Traumatic detachment of the inferior angle of the scapula in a 5-year-old boy—a sonographic diagnosis

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Abstract A complete slip of the cartilage of the inferior angle of the scapula was diagnosed in a 5-year-old boy who fell inside a wooden construction at a kindergarten playground. Radiographs of the scapula were normal, and ultrasound demonstrated complete cartilage detachment, which was displaced deep and laterally. Computed tomography (CT) additionally demonstrated a thin rim of bone displaced along with the detached cartilage. Radiologic findings were confirmed during surgery. We report what we believe to be the first published case of traumatic detachment of the cartilaginous lower angle of the scapula in a child demonstrated by ultrasound.

Keywords Scapula · Cartilage · Inferior angle · Detachment · Trauma · Sonography

Introduction

Fractures of the scapula are very rare in children. When they do occur, they most commonly result from substantial direct trauma (a crush accident or fall from some height) and the possibility of child abuse must also be considered. The radiographic diagnosis of scapular fractures can be a challenge due to overlapping anatomy, support equipment,

as well as the frequent presence of other fractures. If these fractures are present or suspected, one should not hesitate to obtain a CT scan, which can demonstrate small bony fragments that in the majority of cases accompany avulsions in the shoulder [1, 2]. Anterior-posterior (AP) radiographs of the chest may not be sufficient to establish the diagnosis, consequently true AP radiographs of the scapula, and/or CT may be required to demonstrate damage to the bony structures [3–5]. To the authors' knowledge, this is the first published case of traumatic detachment of the cartilaginous lower angle of the scapula in a child demonstrated by ultrasound.

Case report

A 5-year-old boy was admitted to the emergency room after a fall inside a wooden tower in a kindergarten playground. The precise mechanism of injury was not reported by the caregiver.

Physical examination revealed pain and edema, as well as tenderness in the region of the lower angle of the right scapula. The mobility of the shoulder was limited by pain.

Radiographs of the scapula did not demonstrate abnormality, so the child was referred for a sonographic examination of the scapular region. (Fig. 1).

The sonographic examination of the scapular region was performed with a Voluson Expert E8 machine (General Electric). Gray-scale images in sagittal, transverse, and oblique planes, as well as power Doppler images were obtained with a wide-band linear probe (10–16 MHz). Ultrasound showed a complete detachment of the cartilaginous portion of the lower angle of the scapula, with a deep and lateral displacement of the fragment, with moderate edema of the adjacent muscles and

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Fig. 1 **a** An antero-posterior radiograph of the injured right scapula. No abnormality is demonstrated. **b** A lateral radiograph of the injured right scapula. No abnormality is demonstrated

subcutaneous tissues (Fig. 2a). No hematoma in the scapular region was seen; slightly enhanced vascularity was demonstrated in power Doppler (Fig. 2b).

Computed tomography (CT) was performed with a Philips Brilliance 40 CT scanner (80 kV, 162 mAs, slice

thickness 0.5 mm). The CT images showed a detachment of a thin crescent-like rim of the bony border of the scapula, which was displaced deep and lateral in respect to the scapula (Fig. 3a, b).

The patient underwent surgery (open reposition and reattachment with four mattress 2/0 Prolene sutures) (Fig. 4). The intraoperative findings confirmed the sonographic diagnosis. The displaced fragment was impacted between the scapula and ribs. There was no evidence of muscle tear, however, swelling of the neighboring soft tissues and a tiny hematoma were present. The muscles attached to the displaced fragment were identified as the teres minor and serratus anterior muscles.

In a 3-month follow-up, a clinically perfect stabilization of the scapula was obtained. The child is pain-free and has a full range of motion.

Discussion

Avulsion injuries of the lower angle of the scapula are extremely rare. There are only a few cases reported in the literature [6–11].

Fig. 2 **a** Sonography of the lower angles of both scapulae, oblique sections. A displacement of the cartilage of the right scapula is demonstrated (*open arrows* mark the calcified portion of the scapula,

and *arrowheads* mark the cartilage). **b** Power Doppler image of the injured lower angle of the right scapula. Slightly enhanced vascularity is demonstrated

Fig. 3 **a** Computed tomography, transverse section. A detached tiny fragment of the scapula is demonstrated (white arrow). **b** Computed tomography: shaded surface displays reconstruction. A detached tiny fragment of the scapula is demonstrated (white arrows)

In the reported case, the exact mechanics producing the lesion is unclear, since the moment of the fall was not noticed by the caregiver. Theoretically, both avulsion and direct trauma are possible. However, absence of skin bruising speaks against a direct trauma.

The possible consequences of the untreated shoulder dyskinesia are severe. Stabilization of scapula in the functional thoraco-scapular joint and proper thoraco-scapular rhythm are leading factors in the prevention of subacromial impingement and rotator cuff lesions [12]. Generally, in other anatomical locations of epiphysiolysis, a 2–3 mm displacement of a fragment is unacceptable, and should be reduced [13]. The displacement of the detached cartilaginous fragment of the scapula amounted to 4 mm, consequently, by analogy, a decision of surgical treatment was made.

An injury of the scapula in a child should raise suspicion of child abuse. In this reported case, a non-accidental injury was ruled out as the child was confident and cooperative, showed no bruises, hemato-

mas, or other signs of abuse as demonstrated by physical examination, and no suspicious findings were observed on radiographic images.

The center of ossification of the lower angle of the scapula occurs at or soon after puberty [14]. Hence, not surprisingly, no abnormality was demonstrated on radiography in our 5-year-old patient. However, we believe that a radiographic study is mandatory in similar cases to rule out unexpected injuries of the bony structures of the chest wall and scapula, or if non-accidental injury is suspected.

Computed tomography is a well-established method of assessment of skeletal injury, and is especially useful in imaging of structures difficult to assess by radiography, e.g., the calcaneus or the scapula [15–17]. However, it does not depict the cartilage well and is of help only if a concomitant injury of bony structures is present. In our case, the role of CT findings was secondary; it demonstrated a tiny fragment of bone detached along with the cartilage of the interior angle of the scapula. If a CT examination is contemplated, the clinical benefit for the patient has to outweigh the risk of radiation.

Magnetic resonance imaging could potentially demonstrate this kind of injury [18], however, the quality of images of the scapula could be degraded by motion (respiratory) artifacts and examination would require sedation of the patient. To the authors' knowledge, no reports of the use of magnetic resonance in the demonstration of scapular trauma in children have been published.

Ultrasound has been used to demonstrate fractures of bones difficult to assess by radiography, e.g., fracture of the sternum, ribs, or scapula [19–21]. It does not involve use of ionizing radiation, and is usually readily available. The comparison of both sides can be easily completed and in cooperative patients, the information about maximal pain sites can be helpful. Moreover, the superficial portions of cartilage are well depicted on ultrasound. However, the structures located past soft tissue–bone and soft tissue–air interfaces may not be visualized. In the reported case, the bony fragment attached to the avulsed cartilage displaced deep to the ossified portion of the scapula was not visible on ultrasound.

Conclusions

Sonography should always be considered if a lesion of the cartilaginous portions of the scapula in children is suspected.

Fig. 4 Successfully reattached cartilaginous portion of the lower angle of the scapula - an intraoperative photograph

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