




# Dorsal Wrist Carpal Boss Impingement—Dynamic Ultrasound to the Rescue!

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## Abstract

The “carpal boss” is a variant present in 19% of the population according to cadaveric studies but becomes symptomatic in only 1% of cases. With the rising popularity of “yoga,” which includes prolonged hyperextension at the wrist joint with weight bearing, an increasing number of individuals with silent carpal boss present with dorsal wrist pain due to impingement over the dorsal soft tissues by this innocuous bony protuberance. This warrants the attention of radiologists and clinicians while dealing with wrist pain. It can be challenging to identify this bossing on routine radiographs, necessitating special views. We describe the use of dynamic ultrasound in diagnosing “symptomatic” carpal boss, the effects of which become even more evident on imaging during hyperextension—the triggering movement.

## Keywords

- ▶ carpal boss
- ▶ dynamic ultrasound
- ▶ impingement

## Introduction

The human body is a work of art with anatomical variations unique to each which seldom come to notice. One such variant is a “carpal boss” that is thought to be prevalent in 19% of the population according to cadaveric studies but becomes symptomatic in only 1% of cases.<sup>1,2</sup> Carpal boss is a bony protuberance at the quadrangular joint that is an articulation between the dorsal base of second and third metacarpal and the trapezoid and capitate (▶**Fig. 1A and B**). With the rising popularity of “yoga,” which includes prolonged periods of wrist hyperextension with weight bearing, an increasing number of previously asymptomatic individuals with carpal boss are becoming symptomatic and developing the “carpal boss syndrome.”

## Diagnosis

A symptomatic carpal boss often presents with pain on the dorsum of the wrist at the base of the second or third

metacarpal with a “hard” swelling that is most apparent on volar flexion of the wrist. There has been a limited mention of the ultrasound findings of a carpal boss in the literature.<sup>3,4</sup> We describe and present different patients we encountered in our practice to have a symptomatic carpal boss.

An asymptomatic “incidental” carpal boss is often diagnosed on cross-sectional imaging. Significant findings on computed tomography include arthritic changes or fracture (▶**Fig. 2A**). A single-photon emission computed tomography may have avidity for isotope at the quadrangular joint (▶**Fig. 2B**).<sup>5–7</sup> Bone marrow edema and soft tissue changes are more striking on magnetic resonance imaging<sup>3,8</sup> (▶**Fig. 3A and B**).

## Dynamic Ultrasound Evaluation—How We Do It

Hyperextension of the wrist is the usual movement that reproduces the symptoms related to a carpal boss. The authors suggest using a “hockey stick” probe (18–21 Hz)

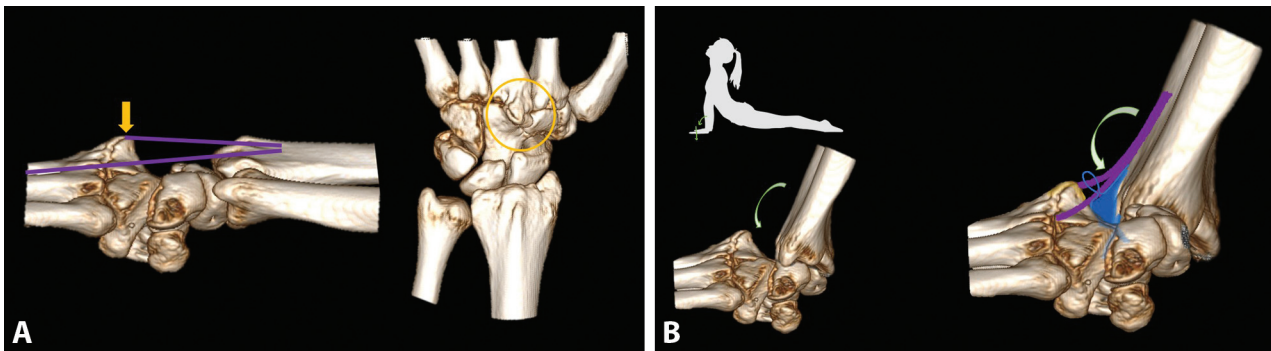
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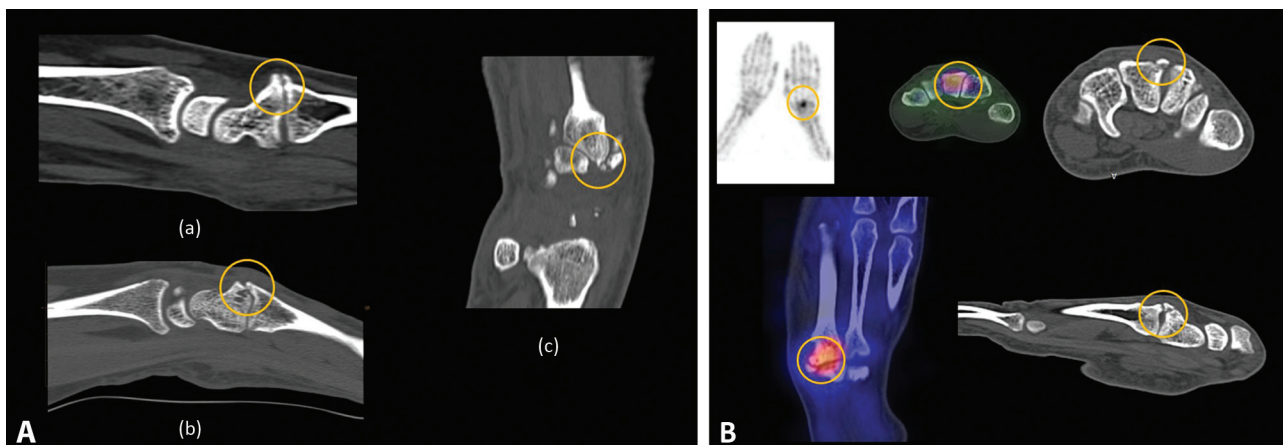
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**Fig. 1** (A) Bony protuberance at the quadrangular joint at the dorsal aspect of the base of third metacarpal and the capitate (yellow arrow and circle). Extensor carpi radialis and digital extensor tendons in close proximity to the carpal boss are also depicted. (B) Increased dorsal soft tissue compartment pressure results in extrusion of a small ganglion (blue) with underlying synovial hypertrophy. Overlying carpal boss and traversing extensor tendons (purple).



**Fig. 2** (A) a: Carpal bossing at the base of third metacarpal with dorsal osteophyte arising from capitate with bony remodeling (encircled). b: Carpal bossing at the base of third metacarpal with bony remodeling and cystic change at the carpometacarpal joint (encircled). c: Carpal bossing at the base of third metacarpal with bony remodeling and degenerative change at the dorsal aspect of the quadrangular joint (encircled). (B) Single-photon emission computed tomography demonstrating an unfused os styloideum with radioisotope avidity at the third carpometacarpal joint suggesting ongoing mechanical stress (encircled).

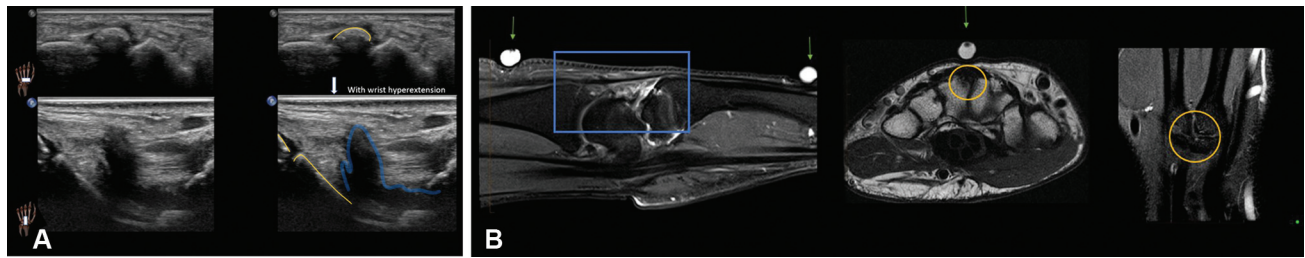


**Fig. 3** (A) Magnetic resonance imaging proton density fat-saturated axial, sagittal T1, and PDFS coronal images demonstrating an unfused and fragmented os styloideum with prominent edema and cystic change at the synchondrosis at the third carpometacarpal joint suggesting stress (encircled). (B) Magnetic resonance proton density fat-saturated sagittal, axial, and T1 axial images demonstrating an unfused os styloideum with mild edema at the synchondrosis at the third carpometacarpal joint suggesting stress (encircled). GRE; gradient echo; PDFS, proton density fat saturated.

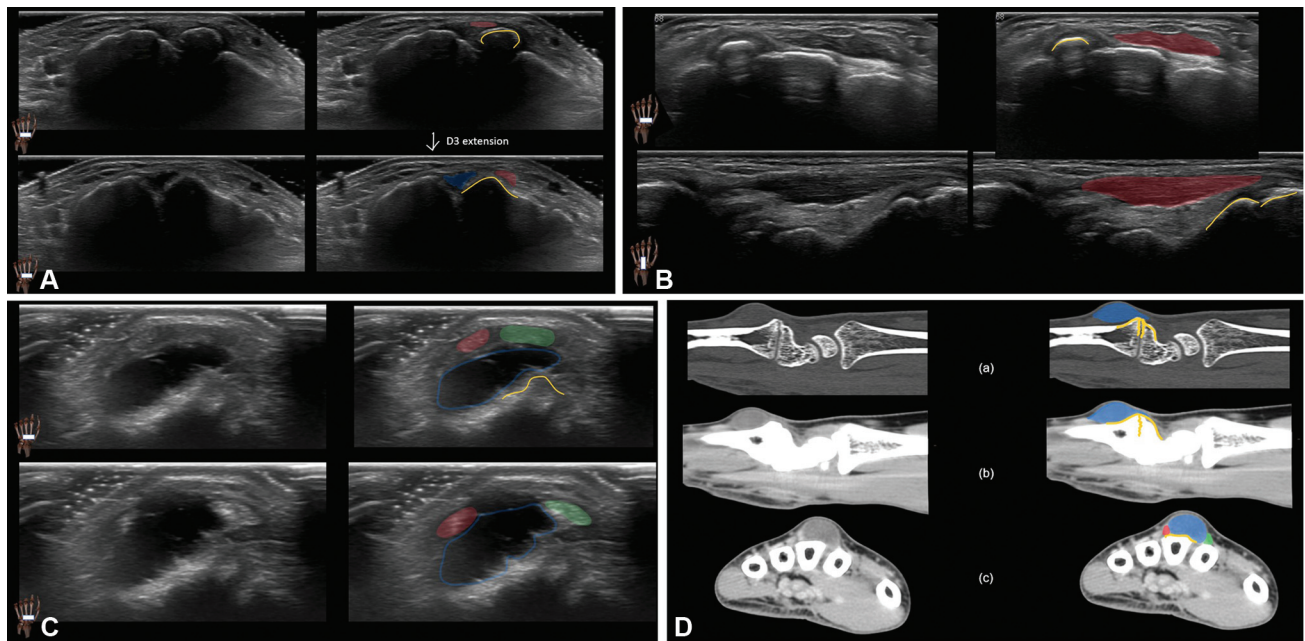
with a small footprint that will fit easily into the crevice for dynamic assessment.

Beginning with imaging at rest, using a linear probe, the wrist and hand are scanned from proximal to distal, looking for an undue bony prominence distal to the distal carpal row in the line of the second or third metacarpal base.

Soft tissue changes include synovial thickening, effusion, tenosynovitis of extensor tendon (usually the extensor carpi radialis brevis, ECRB/extensor carpi radialis longus, ECRL or extensor digitorum longus, EDL), and often an associated ganglion cyst. Doppler evaluation demonstrates hyperemia in the soft tissue (► Fig. 4A and B).



**Fig. 4** (A) Dorsal soft tissue impingement with wrist hyperextension secondary to an underlying carpal boss (yellow), resulting in extrusion of hypertrophied synovium and small effusion (blue). (B) Magnetic resonance imaging sagittal T1 fat-saturated post-contrast image, axial T1, and coronal GRE images: Dorsal soft tissue impingement secondary to an underlying carpal boss (yellow), resulting in post-contrast enhancement of hypertrophied synovium and small effusion (blue). The patient-placed skin markers are along the third ray and correspond to the site of the bony protuberance (green arrows).

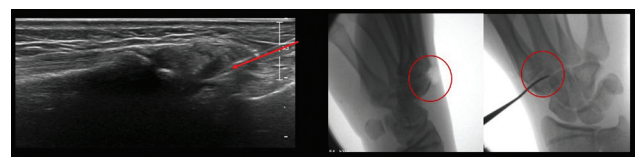


**Fig. 5** (A) Snapping of third digit extensor tendon (red and blue) over a carpal boss (yellow) with finger extension. Associated small dorsal wrist ganglion. The probe position has been depicted in the inset. (B) Accessory extensor digitorum manus brevis (red) over carpal boss (yellow) resulting in dynamic impingement and dorsal wrist pain. The probe position has been depicted in the inset. (C) Splaying of second- and third-digit extensor tendons (red and green) around a dorsal wrist ganglion (blue) and underlying carpal boss (yellow) with finger extension. The probe position has been depicted in the inset. (D) Splaying of second- and third-digit extensor tendons (red and green) over dorsal wrist ganglion (blue) and underlying carpal boss (yellow) with finger extension.

A generous amount of jelly is used to create a “gel pad” and the patient is asked to perform the wrist movement that reproduces usual symptoms. With the probe at the quadrangular joint, the patient is asked to slowly dorsiflex the wrist. The hypertrophied periarticular soft tissue on the dorsum of the wrist can be seen crumpling into a small space at the maximal limit of dorsiflexion. A small ganglion cyst is often seen in association with a carpal boss (►Fig. 4A and B). With hyperextension of the wrist, the ganglion cyst can be seen bulging outward, reflecting increased compartmental pressure. A symptomatic carpal boss may also result in symptomatic snapping of digital extensors around the bony protuberance with extension (►Fig. 5A). An accessory digitorum manus brevis muscle belly may be seen getting dynamically impinged by a carpal boss upon dorsiflexion

(►Fig. 5B). A dorsal wrist ganglion cyst associated with a carpal boss may become large enough to result in splaying of digital extensor tendons around it (►Fig. 5C and D).

Real-time evaluation with ultrasound helps to ensure that the patient’s usual symptoms correspond to the identified carpal boss and it is not just an incidental finding.



**Fig. 6** Management options for symptomatic carpal boss—ultrasound-guided steroid injection and surgical excision.

Ultrasound-guided steroid injection into the quadrangular space can be offered for pain relief, if conservative therapy fails (► **Fig. 6**).

#### Conflict of Interest

None declared.

#### References

- 1 Vieweg H, Radmer S, Fresow R, et al. Diagnosis and treatment of symptomatic carpal bossing. *J Clin Diagn Res* 2015;9(10):RC01–RC03
- 2 Porrino J, Maloney E, Chew FS. Current concepts of the carpal boss: pathophysiology, symptoms, clinical or imaging diagnosis, and management. *Curr Probl Diagn Radiol* 2015;44(05):462–468
- 3 Mespreuve M, Waked K, Verstraete K. Imaging findings at the quadrangular joint in carpal boss. *J Belg Soc Radiol* 2017;101(01):21
- 4 Arend CF. The carpal boss: a review of different sonographic findings. *Radiol Bras* 2014;47(02):112–114
- 5 Clarke AM, Wheen DJ, Visvanathan S, Herbert TJ, Conolly WB. The symptomatic carpal boss. Is simple excision enough? *J Hand Surg [Br]* 1999;24(05):591–595
- 6 Keupers M, Gelin G, Vandevenne J, Grieten M. Carpal boss syndrome. *JBR-BTR* 2012;95(05):320–321. Doi: 10.5334/jbr-btr.678
- 7 Conway WF, Destouet JM, Gilula LA, Bellinghausen HW, Weeks PM. The carpal boss: an overview of radiographic evaluation. *Radiology* 1985;156(01):29–31
- 8 Nevalainen MT, Roedl JB, Morrison WB, Zoga AC. MRI of a painful carpal boss: variations at the extensor carpi radialis brevis insertion and imaging findings in regional traumatic and overuse injuries. *Skeletal Radiol* 2019;48(07):1079–1085