That's my STYLEoideum - Symptomatic os styloideum in an adolescent male

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ABSTRACT

We present a 15-year-old male patient with persistent localized pain on the dorsal side of the left wrist between the base of the 2nd and 3rd metacarpal bones and over the third carpometacarpal joint. It was diagnosed as an accessory metacarpal bone -Os styloideum. This entity may be detected on plain radiographs and in ultrasound examination and is often asymptomatic. Symptomatic os styloideum occurs more frequently in the dominant hand and may be treated conservatively with corticosteroid infiltration. A palpable prominence on the dorsal side of the wrist and focal pain evoked anxiety of the adolescent patient who searched medical consultation. In the clinical examination, a bony protrusion was confirmed and different possible diagnoses have been considered. After treatment with a corticosteroid infiltration of the third carpometacarpal joint under fluoroscopy the pain resolved completely. We would like to draw attention of clinicians and radiologists to this rare anatomical variant that normally is asymptomatic, and therefore not immediately recognized. Acquaintance with this entity and its early detection may lead to conservative treatment instead of surgical excision. A comprehensive literature search, review and discussion about os styloideum are provided in the article.

CASE REPORT

CASE REPORT

We report a case of a 15-year-old male who was admitted to our hospital because of persistent localized pain on the dorsal side of the left non-dominant wrist.

Clinical assessment and physical examination revealed focal pain on the dorsal aspect of the left wrist between the base of the 2nd and 3rd metacarpal bones and over the third carpometacarpal joint. Inspection showed a focal protrusion, asymmetry and concomitant tenderness. There was no swelling or signs for infection. The mobility and strength of the wrist and fingers were symmetric with the opposite side.

There was no history of trauma or prior operation. The sensation of pain occurred mostly when lifting heavy objects. According to his mother the patient had recently grown noticeably.

Based on clinical symptoms and assessment a slight insertional tendinitis of extensor carpi radialis longus/brevis muscle, a carpe bossu (orthopedic term for symptomatic os styloideum) were suspected.

To rule out a fracture and eventually for the purpose of accurate characterization of the lesion a non-enhanced low-dose multi-slice CT (Siemens Somatom Definition Flash, Siemens Medical Solutions, Germany) of the left wrist was performed (Fig. 1).

The CT examination showed no fracture and a normal alignment of the carpal bones. An accessory round osseous structure between the dorsal aspect of the capitate and trapezoid bones and the radial aspect of the base of the third metacarpal bone with pseudoarticulation was detected.

To determine if the accessory bone was present in the opposite wrist, a further verifying ultrasound examination with the use of a 12 MHz linear transducer (Toshiba Amplio 500, Toshiba Medical Systems Corporation, Japan) was performed. Due to the young age of the patient in order to avoid the additional ionizing radiation, the ultrasound examination for the non-symptomatic right wrist was chosen (Fig 2).

Ultrasonography revealed additional bones on the base of the 2nd and 3rd metacarpal bones on both sides. However, the accessory bone was significantly larger in the painful left wrist.

The patient received conservative management with a corticosteroid infiltration of the third carpometacarpal joint under fluoroscopy. Pain resolved completely within a few days, verifying the carpe bossu causing the patient´s clinical symptoms.

DISCUSSION

Etiology & Demographics:

An accessory bone called os styloideum is a rare anatomical variant in the construction of a carpometacarpal joint with an incidence of 0.3-1.6% (1).

It is located between the capitate and trapezoid and the bases of second and third metacarpals, and is also called “ninth carpal bone”. It can occur as a free accessory bone as in the presented case but it may also fuse with the underlying carpal bones (1). In the orthopedic jargon terms like “carpe bossu” or “carpal boss” stand for the pain in the dorsum of the wrist, thus correlate with the location of the os styloideum (2-4). Mostly, os styloideum disappears during fetal development while its occurrence is explained as an embryologic developmental variant resulting from non-fusion of the primordial cartilaginous units (5).

The current literature keeps silent on the true incidence of symptomatic carpe bossu. Solely the studies on cadavers of Nakamura and Alemohammed point out that the authentic occurrence of additional bones in the hand, appear to be more frequent than previously suspected (6, 7). Interestingly, the available studies on humans suggest that the incidence of symptomatic carpal boss rather affects the dominant hand (8). The study of Fusi et al. suggests that the mean age of 116 evaluated patients who were treated surgically for symptomatic carpal boss was 32 years and male and female patients were equally affected (8). Frictional tendinopathy with extensor tendor slipping over the bony prominence, posttraumatic irritation and degenerative changes due to abnormal type of arthrosis are considered as main pain generators (9, 10).

Clinical & Imaging findings:

Routinely the way from clinical symptoms to the conclusive diagnosis leads through plain radiography, CT and ultrasound examinations to rule out other possible differential diagnoses (10). A palpable bony prominence on the dorsal side of the wrist in the clinical examination and concomitant unspecified local pain evoke an impressive list of differential diagnoses, with ganglions, tendinopathies and degenerative joint diseases on top of it. Therefore, such initial finding would be probably not immediately associated with the existence of os styloideum. In the radiographic imaging, it is usually an “aunt minnie” finding.

Treatment & Prognosis:

However, there is no agreement on the “gold standard” therapy, many authors suggest that the initial treatment should be conservative, either with the anti-inflammatory medication or with corticosteroid injections (11, 12). Prognosis depends on the applied therapy and on the fact, if the affected hand is dominant, which is less favorable for complete relief of pain.

Differential Diagnosis:

The list of most plausible differential diagnoses includes posttraumatic changes, ganglion/synovial cysts with tendinopathy of the nearby tendon, carpometacarpal osteoarthritis, gout arthropathy and bizarre parosteal osteochondromatous proliferation (BPOP).

Traumatic changes

History of trauma is essential for the diagnosis. Associated pain, soft tissue swelling or hematoma indicate rather acute or subacute event. Old fractures and contusions can also account for the wrist pain, for instance due to intraarticular bone fragments with improper, painful articulation that leads secondary to the pre-arthrosis.

If pain and concomitant restriction of motion occur after trauma, it is the most probable cause of the symptoms and an accessory os styloideum is not considered. A complete anamnesis of history of trauma and its mechanism are essential for the targeted diagnosis and patient-tailored therapy.

Usually a plain radiography delivers the valuable information, with CT being performed in complex cases like intra-articular or severely comminuted fractures (13). Dual-energy CT grows in popularity in acute setting imaging, offering bone marrow quantification and detection of fractures (14). Heterotopic ossifications may occur after trauma and they can mimic the appearance of os styloideum.

Ganglion/synovial cyst and tendinopathy

Ganglion cysts are fluid containing structures with connection to the joints, bones, muscles or tendon sheaths (15, 16). They normally appear after trauma and can cause similar pain as the symptomatic os styloideum. Wrist and hand are the most often locations for the ganglion cysts, what makes the diagnosis of painful os styloideum rather unlikely. The majority of ganglion cysts present hypoechoic in the ultrasound examination, and the connection to the underlying tendon sheath or the adjacent joint may be visualized. They are fluid containing structures and present hypointense in T1-weighted and hyperintense in T2-weighted sequences.

Carpometacarpal osteoarthritis

It is a degenerative disorder of synovial joints that results in narrowing of the joint space, osteophytes, subchondral sclerosis and periarticular soft tissue swelling. Risk factors for this condition include repetitive use and trauma, abnormal biomechanical loading and underlying joint disease (17, 18). Radiographs are normally sufficient to make the diagnosis. The Eaton and Littler classification can be used to stage the disease (19).

Gout arthropathy

Gout is a crystal arthropathy caused by accumulation of monosodium urate crystals in joints and soft tissues. It has a predilection for the small joints of the hands and feet and is normally asymmetric (20). Birefringent monosodium urate crystals in tissue or synovial fluid are detected by polarized microscopy (21). Gout is manifested radiographically by joint effusion, bone erosions, overhanging sclerotic margins of the bone and deposits of monosodium urate crystals in the periarticular soft tissues (known as tophi) (22). CT can be used for quantification of the osseous changes and the Dual-Energy CT examination for crystal deposits detection (20).

Bizarre parosteal osteochondromatous proliferation (BPOP)

Bizarre parosteal osteochondromatous proliferation (BPOP) is a rare benign osteocartilaginous lesion that most frequently affect the hand, the feet and the skull (23). It was described by Nora et al. and therefore is also called „Nora's lesion“. On plain radiographs it occurs as a well-delineated osseous tumor adjacent to the underlying bone. It normally has a low signal intensity on T1w and high signal intensity on T2w and STIR MR images (24). The adjacent bones and soft tissues are usually normal. BPOP occurs mostly in adults, its incidence in pediatric population is unclear (25). Radiographic and histologic findings are the gold standard for diagnosis of BPOP (26).

Our case is unusual as the patient was only 15 years old, had an accessory os styloideum in both wrists, symptomatic only on the non-dominant side. We assume that his noticeable growth in recent time might have involved the probably already existing accessory bones and released pain. The case shows that the diagnosis may be made by means of CT or ultrasound examination. Ultrasonography may reveal the existence of an accessory metacarpal bone on a non-symptomatic side.

TEACHING POINT

Os styloideum may be a bothersome and inconvenient condition but as a rare anatomical variant is usually not suspected, and may be missed on clinical and radiological assessment. Early and proper detection of this accessory bone makes it a “do not touch lesion” that does not require a biopsy or excision. Primarily, it can be treated conservatively without initial need for surgical approach. The general awareness of this easily detectable lesion should be raised.

REFERENCES

1. Keats TE. Atlas of Normal Roentgen Variants That May Simulate Disease. Chicago: Year Book Medical Publishers; 1988.

2. Bassoe E, Bassoe HH. The styloid bone and carpe bossu disease. The American journal of roentgenology, radium therapy, and nuclear medicine. 1955;74(5):886-8. Epub 1955/11/01. PMID: 13258941.

3. Conway WF, Destouet JM, Gilula LA, Bellinghausen HW, Weeks PM. The carpal boss: an overview of radiographic evaluation. Radiology. 1985;156(1):29-31. doi: doi:10.1148/radiology.156.1.3923555. PMID: 3923555.

4. Fusi S. WHK, Cuono C.B. . The carpal boss. A 20-year review of operative management Journal of Hand Surgery. 1995;20 (3):405-8 PMID: 7561423.

5. Kootstra G, Huffstadt JC, Kauer JM. The styloid bone. A clinical and embryological study. The Hand. 1974;6(2):185-9. Epub 1974/06/01. PMID: 4846215.

6. Alemohammad AM, Nakamura K, El-Sheneway M, Viegas SF. Incidence of Carpal Boss and Osseous Coalition: An Anatomic Study. The Journal of Hand Surgery. 2009;34(1):1-6. PMID: 19081681.

7. Nakamura K, Patterson RM, Viegas SF. The ligament and skeletal anatomy of the second through fifth carpometacarpal joints and adjacent structures. The Journal of Hand Surgery. 2001;26(6):1016-29. PMID: 11721245.

8. Capo JT, Orillaza NS, Lim PK. Carpal Boss in an Adolescent: Case Report. The Journal of Hand Surgery. 2009;34(10):1808-10. PMID: 19897321.

9. Apple JS, Martinez S, Nunley JA. Painful os styloideum: bone scintigraphy in carpe bossu disease. AJR American journal of roentgenology. 1984;142(1):181-2. Epub 1984/01/01. doi: 10.2214/ajr.142.1.181. PMID: 6229168.

10. Arend CF. The carpal boss: a review of different sonographic findings. Radiologia brasileira. 2014;47(2):112-4. PMID: 25741059.

11. LORÉA P, SCHMITZ S, ASCHILIAN M, CHIRILA-DOBREA A, PETREA AD. The Preliminary Results of Treatment of Symptomatic Carpal Boss by Wedge Joint

Resection, Radial Bone Grafting and Arthrodesis with a Shape Memory Staple. Journal of Hand Surgery (European Volume). 2008;33(2):174-8. PMID: 18443059.

12. Mader K, Pennig D. The treatment of severely comminuted intra-articular fractures of the distal radius. Strategies in Trauma and Limb Reconstruction. 2006;1(1):2-17. PMID: PMC2780584.

13. Reddy T, McLaughlin PD, Mallinson PI, Reagan AC, Munk PL, Nicolaou S, et al. Detection of occult, undisplaced hip fractures with a dual-energy CT algorithm targeted to detection of bone marrow edema. Emergency radiology. 2015;22(1):25-9. Epub 2014/07/06. PMID: 24985783.

14. Banks KP, Bui-Mansfield LT, Chew FS, Collinson F. A compartmental approach to the radiographic evaluation of soft-tissue calcifications. Seminars in roentgenology. 2005;40(4):391-407. Epub 2005/10/13. PMID: 16218555.

15. Teefey SA, Dahiya N, Middleton WD, Gelberman RH, Boyer MI. Ganglia of the hand and wrist: a sonographic analysis. AJR American journal of roentgenology. 2008;191(3):716-20. Epub 2008/08/22. PMID: 18716098.

16. Teh J, Whiteley G. MRI of soft tissue masses of the hand and wrist. The British journal of radiology. 2007;80(949):47-63. Epub 2006/05/12. PMID: 16687461.

17. Li YK, White CP. Carpometacarpal osteoarthritis of the thumb. CMAJ : Canadian Medical Association Journal. 2013;185(2):149. PMID: 23008487.

18. Luker KR, Aguinaldo A, Kenney D, Cahill-Rowley K, Ladd AL. Functional task kinematics of the thumb carpometacarpal joint. Clin Orthop Relat Res. 2014;472(4):1123-9. Epub 2013/04/04. PMID: 23549712.

19. Cook GS, Lalonde DH. MOC-PSSM CME article: Management of thumb carpometacarpal joint arthritis. Plastic and reconstructive surgery. 2008;121(1 Suppl):1-9. Epub 2008/01/10. PMID: 18182958.

20. Chowalloor PV, Siew TK, Keen HI. Imaging in gout: A review of the recent developments. Therapeutic advances in musculoskeletal disease. 2014;6(4):131-43. Epub 2014/10/25. PMID: 25342993.

21. Wallace SL, Robinson H, Masi AT, Decker JL, Mccarty DJ. Preliminary criteria for the classification of the acute arthritis of primary gout. Arthritis & Rheumatology. 1977;20(3):895-900. PMID: 856219.

22. Brailsford JF. The radiology of gout. The British journal of radiology. 1959;32:472-8. Epub 1959/07/01. PMID: 13803780.

23. Kumar A, Khan SA, Sampath Kumar V, Sharma MC. Bizarre parosteal osteochondromatous proliferation (Nora's lesion) of phalanx in a child. BMJ case reports. 2014;2014. Epub 2014/01/25. PMID: 24459223.

24. Torreggiani WC, Munk PL, Al-Ismail K, O'Connell JX, Nicolaou S, Lee MJ, et al. MR imaging features of bizarre parosteal osteochondromatous proliferation of bone (Nora's lesion). European journal of radiology. 2001;40(3):224-31. Epub 2001/12/04. PMID: 11731211.

25. Barrera-Ochoa S, Lluch A, Gargallo-Margarit A, Pérez M, Vélez R. Bizarre Parosteal Osteochondromatous Proliferation (Nora's Lesion) of the Hand: A Report of Two Atypical Cases. Case Reports in Medicine. 2012;2012:453560. PMID: 23326274.

26. Joseph J, Ritchie D, MacDuff E, Mahendra A. Bizarre Parosteal Osteochondromatous Proliferation: A Locally Aggressive Benign Tumor. Clinical Orthopaedics and Related Research. 2011;469(7):2019-27. PMID: PMC3111785.

FIGURES

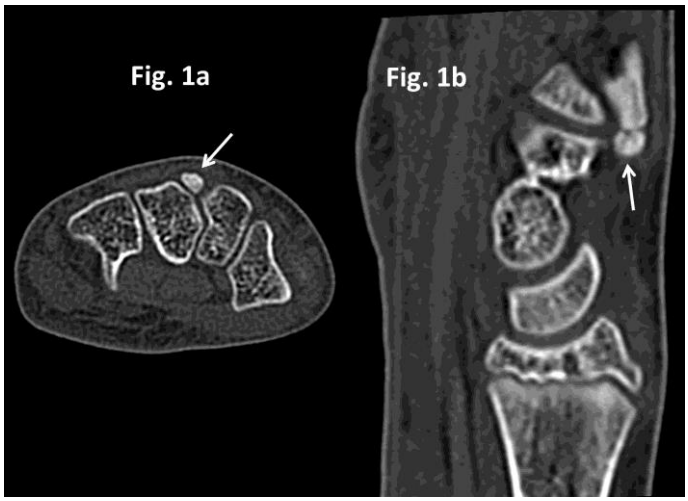

Figure 1: 15-year-old male patient with symptomatic os styloideum (Non-enhanced CT of the wrist)
TECHNIQUE: Non-contrast multislice CT (Somatom Definition Flash, Siemens). 100/Sn140 kV, 108/88 mAs. 0.6 mm slice thickness. CTDIvol 8.6 mGy. DLP 87 mGycm.
CT axial (1a) and sagittal (1b) views. Os styloideum is visible on both reconstructions (arrows). It is located on the dorsal side of the wrist between the capitate and trapezoid and the base of the styloid process of the third metacarpal (arrows).

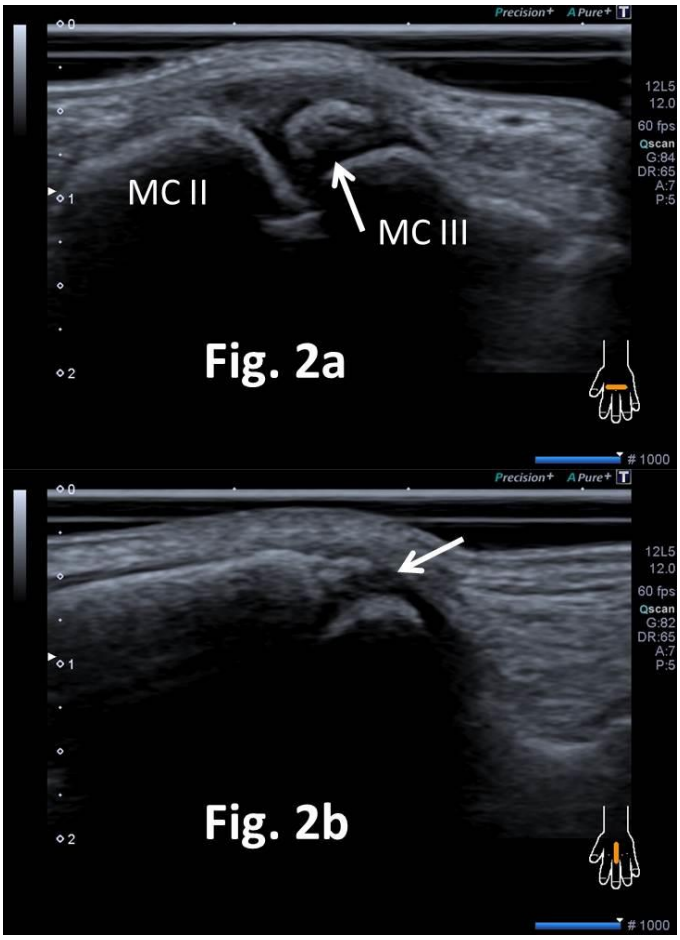

Figure 2: 15-year-old male patient with symptomatic os styloideum (Ultrasound of the left hand)
TECHNIQUE: 12 MHz linear transducer (Toshiba Amplio 500, Toshiba Medical Systems Corporation, Japan). Transverse (a) and longitudinal view (b).
The left os styloideum is seen between the bases of the 2nd and 3rd metacarpals on both the longitudinal and transverse images.

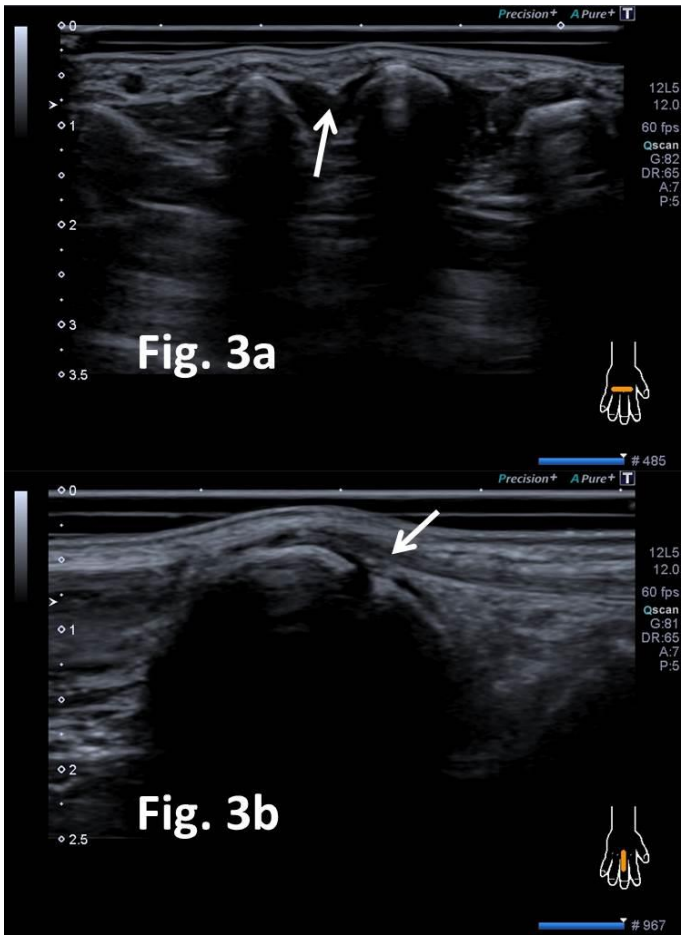

Figure 3: 15-year-old male patient with symptomatic os styloideum (Ultrasound of the right hand)
TECHNIQUE: 12 MHz linear transducer (Toshiba Amplio 500, Toshiba Medical Systems Corporation, Japan). Transverse (a) and longitudinal view (b).
The right os styloideum is also seen between the base of the 2nd and 3rd metacarpals on longitudinal and tranverse images, but is significantly smaller than the accessory ossicle on the left.

- **Rare anatomical variant (0.3%-1.6%)**
- **Easily detectable bone structure in different imaging modalities**
- **Located between the capitate and trapezoid and the bases of second and third metacarpals**
- **Synonyms: "carpe bossu", "carpal boss"**
- **No gold standard therapy for treatment, usually conservative approach with anti-inflammatory medication**
- **Prognosis depends on applied therapy and whether the affected hand is dominant, which is less favorable for complete relief of pain**

Table 1: Summary table of os styloideum.

	X-ray	CT	MRI
Os styloideum	Well circumscribed bony structure in typical localisation	Typical bony structure in typical localisation	Typical bony signal in T1w and T2w. Depending on inflammation high signal in STIR and Gd-enhancement.
Traumatic changes	Well circumscribed bony structure, may be dislocated	Bony fragment, missing cortical delineation at height of the fracture	Typical bony signal. Traumatic edema in STIR, trauma associated soft tissue edema surrounding
Ganglion/ synovial cyst	Hardly visible since fluid containing. No bony structure	Iso- to hypodense density, no trabecular bone, may be ill circumscribed	Hypointense in T1w, hyperintense in T2w
Carpometacarpal osteoarthritis	Joint space narrowing, osteophytes formation, subchondral sclerosis, soft tissue swelling	Osteophytes formation, subchondral sclerosis hyperdense	Soft tissue swelling hyperintense in T2w, subchondral sclerosis hypointense in T1w
Gout	Joint effusion, bony erosions, overhanging sclerotic margins, normal bone mineralisation	Bony erosions Dual-Energy CT: Detection of monosodium urate crystals around the joints	Gout tophus: T1w and T2w normally hypointense, enhancement after i.v. Gadolinium administration
Bizarre parosteal osteochondromatous proliferation (BPOP)	Well-delineated bony lesion adjacent to the underlying bone	Continuous with the underlying bone cortex, similar appearance	Low signal intensity on T1w High signal intensity on T2w and STIR

Table 2: Differential diagnosis table for os styloideum.

ABBREVIATIONS

CT - Computed Tomography
MC - Metacarpal
MRI - Magnetic Resonance Imaging

KEYWORDS

Os styloideum; Carpe bossu; carpal boss; wrist pain; computed tomography; ultrasound

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