

Symptomatic Carpal Coalition: Scaphotrapezial Joint

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Abstract

Carpal coalition is an uncommon congenital abnormality that arises from incomplete cavitation of the common cartilaginous precursor that forms the carpal bones. When carpal coalition is discovered, it is typically an asymptomatic incidental radiographic finding, and is often bilateral. We present a case of symptomatic unilateral carpal coalition of the scaphotrapezial joint, which was treated by excising the fibrous coalition and placing an interposition fat graft. This treatment was effective in alleviating the patient's symptoms.

Individual carpal bones form from cavitation of a common cartilaginous precursor during weeks 4 to 8 of intrauterine life.¹⁻³ By week 10, apoptotic cell death creates clefts that lead to joint divisions.⁴ Incomplete cavitation results from the failed separation of the cartilaginous precursors during fetal development and the end result is varying degrees of carpal coalition.^{1,4-7} Once bone ossification occurs, this incomplete

joint formation may be radiographically visible, with joint space narrowing wherein bone or fibrous material is present in place of articular cartilage.^{2,4} Minaar⁸ developed a classification system based on his observations of 12 lunotriquetral coalitions and their differences in coalition:

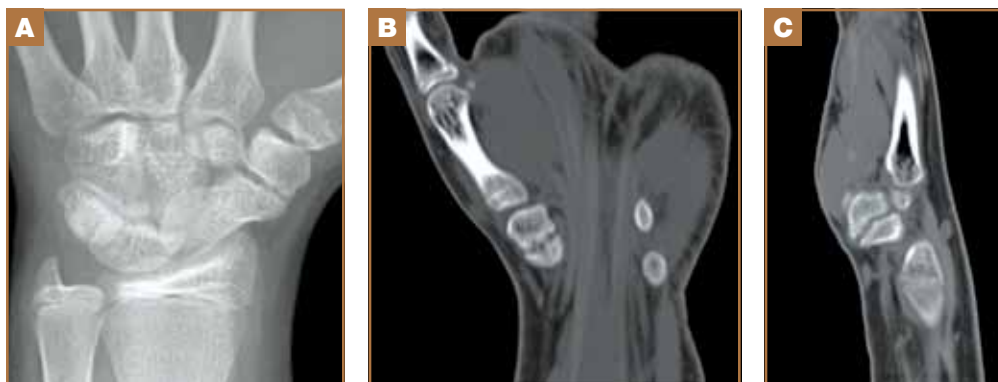
- Type I, incomplete fusion resembling pseudarthrosis or synchondrosis
- Type II, proximal fusion with a distal notching
- Type III, complete fusion, and
- Type IV, complete fusion associated with other anomalies.

Although these 4 types were based on lunotriquetral coalitions, this classification system is used to describe the coalition of any carpal bone.

Carpal coalition is uncommon, and the reported prevalence is close to 0.1%.^{2,5,6,9} There is, however, an increase of up to 1.5% in patients of African descent, and 9.5% in the West African Bantu.^{2,5-10} Carpal coalition is often bilateral and occurs more frequently in women.^{2,3} Lunotriquetrum coalition is most common, followed by the capitate and hamate bones.^{2,3,5,7} While it typically occurs as an isolated anomaly, carpal coalition may also be associated with other congenital anomalies in the same extremity, or as part of a syndrome with other bony abnormalities or that affects different organ systems.^{2,3} An isolated coalition most often is between 2 carpal bones within the same row, however it may occur anywhere, including with more than 1 bone, or within both rows, as is the case in syndromic coalitions.^{2,3,10}

Carpal coalition is a rarely reported congenital abnormality, and when it is discovered, it is most often an asymptomatic incidental finding.^{4,10} We present a case of symptomatic carpal coalition of the scaphotrapezial joint. The patient and the patient's guardian provided written informed consent for print and electronic publication of this case report.

Figure 1. Radiograph of the left hand (A) demonstrating an irregular border along the scaphotrapezial joint and flattening and widening of the distal portion of the scaphoid. Computed tomography scan demonstrating rough scaphotrapezial interarticular surface and fibrous coalition of the scaphotrapezial joint in both the anteroposterior (B), and lateral (C) views.



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Case Report

A 12-year-old left-hand dominant Caucasian girl presented with a 4-month history of palmar surface left wrist and thumb pain that began after she was hit in the left wrist by an elbow. She also noticed a progressive decreased range of motion and pain with writing, gripping, or lifting. Clinical examination revealed slightly decreased thenar mass on the left, compared with the right, and a more prominent scaphoid tubercle on the left with some tenderness in this area. The size of her left thumb was similar to the right, and there were no other gross deformities. She also had increased hyperextension of the thumb interphalangeal (IP) joint on the left, compared with the right. She was otherwise healthy with normal development and no evidence of other anatomic anomalies. Radiograph images (Figure 1A) demonstrated an irregularity along the scaphotrapezoidal joint, where there was flattening and widening of the distal portion of the scaphoid; this was not seen on an x-ray performed 3 years prior, which was taken due to a left-wrist injury. Subsequent computed tomography scan revealed fibrous coalition on the palmar surface of the scaphotrapezoidal joint, with the dorsal portion appearing to be intact, and no evidence of fracture (Figure 1B, 1C). Radiographs of the contralateral side did not show this abnormality.

The patient underwent several months of conservative treatment including rest and physiotherapy without improvement. Based on the patient's symptoms, her clinical examination, and results of the imaging studies, the decision was made to excise the palmar surface of the fibrous coalition and place an interposition fat graft to separate the scaphotrapezoidal joint and prevent recurrence. Upon exploration from a palmar approach, the scaphotrapezoidal articulation was found to be beaked as opposed to rounded. There was no visible articular cartilage. An area of fibrous appearing tissue, which was able to be penetrated with a needle (Figure 2A), corresponded to the area of the coalition visualized fluoroscopically. This tissue was resected to normal-appearing articular cartilage and motion of the joint was confirmed. Her symptoms resolved postoperatively, and the improvement was also evident in her radiographs immediately postoperatively (Figure 2B), and 2 years later (Figure 2C), at which time she remained asymptomatic with a normal examination. Since this excision of the coalition and interposition fat graft

was effective in alleviating her symptoms, scaphotrapezoidal arthrodesis was avoided.

Discussion

Carpal coalition is typically asymptomatic. However, this case represents a situation wherein the patient had pain significant enough to affect her ability to write and play sports at school, which was alleviated by surgical excision of the scaphotrapezoidal coalition maintained with an interposition fat graft. Minaar Type I is the most likely manifestation known to cause symptoms, possibly because of cartilage destruction from the intercarpal motion at the site of incomplete fusion.^{4,11} Pain may also be caused by a fracture through the osseous bridge, degenerative changes, or with mobility impairment from a more substantial fusion.^{4,7}

Zielinski and Gunther¹⁰ reported a case of bilateral scaphotrapezoidal and lunotriquetral coalition with intermittent pain in one wrist. There was some limitation with radial deviation, but the symptoms were not severe enough to warrant surgical intervention. Weinzeig and colleagues² discussed 2 cases of coalitions between the scaphotrapezotrapezoidal joint, both of which were symptomatic after a previous injury. The operative treatment consisted of fixation of a prior scaphoid fracture, and a bone graft arthrodesis, both of which provided symptomatic relief.² Ritt and colleagues⁴ described 9 patients with symptomatic lunotriquetral coalition: 4 were treated successfully with conservative management, 3 underwent proximal row carpectomy, and 5 had an arthrodesis. Among 36 reported cases of carpal coalition reported by Delaney and Eswar,³ including 32 lunotriquetral, 2 capitolunate, 1 luno-navicular, and 1 trapeziocapitate coalitions, all patients had asymptomatic incidental findings without any functional limitations. Ingram and colleagues⁶ reported a fusion of the scaphoid, trapezium, trapezoid, and capitate that did limit wrist motion, but the patient had no pain and required no formal treatment. The symptomatic scaphotrapezoidal coalition described by Wilson and colleagues⁹ resolved with conservative treatment. The treatment options for carpal coalition are somewhat limited, in that if conservative management and physical therapy fail, one proceeds with operative treatment either to correct the underlying initial



Figure 2. Intraoperative image (A) demonstrating the coalition via a palmar approach. Postoperative radiograph (B), and 2 years postoperatively (C).

injury, complete a formal fusion of the carpal bones, or perform a proximal row carpectomy depending on the condition of the articular surfaces.^{2-4,6,9}

After a trial of conservative treatment that included rest, immobilization, non-steroidal anti-inflammatory drugs, and physiotherapy in our young patient, instead of arthrodesis or proximal row carpectomy, we offered coalition excision with fat graft interposition. Peters and Colaris¹² recently described a case of capitate and trapezoid carpal coalition and entertained the idea of treating it with excision of the coalition, if their patient's symptoms recurred. This is, indeed, how we treated this symptomatic scaphotrapezoidal coalition effectively.

Our patient represents an example of a rare condition, made even more unusual due to her debilitating symptoms. The operative repair that avoided arthrodesis demonstrated a treatment that maintains functionality while completely alleviating symptoms.

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