**Title:** Second, Third Carpometacarpal injuries of the wrist: A frequently missed injury with significant sequelae

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**Introduction**

Dorsoradial wrist pain is a common problem that can be difficult to diagnose due to the widely varied and complex differential diagnosis. There are many causes of dorsoradial wrist pain which include dorsal ganglion, tendonitis, scaphoid fracture, thumb carpometacarpal arthritis, Kienbock’s disease, radiocarpal impingement, posterior interosseous nerve entrapment, carpal instability and carpal boss. In addition, Joseph, et al described second and third carpometacarpal (2, 3 CMC) joint injury as another cause of dorsoradial wrist pain in 1981. Despite previous recognition, there remains a significant delay in diagnosis of this problem often with inadequate workup and treatment leading to significant morbidity. To our knowledge it has been over two decades since the last report of this clinical entity and it remains a frequently missed injury. Delay in diagnosis can result in prolonged treatment and continued pain. The purpose of the study is to retrospectively review patients diagnosed with 2, 3 CMC sprains in a single hand surgeon’s practice and evaluate mechanism of injury, delay in diagnosis, physical exam techniques, and the need for conservative versus surgical treatment.

**Methods**

A retrospective review of all patients diagnosed with 2, 3 CMC sprains in a single hand surgeon’s practice between September 1994 and December 2011 was performed. The mechanism of injury, time to diagnosis, physical exam techniques, and outcome of conservative versus surgical treatment were recorded and analyzed. Physical exam techniques included tenderness to palpation directly of the 2, 3 CMC joint, the shuck test, and the torque test. A physical exam technique described by William B. Kleinman, MD was used involving compression of the base of the second carpometacarpal joint against the fifth carpometacarpal joint (Kleinman compression)

**Results**

Twenty-nine patients were diagnosed with 2, 3 CMC sprains. The average age of the patients was 33.2 years old at the time of diagnosis (range 14-61 years old). This included 13 males and 16 females. The nondominant hand was injured in 62% of the patients. The mean time to diagnosis of a CMC sprain was 165 days (range 1 days to 3 years). 48% were sports related and 34% of the injuries were sustained due to gripping the steering wheel during a motor vehicle accident. Other mechanisms of injury included crush injuries (n=2) and unknown mechanism (n=3). On physical exam, all patients had tenderness over the 2, 3 CMC joint. The torque and shuck tests were found to be positive in 41% (7/17) and 33% (5/15) of documented cases. A positive Kleinman compression was in 96% (23/24) of documented patients. Of 28 patients with documentation of the presence or absence of a carpal boss, 17 were found to have a boss. 44.8% (13/29) patients ultimately underwent surgical intervention. Average time to diagnosis in the operative group was 251.4 days compared to 109.8 days in the nonoperative group. All patients were initially treated nonoperatively, receiving injections with lidocaine and celestone into the 2, 3 CMC joint, except for one patient that was treated with immobilization alone. Of the patients that went on to surgery, 5 patients had a boss excision alone and 8 had a fusion with k wire fixation.

**Discussion**

The purpose of this paper is to retrospectively review patients with second and third carpometacarpal injuries that demonstrate the continued delay in diagnosis of the injury. Initially described by Joseph, et al, these sprains resulted in traumatic arthrosis and instability of the carpometacarpal joints. They found this injury was often initially unrecognized, leading to a delay in diagnosis and chronic symptoms. Injection of local anesthetic into the joint was a useful diagnostic tool and they recommended early immobilization in the acute period. In cases of chronic pain, joint arthrodesis was an effective treatment. All 28 surgical patients went on to fusion in their study. They briefly discussed 20 patients diagnosed with chronic sprains that did not undergo surgery, however did not go into detail on their treatment other than to say that a few felt their symptoms insufficient to warrant surgery while others were successfully treated with steroid injections and splinting. They also successfully treated 10 patients with acute sprains conservatively for 3 to 6 weeks in a splint or cast. Carrol and Carlson in 1989 reported their experience with the diagnosis and treatment of injuries specifically to the second and third carpometacarpal joints with similar findings and results. They obtained excellent results in 12 of 13 patients treated with fusion. They also successfully treated 13 patients diagnosed with “laxity or sprain of the second or third CMC joint” conservatively. Although the difference in successful conservative treatment versus patients requiring surgery was not discussed, they found improvement with splinting, anti-inflammatories and rest at an average of five months with return to previous activity. Injuries of the 2, 3 CMC joint have been rarely described in the literature but can have significant sequelae due to a delay in diagnosis from inadequate diagnostic workup or treatment.

We found a common mechanism of injury involves motor vehicle accidents in which the driver grasps the steering wheel and at impact the wrist is dorsiflexed resulting in a dorsally-directed injury pattern to the CMC joints. This injury pattern was also found in racket and club sport athletes. Previously described exam techniques such as the torque and shuck test for the 2, 3 CMC joint were found to be less sensitive than compression of the base of the second CMC joint against the fifth CMC joint (Kleinman compression). A CMC boss was often found to be associated with 2, 3 CMC injury and should be considered as part of the spectrum of the 2, 3 CMC disease process rather than a separate entity. The constrained anatomy of the 2, 3 CMC joint serves as the keystone of the hand in which movement occurs around this central post. This configuration and injury could be thought of as analogous to the lisfranc sprain in the foot. Initial treatment begins with immobilization, NSAIDs and corticosteroid injection. In cases of failed conservative treatment, excision of the CMC boss or a 2, 3 CMC joint fusion can achieve lasting relief.