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Sternal fractures in children without direct trauma: A case series

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Abstract

Sternal fractures in children are rare and tend to be caused by high-energy injury. However, sternal fractures may also be caused by minor and indirect trauma and might therefore not be as rare as previously stated. Ultrasound examination is the method of choice for the diagnosis of sternal fractures. We present three cases of sternal fractures not caused by direct trauma that presented to our A&E department within a period of only 62 days. All of them exhibited localized tenderness, but none had an associated injury.

Children presenting to the A&E unit with musculoskeletal thorax pain should be screened by POCUS for sternal fractures, even if they do not report any direct trauma to the thorax.

Introduction

Sternal fractures in children are traditionally considered a rare event and are usually associated with high-energy injury mainly caused by motor-vehicle incidents [1-3]. However, sternal fractures might also be caused by minor or indirect trauma. These injuries may not be visible on X-rays and are therefore often overlooked [4].

Ultrasound examination of the sternum is well established and has proven to be more sensitive than X-ray or even CT for diagnostic imaging of sternal fractures [5-9]. With the progressive use of point-of-care ultrasound (POCUS), some case reports have emerged documenting sternal fractures after low-energy trauma or even in the absence of direct trauma to the sternum or thorax [10-12].

We present a series of three cases of sternal fractures that occurred without direct trauma to the thorax. The three cases presented to our A&E department within a period of only 62 days.

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Case presentations

Case 1: A 14-year old boy who presented to the A&E unit after a jump with a somersault from a height of 2 meters. Upon landing on his feet on an air mattress, he felt his chest "col-lapse". Since then, the boy complained of pain across the sternum that is exacerbated on arm movement and deep inspiration. He did not receive any direct impact to the chest. Physical ex-amination revealed pain across the sternum, and POCUS showed a fracture of the caudal part of the manubrium sterni (Figure 1).

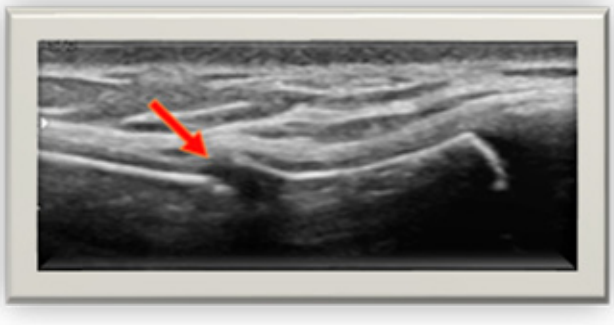

Figure 1: Case 1, Fracture of caudal manubrium sterni.

Case 2: A 9-year old boy presented to the A&E department because of persistent pain across the sternum after falling from monkey bars and landing on his feet. He did not sustain any direct trauma to the thorax. He complained of pain, especially during physical effort and laughing. Upon clinical examination, he complained of pain across the sternum and the right sternocostal region. POCUS revealed a fracture of the cranial part of the first sternebra (Figure 2).

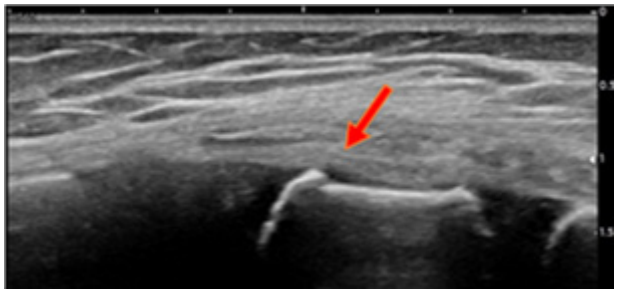

Figure 2: Case 2, Fracture 1st sternebra cranial.

Case 3: A 6-year old girl presented to the A&E department after attempting a somersault on the trampoline and landing on her head. She complained of pain across the anterior thorax. Up-on physical examination, pain could be elicited across the manubrium sterni and the cranial part of the sternum. POCUS revealed a fracture of the caudal part of the first sternebra (Figure 3). The girl did not exhibit any signs of concussion.

None of the three patients exhibited any associated injuries. Palpation or percussion of the spine did not elicit any pain in all three children. All three patients received symptomatic pain treatment and were discharged from the A&E unit on the same day.

Discussion

Because sternal fractures in children may not only be caused by direct trauma but may be induced by minor and indirect impact, they appear to be more frequent than previously stated. Hyperflexion of the cervical and thoracic spine with longitudinal compression seems to be a fre-quent mechanism of injury [13].

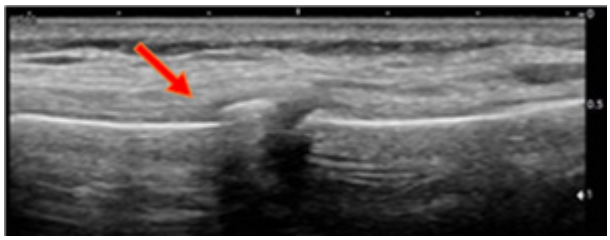

Figure 3: Case 3, Fracture 1st Sternebra caudal.

Table 1 shows the baseline characteristics and mode of injury of the three children suffering sternal fractures.

Table 1: Baseline characteristics and mode of injury of the three children suffering sternal fractures.

	Case 1	Case 2	Case 3
Age (years)	14	9	6
Sex	Male	Male	Female
Trauma impact	Feet	Feet	Head
Fracture site	Manubrium sterni caudal	1st sternebra cranial	1st sternebra caudal
Dislocation	None	None	None

POCUS provides fast and reliable diagnosis of sternal fractures without the use of ionizing radiation. Associated lesions seem to be rare in sternal fractures caused by minor, indirect de-forming forces. These fractures can be managed safely in an outpatient setting.

A clear diagnosis by POCUS imaging benefits the patient because it allows to adapt activi-ties accordingly.

Conclusions

As POCUS is fast and devoid of inherent risks of ionizing radiation, A&E departments should have a low threshold in screening children with musculoskeletal thorax pain for sternal fractures.

Further research is needed to evaluate the incidence, risk of associated lesions, and optimal duration of restricted activity as well as prevention of such injuries in high-risk activities.

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References

1. Schmitt S, Krinner S, Langenbach A, Hennig FF, Schulz-Drost S, et al. Analysis on the Age Distribution of Sternum Fractures. Thorac Cardiovasc Surg. 2018; 66: 670-677.

2. Ozsoy IE, Tezcan MA. A Rare Injury in Children: Sternum Fractures. J Coll Physicians Surg Pak. 2019; 29: 993-995.

3. Perez FL Jr, Coddington RC. A fracture of the sternum in a child. Journal of pediatric orthopedics 1983; 3: 513-515.

4. Fichtel I, Fernandez FF, Wirth T. Sternal fracture in growing children: A rare and often overlooked fracture? Documentation of four cases. Der Unfallchirurg. 2016; 119: 570-574.

5. Khalil PA, Benton C, Toney AG. Point-of-Care Ultrasound Used to Diagnose Sternal Fractures Missed by Conventional Imaging. Pediatric emergency care. 2021; 37: 106-107.

6. Nickson C, Rippey J. Ultrasonography of sternal fractures. Australas J Ultrasound Med. 2011; 14: 6-11.

7. You JS, Chung YE, Kim D, Park S, Chung SP et al. Role of sonography in the emergency room to diagnose sternal fractures. J Clin Ultrasound. 2010; 38: 135-137.

8. Sesia SB, Prüfer F, Mayr J. Sternal Fracture in Children: Diagnosis by Ultrasonography. European J Pediatr Surg Rep. 2017; 5: e39-e42.

9. Troxler D, Sanchez C, de Trey T, Mayr J, Walther M, et al. Non-Inferiority of Point-of-Care Ultrasound Compared to Radiography to Diagnose Upper Extremity Fractures in Children. Children (Basel). 2022; 9.

10. Moënne Bühlmann K, Araneda Castiglioni D, Ortega Flores X, Sánchez CP, Johnson JE, et al. Clinical and radiological study of sternal fractures in pediatrics. Radiologia (Engl Ed). 2019; 61: 234-238.

11. Pérez-Martínez A, Marco-Macián A, Gonzálvez-Piñera J, Agustí-Buztke B, Solera Santos G, et al. Cortical fracture of the sternum in a child: an infrequent case. Cir Pediatr. 1996; 9: 130-131

12. Ferguson LP, Wilkinson AG, Beattie TF. Fracture of the sternum in children. Emerg Med J. 2003; 20: 518-520.

13. Jones GL. Upper extremity stress fractures. Clin Sports Med. 2006; 25: 159-174.