticollis arising in the sternocleidomastoid muscle of neonates and young infants. A history of birth trauma, difficult delivery, or breech delivery is common [1–5]. The sonographic and computed tomography (CT) findings of fibromatosis colli have been described [1, 2, 4, 5]; the magnetic resonance imaging (MRI) appearance has been described in only one case in which the mass resolved over time [4]. This report describes the MRI findings in an additional case of fibromatosis colli proven by fine needle aspiration biopsy.

Case report

A 2-month-old girl, the product of an uncomplicated vaginal delivery, presented to her pediatrician with a left neck mass, and was otherwise healthy. The mother first noticed this mass at 4 weeks of age while the infant was turning her head. The mass increased mildly in size over the next month. The pediatrician obtained both ultrasound and MRI examinations of the neck, which are shown in Figs. 1 and 2, respectively. After the parents were told the infant had a potential malignancy, the infant was referred to the University of California, Davis Medical Center for evaluation. Physical examination demonstrated mild torticollis, and a 1.5-cm palpable firm, rubbery mass in the mid-portion of the left sternocleidomastoid muscle. Two very small lymph nodes were palpable in the right anterior cervical and occipital lymph node chains. Blood count and chemistries were normal. Family history was remarkable for childhood lymphoma in an uncle. Outside imaging studies were reviewed by a pediatric radiologist who felt this lesion was typical of fibromatosis colli based on imaging and clinical history. However, the pediatric oncologists and surgeons performed

a fine needle aspiration biopsy of the mass to exclude the remote possibility of malignancy. The cytologic findings (Fig. 3), combined with the clinical and radiologic findings, confirmed the diagnosis of fibromatosis colli [6].

Discussion

Fibromatosis colli is a benign fusiform mass arising from the sternocleidomastoid muscle in the anterior neck. Clinical features and sonographic findings are usually characteristic, and the diagnosis is made based on these findings. Usually a neck mass arises in a neonate approximately 2 weeks after birth, and is associated with torticollis in 14–20 % of cases [1–5]. The mass may continue to increase in size for 2–4 weeks [2, 4] or, less commonly, months [1]. These infants are otherwise healthy. A history of birth trauma, such as breech presentation, forceps delivery, or difficult delivery is common [2–5]. Pre-existing intrauterine torticollis may contribute to a difficult delivery [2]. Traumatic compression of the neck during delivery may cause pressure necrosis [4] and/or occlusion of the venous outflow of blood from the sternocleidomastoid muscle, resulting in edema in the muscle, degeneration of muscle fibers, and then, fibrosis of the muscle [1]. Usually fibromatosis colli is unilateral [4], and is more common in the right (73 %) than the left neck (22 %), but it may be bilateral [1, 2]. The mass usually resolves spontaneously over 4–8 months with conservative management, either with stretching exercises or no treatment [1–5]. The mass has erroneously been called a hematoma.

Sonography is the procedure of choice for diagnosis [1–5]. On sonography, focal or diffuse enlargement of the sternocleidomastoid muscle is present, usually in a fusiform configuration, and in the lower two-thirds of the muscle [1, 2, 4, 5]. The mass moves synchronously with the sternocleidomastoid muscle [1–5]. The echogenicity of the mass may be hyperechoic (49 %), isoechoic, or hypoechoic relative to normal muscle [1, 3, 5]. The echo texture may be heterogeneous (49 %) or homogeneous (51 %) [1, 5]. The mass is surrounded by a hypoechoic rim in 90 % of cases, and lacks good through transmission [1, 4, 5]. The hypoechoic rim may represent remaining normal peripheral muscle. Margins of the mass are usually well-defined (89 %), especially on transverse images. Echogenic foci with acoustic shadowing due to calcifications have been reported, although uncommonly [1].

CT imaging of fibromatosis colli demonstrates focal or diffuse isodense enlargement of the sternocleidomastoid muscle with normal surrounding fascial planes [2]. The mass may cause deviation of surrounding structures, such as the trachea or neck vessels, but not encasement or significant compression [2]. Although the diagnosis of fibromatosis colli may be made by CT, ultrasound is the preferred modality because it is non-invasive, less expensive, easier to perform, and without X-ray exposure [2].

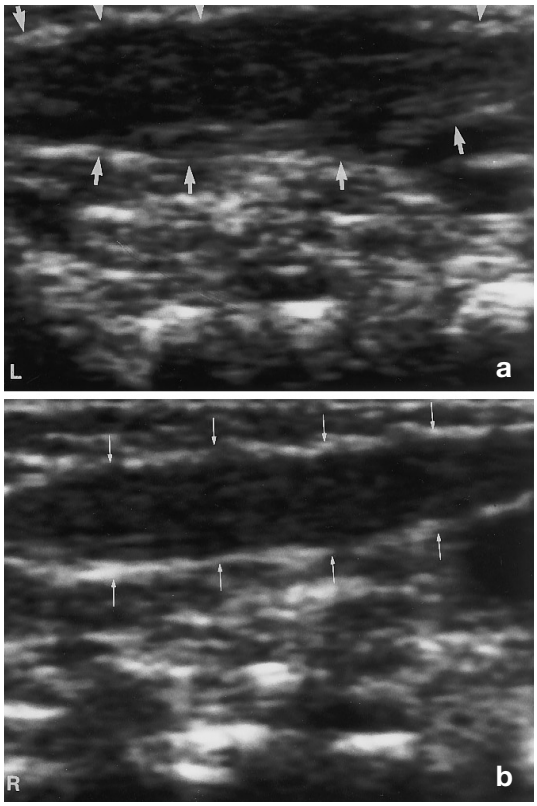


Fig. 1 Ultrasound of the right *(R)* and left *(L)* neck in longitudinal view shows fusiform enlargement of the left sternocleidomastoid muscle *(short thick arrows)* compared to the right side *(long thin arrows)*. The echogenicity of the left sternocleidomastoid muscle is similar to the right side and is homogeneous. The borders are well defined. On transverse views *(not shown)*, there was no associated significant mass effect on adjacent vessels or trachea

MRI may be a helpful further adjunct in the evaluation of fibromatosis colli by demonstrating the signal characteristics of the mass; localizing the mass to within the sternocleidomastoid muscle, demonstrating clear surrounding fascial planes; and showing lack of associated lymphadenopathy, airway compression, vascular encasement, bone involvement, or intracranial/intraspinal extension that may be seen in other neck masses. In our case, the signal intensity of the mass on T2-weighted images (Fig. 2 c) was slightly less than on gradient-recalled T1-weighted images (Fig. 2 b), consistent with the presence of some fibrous tissue (fibroblasts) within the muscle mass, as proven on biopsy. However, the signal characteristics of fibromatosis colli on MR may vary, similar to the echogenicity on sonography. The margins of the involved portion of the muscle

were better defined on MRI (Fig. 2) compared to sonography (Fig. 1).

It is important to know the clinical and imaging features of fibromatosis colli to distinguish it as a benign condition and avoid unnecessary interventional procedures, such as fine needle aspiration biopsy [6], open biopsy, or surgical resection [2]. Sonography should be utilized initially. If an infant fails to follow the typical clinical course or develops other symptoms and/or physical findings not typical of the condition, further evaluation with CT and/or MR and/or biopsy are necessary for diagnosis [2]. Imaging findings that are not characteristic of fibromatosis colli and may suggest the presence of another solid neck mass would include: irregular margins; mass extending beyond the confines of the sternocleidomastoid muscle; poor definition of the surrounding fascial planes; and/or mass associated with adenopathy, bone involvement, intracranial/intraspinal extension, vascular encasement, and airway compression [2–4].

The differential diagnosis of fibromatosis colli includes primarily other solid soft-tissue masses of the anterolateral neck: lymphoma, rhabdomyosarcoma, other soft tissue sarcomas, neuroblastoma, inflammatory masses, and infectious or metastatic adenopathy [2, 3]. Other rare benign soft-tissue tumors include aggressive fibromatosis, cervicothoracic lipoblastomatosis, parathyroid adenoma, and plexiform neurofibroma [3]. Vascular lesions are distinguished by Doppler US, Valsalva maneuver, contrast enhancement on CT, or signal void on MR [3].

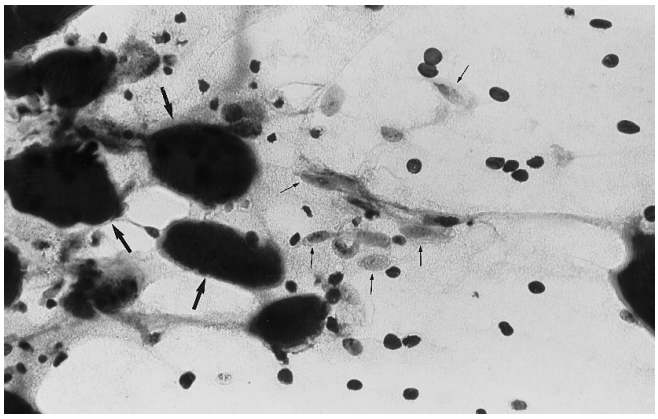
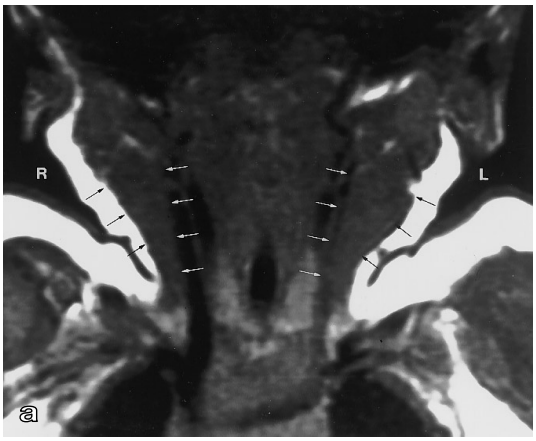
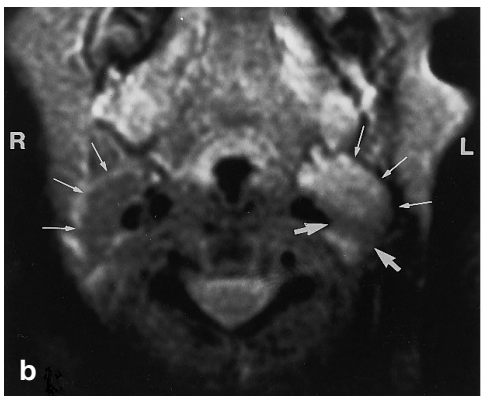


Fig. 3 Microscopic examination of the fine needle aspiration biopsy revealed reactive skeletal muscle cells *(large arrows)* and smaller spindled fibroblasts *(small arrows)* with elongated uniform nuclei, smooth nuclear membranes, and small nucleoli. No malignant tumor cells are seen. The cytologic findings are consistent with fibromatosis colli (Papanicolaou stain, × 250)





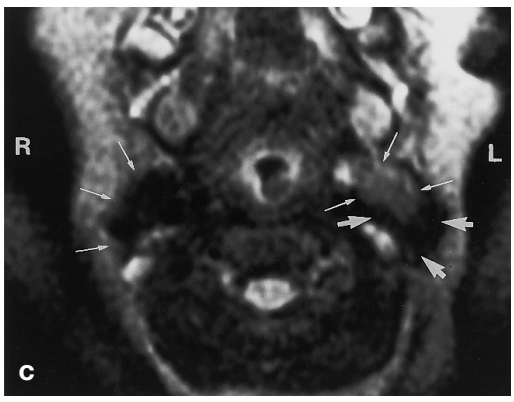


Fig. 2 a–c MRI of the neck. **a** Spin-echo, T1-weighted (TR = 500 msec/TE = 16 msec) coronal view of the neck shows a fusiform enlargement of the left *(L)* sternocleidomastoid muscle *(thin arrows)* compared to the right *(R)* side *(thin arrows)*. The signal intensity of the left sternocleidomastoid muscle is similar to the right. **b** Gradient-recalled, T1-weighted (TR = 400 msec/TE = 9 msec) transverse view of the neck shows enlargement and increased signal intensity of the involved portion of the left *(L)* sternocleidomastoid *(thin arrows)* compared to the right *(R)* side *(thin arrows)*. **c** Spin-echo, T2-weighted (TR = 2000 msec/TE = 80 msec) transverse view of the neck, shows enlargement and increased signal intensity of the involved portion of the left *(L)* sternocleidomastoid *(thin arrows);* compared to the right *(R)* side *(thin arrows),* and the T2-weighted signal intensity of the involved left muscle in **c** is less than on the gradient recalled T1-weighted image in **b**. The involved portion of the left *(L)* muscle *(thin arrows),* in both **b** and **c**, is better shown on MRI than on sonography, as there is a demarcated rim of preserved normal muscle *(arrowheads)* of signal intensity similar to the normal muscle on the opposite side of the neck. The surrounding fascial planes are well preserved. There was no significant associated adenopathy or mass effect on adjacent vessels or trachea.

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PICTORIAL INTERLUDE

Complete calcification of an aneurysm of the vein of Galen

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We present the fourth case of complete spontaneous calcification of an aneurysm of the vein of Galen (AVG) in the youngest child yet reported.

The diagnosis of AVG had been made by antenatal sonography and confirmed by postnatal CT and angiography. Postnatal acute hydrocephalus required a ventriculoperitoneal shunt. During the patient's 2nd year of life, CT revealed the characteristic features of thrombosis – a dense peripheral rim with a low density centre on the precontrast scan and "ring-like" enhancement after contrast medium. At the age of 2 years 4 months, CT showed the AVG to be completely calcified (Fig. 1), and a third examination, at 6 years of age, demonstrated a small midline calcification and normal sized ventricles (Fig. 2). At 7 years of age, the boy is developmentally normal.

More than 200 cases of AVG have been reported to date, mainly as case reports. Although thrombosis is rare, it is well documented. All cases of thrombosed AVG have presented initially with acute hydrocephalus. Partial calcification occurs in approximately 14% of patients, but is rarely seen below 15 years of age. Complete calcification of AVG is extremely rare; only three cases have been previously reported – a $2^1/_2$-year-old boy by Chapman and Hockley [1], a 9-year-old boy by Di Rocco et al. [2] and a 45-year-old woman by Copty et al. [3].

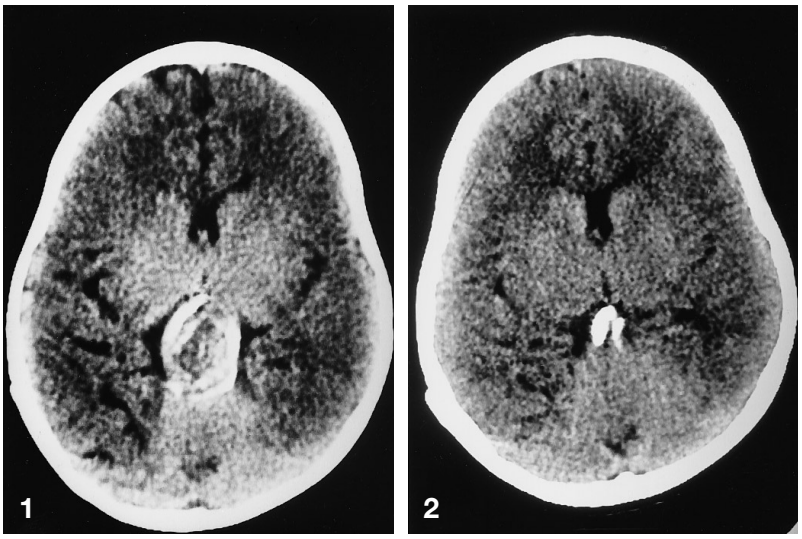

Fig. 1 CT at 2 years 4 months shows ring calcification with a central organised thrombus

Fig. 2 CT at 6 years of age shows a "V"-shaped midline calcification at the site of the previous AVG

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