



Trans-scaphoid Trans-lunotriquetral Perilunate Dislocation in a Patient with a Carpal Coalition

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Summary: Congenital carpal coalitions are rare conditions that arise from a failure or an incomplete cavitation of a common cartilaginous precursor of the carpal bones between the fourth and eighth week of intrauterine life. The incidence of coalitions has been estimated to occur in about 0.1% of the population and up to 1.6% in people of African descent. This study reports a case of trans-scaphoid trans-lunotriquetral perilunate dislocation with a lunotriquetral coalition and successful management with closed reduction, percutaneous fixation, and a thumb spica cast. (*Plast Reconstr Surg Glob Open* 2014;2:e144; doi: 10.1097/GOX.0000000000000040; Published online 6 May 2014.)

Congenital carpal coalitions are rare conditions that arise from a failure or an incomplete cavitation of a cartilaginous precursor of the carpal bones between the fourth and eighth week of intrauterine life.¹ The incidence of coalitions has been estimated to occur in 0.1% of the population and up to 1.6% in people of African descent.^{2,3} Coalitions can occur either in isolation or in association with a syndrome.^{2,4} The most common type is the lunotriquetral coalition that represents approximately 88.9% of all carpal fusions.⁵

The majority of coalitions remain asymptomatic and are incidentally found during imaging procedures or following traumatic injuries. Furthermore, fusions do not transmit stresses well and have a predisposition to fracture.^{4,6,7}

This study reports a case of trans-scaphoid trans-lunotriquetral perilunate dislocation with a lunotriquetral coalition and successful management with

closed reduction, percutaneous fixation, and a thumb spica cast.

CASE REPORT

The patient is a 16-year-old African American boy who sustained an injury to the left wrist while playing basketball. He was seen in the emergency room at which time he was noted to have a nondisplaced distal radius fracture, a trans-scaphoid perilunate fracture dislocation with some median nerve distribution paresthesia, and a lunotriquetral coalition with a fracture through the coalition (Fig. 1). The dislocation was reduced in the emergency department with resolution of the paresthesia. The patient was placed in a splint and scheduled for definitive treatment of the fractures.

The patient was taken for definitive repair of the fracture within a week of presentation. Surgery was performed under supraclavicular block with sedation. Under fluoroscopic control, and continuously checking in multiple planes, a mini-Acutrak screw (Acumed, Hillsboro, Ore.) driven volarly in a retrograde fashion was used to reduce and fix the scaphoid fracture. The lunotriquetral fracture was then treated by passing a second mini-Acutrak screw from the ulnar to radial direction into the triquetral bone across the lunotriquetral fracture into the lunate bone. Both screw positions were checked on multiple planes and found to be satisfactory (Fig. 2). A

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Fig. 1. Plain x-ray of left wrist on presentation demonstrating trans-scaphoid trans-lunotriquetral perilunate dislocation: posterior-anterior (A), oblique (B), and lateral (C).



Fig. 2. Intraoperative fluoroscopy of left wrist following percutaneous screw fixation.

short-arm thumb spica cast was applied. The patient had the cast removed 6 weeks after fracture fixation and underwent 16 weeks of intensive rehabilitation. Range of motion exercises were undertaken for approximately 3 weeks and then strength exercises were added to the regimen.

Ten months postoperatively, the patient was found to have satisfactory bony union of both the lunotriquetral coalition and the scaphoid fractures (Fig. 3). The patient was clinically evaluated using the Mayo functional outcome wrist score.⁸ He was found to have 71° of wrist extension, 70° of wrist flexion, 86° of pronation, 81° of supination, 26° of radial deviation, and 35° of ulnar deviation on the affected wrist. He was also found to have 35.6kg grip strength. His pain score and functional score were 25

and 25, respectively. He had an overall Mayo score of 90, representing a good outcome when compared to his uninjured wrist (Table 1).

It is important to note that the difference between a good and an excellent Mayo score was the fact that the patient did not have symmetric grip strength. Coincidentally, the patient did injure his nondominant hand and it may very well be that his grip strength was asymmetric before injury. As with most people, the patient states that he did not have symmetric grip strength before injury.

DISCUSSION

This case is unique as it is the first we have encountered to describe a trans-scaphoid trans-lunotriquetral perilunate dislocation in a patient with a lunotriquetral coalition. Devilliers Minnaar⁹ described lunotriquetral coalitions and classified them into 4 types: type I, incomplete fusion representing a pseudoarthrosis; type II, fusion with notch of carrying depth; type III, complete fusion of lunate and triquetrum; and type IV, with complete fusion and other carpal anomalies. The patient described was determined to have a type III coalition. The complete fusion restricts motion between the anatomic structures of the hand thereby avoiding degenerative arthritis or impingements leading to pain.¹⁰

Trans-scaphoid perilunate fracture dislocations are high-energy injuries produced by wrist hyperextension where the scaphoid is fractured and there is dislocation of the capitate from the lunate.^{11,12} Complete coalitions have a propensity to fracture with trauma due to poor transmission of forces.^{4,6,7,10}

Surgical intervention is the mainstay of treatment for perilunate fracture dislocations. Initial management can be either early surgical intervention or de-



Fig. 3. Plain x-ray of left wrist at last follow-up demonstrating bony union: posterior-anterior (A), oblique (B), and lateral (C).

Table 1. Functional Outcomes

	Repaired Wrist	Normal Side	% of Normal
Extension (°)	71	82	86.6
Flexion (°)	70	84	83.3
Pronation (°)	86	90	95.6
Supination (°)	81	80	101.3
Radial deviation (°)	26	33	78.8
Ulnar deviation (°)	35	40	87.5
Grip strength (kg)	35.6	36.0	98.9
Pain*	25		
Functional status†	25		
Mayo score‡	80		

*Pain score: no pain, 25; mild occasional, 20; moderate, 15; intolerable, 0.

†Functional status: return to regular employment, 25; restricted employment, 20; able to work, unemployed, 15; unable to work due to pain, 0.

‡Mayo score: calculated from 4 domains (range of motion, grip strength, pain, and functional status): excellent, 100–90; good, 90–80; fair, 80–65; and poor, less than 65.

layed surgical treatment following closed reduction dependent on the amount of soft-tissue swelling and time to presentation.^{12,13} If excessive swelling is present with early presentation following injury, as in this case, closed reduction followed by delayed surgical intervention is preferred.

The main debate remains as to whether a trans-scaphoid perilunate dislocation can be managed closed or whether the ligamentous injury must be directly repaired. Many surgeons have emphasized the need for repair of the interosseous ligament to stabilize the carpal architecture, whereas some investigators suggest that maintenance of anatomic position is sufficient to reestablish stability without ligamentous repair.^{14–18} Various surgical techniques have been described with a majority showing acceptable outcomes with open reduction and internal fixation.^{12,19–24} Although most reports describe open approaches, these involve soft-tissue dissection that have been shown to

increase the risk of disrupting the blood supply to the scaphoid.²⁵ Closed reduction with percutaneous fixation has been shown to have excellent functional outcomes in patients with trans-scaphoid perilunate injuries.^{13,21,26} One of the main objectives to open approaches is to repair the lunotriquetral ligament. However, due to the absence of a lunotriquetral joint in this patient, rigid fixation of the coalition was the treatment objective. Without fixation, disruption of a lunotriquetral coalition has been reported to lead to painful pseudoarthrosis.²⁷ Achieving proximal stability through the use of percutaneous screw fixation of the lunotriquetral coalition and the scaphoid allowed for healing and bony union of the fractures (Fig. 3). Using this minimally invasive approach, we achieved good outcomes for this patient as determined by the Mayo functional score of 80 (Table 1).

CONCLUSIONS

Trans-scaphoid trans-lunotriquetral perilunate dislocations with a lunotriquetral coalition are exceedingly rare. Initial management requires reduction of the dislocation and fractures followed by surgical fixation. Percutaneous fixation can be considered for patients in whom the fracture is closed, and reduction of the dislocation and fractures is achieved through closed manipulation. Percutaneous fixation allows for proximal stability leading to carpal healing and complete bony union. Finally, percutaneous fixation of trans-scaphoid trans-lunotriquetral perilunate dislocation may lead to a good to an excellent functional outcome.

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