



Contents lists available at ScienceDirect

Journal of Hand Surgery Global Online

journal homepage: www.JHSGO.org

Case Report

Volar Carpus Dislocation Following Proximal Row Carpectomy for Scapholunate Advanced Collapse: A Rare Complication

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ARTICLE INFO

Article history:

Received for publication June 24, 2019

Accepted in revised form April 16, 2020

Available online June 17, 2020

Key words:

Carpectomy

Complication

PRC

Scapholunate

SLAC

Scapholunate advanced collapse (SLAC) is a frequently encountered cause of wrist arthritis. For stage 2 disease, proximal row carpectomy (PRC) is an accepted treatment for which the literature has documented satisfactory outcomes and generally low complication rates. However, we report a case of SLAC wrist treated with PRC complicated by postoperative volar dislocation of carpus, to our knowledge a complication not yet reported in the literature. The patient developed atraumatic volar carpus dislocation after a routine PRC. This was treated with subsequent return to the operating room with closed reduction and percutaneous pinning of the wrist. Adequate reduction of the carpal dislocation was achieved and maintained after removal of pins. This case shows that closed reduction and percutaneous pinning is a valid option in this rare complication.

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Scapholunate advanced collapse (SLAC) is a common problem and the most familiar pattern of wrist arthritis.¹ Scapholunate advanced collapse accounted for 57% of cases of degenerative wrist arthritis in the original series by Watson and Ballet.² It is a progressive instability of the scapholunate joint that leads to advanced arthritis of the radiocarpal and midcarpal joints.² Patients with SLAC are more likely to be male, have a manual labor job, and be younger compared with patients with carpometacarpal osteoarthritis.¹ Reported causes include traumatic injury, repetitive trauma, and nontraumatic causes rheumatoid arthritis or neuropathic disease.³

Watson and Ballet² described 3 progressively degenerative changes in SLAC: stage 1 arthritis between the scaphoid and radial styloid, stage 2 arthritis between the scaphoid and the entire scaphoid facet, and stage 3 arthritis involving capitate and lunate. Later, Weiss and Rodner⁴ added a stage 4 designation to include arthritis in the radiolunate joint (pancarpal arthritis). The stage at presentation may guide treatment strategy. In stage 2 disease, proximal row carpectomy (PRC) or 4-corner arthrodesis (FCA) may

be indicated.⁵ The literature has shown both to be effective, each with its own distinct advantages and disadvantages. Proximal row carpectomy is reported to have better postoperative range of motion (ROM).⁶ It is also reported to have lower complication rates when used for stage 2 disease.^{5,6} Proximal row carpectomy is contraindicated in stage 3 disease. Four-corner arthrodesis has been shown to result in better postoperative hand grip strength and may be used in patients with stage 3 disease.⁶

Regarding complications, rates for PRC have been reported to range from 16.1% to 18.5%, lower than for FCA, which has reported complication rates of 29% to 34.4%.^{6,7} Systematic reviews reported common complications of PRC to include reflex sympathetic dystrophy (1.0%), sepsis (0.2%), osteoarthritis (3.7%), synovitis with significant edema (3.1%), and the need for conversion to wrist arthrodesis (3.9%).^{5,8,9} To our knowledge, there are no reported cases of atraumatic wrist dislocation after PRC. Here, we report a case of stage 2 SLAC wrist treated with PRC, which sustained a complication that, to our knowledge, was not previously reported in the literature.

Case Report

The patient, a 44-year-old, right-handed woman, presented to the office with progressively worsening right wrist pain over the past 4 years. Upon examination, she had tenderness to palpation over the dorsum of the wrist at the radiocarpal joint and a positive Watson maneuver, and was neurovascularly intact distally. Initial

Declaration of interests: No benefits in any form have been received or will be received by the authors related directly or indirectly to the subject of this article.

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<https://doi.org/10.1016/j.jhsg.2020.04.007>

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Figure 1. Initial x-rays of right wrist taken in the clinic. Anteroposterior, lateral, and oblique views of right wrist demonstrate changes consistent with SLAC stage 2.



Figure 2. Postoperative operative x-rays of right wrist at the 2.5-week follow-up appointment. Anteroposterior, lateral, and oblique views of right wrist show the patient after PRC, now with volar dislocation of the carpus relative to the distal radius.

Quick–Disabilities of the Arm, Shoulder, and Hand (*QuickDASH*) score was 93.18. X-rays of the right wrist showed a flexed position of the scaphoid consistent with a scapholunate ligament injury as well as early degenerative changes at the entire scaphoid and scaphoid fossa articulation (Fig. 1).

The patient was given a diagnosis of stage 2 SLAC. She was offered and recommended injections and bracing as a first-line conservative treatment; however, she strongly wanted to proceed with definitive surgical treatment. For this reason, surgical intervention was planned. Both PRC and FCA were discussed, with



Figure 3. Immediate postoperative x-rays of right wrist status after reduction of carpal dislocation.

preference for PRC if the capitate appeared without degenerative changes during surgery.

The procedure was performed via a longitudinal incision through the wrist capsule. The radioscaphocapitate ligament was visualized and found to be intact, and the capitate was visualized and appeared pristine. Proximal row carpectomy was performed. During the procedure, it was noted that the extensor carpi radialis brevis tendon was transected during removal of the carpals. This was repaired primarily using 3-0 nonabsorbable, braided poly(ethylene terephthalate) suture. The split in the capsule was repaired using nonabsorbable suture at the end of the case. No initial pin fixation was used owing to surgeon preference and success without this type of fixation in the past, in addition to concern regarding possible pin tract infection. The carpals were reduced at the time of capsule closure and were clinically stable, although no immediate postoperative images were available to confirm postoperative reduction.

At the first postoperative follow-up appointment 2.5 weeks after surgery, the patient reported moderate pain as well as numbness and tingling in the hand. The *QuickDASH* score was reported to be 100. She had been compliant with the orthosis splint as well as postoperative activity restrictions. The operative orthosis was removed in the clinic. Upon physical examination, she had notable swelling at the right wrist as well as symptoms consistent with carpal tunnel syndrome. The x-rays in the office (Fig. 2) demonstrated volar dislocation of the carpus relative to the distal radius.

Subsequently, the patient was treated with right open carpal tunnel release as well as closed reduction of the PRC dislocation. Although no Kirschner wires were used in the index surgery, the

decision was made to use this type of fixation at this point because the need for supplemental fixation was thought to outweigh the possibility of pin tract infection. The reduction was held with one 1.6-mm (0.062-in) Kirschner wire drilled from the radius into the capitate. A volar orthosis was placed, and the patient was discharged the same day as the procedure. Postoperative x-rays are shown in Figure 3.

The patient presented for routine follow-up 2.5 weeks after surgery. Pain had improved and paresthesias resolved. Radiographs obtained at follow-up showed the Kirschner wire fixation in place and no evidence of recurrent dislocation (Fig. 4). The Kirschner wire was removed in the clinic because of concern regarding infection risk. This short interval of semirigid immobilization was thought to be enough to allow the soft tissues to settle and tighten in a reduced position. The patient was placed into a removable wrist orthosis to maintain and protect the reduction.

At 4 weeks after surgery, repeat x-rays in the clinic showed maintenance of the reduction (Fig. 5). The patient had a small dehiscence of the carpal tunnel incision noted at the 4-week appointment, but this was superficial, without evidence of infection. At 13 weeks after surgery, the *QuickDASH* score had improved 65.1. Despite this score, she reported almost no residual pain and expressed satisfaction with the level of function. She was subsequently seen in the clinic at approximately 7 months after surgery for unrelated problems regarding the contralateral wrist. The *QuickDASH* score remained stable at 65.9, and the patient expressed continued satisfaction with the outcome, feeling that the wrist was markedly improved from the preoperative state. She was seen at 1 year, when the clinical examination was documented with active ROM from 40° flexion to 30° extension and 40 lb grip



Figure 4. The 2.5-week follow-up x-rays of right wrist after reduction of carpal dislocation. Anteroposterior, lateral, and oblique views of right wrist show a pin transfixing the distal radius to the distal carpal row after proximal carpal row resection is intact. There are scattered regional foci of heterotopic ossification. There is no acute fracture or dislocation.

strength. However, she returned at 15 months after surgery for a long-term follow-up appointment with worsening right wrist pain. She rated the pain at 10 out of 10. The *QuickDASH* score had increased to 79.54. Wrist flexion and extension had both decreased to 10° and grip strength had decreased to 10 lb. X-rays (Fig. 6) demonstrated arthrosis of the radiocarpal interface, most notable at the radial capitate articulation. The remaining carpals remained reduced with no recurrent dislocations or instability. Given the worsening pain and degenerative changes, the patient is planning for wrist arthrodesis in the future.

Discussion

For cases of stage 2 SLAC wrist, both PRC and FCA are reasonable surgical options.^{5,6} The literature showed FCA to have the advantage of higher postoperative grip strength, whereas PRC has better postoperative ROM and fewer postoperative complications.^{5–9} Despite the apparent advantage of lower complications rates, major complications occur with PRC, including synovitis, edema, surgical infections, and ongoing pain requiring further surgery. In this case, we report a postoperative complication for PRC in which a patient with stage 2 SLAC changes was treated with PRC and subsequently developed volar dislocation of the remaining carpals as well as symptoms of carpal tunnel syndrome. These findings were noted at the 2.5-week postoperative appointment despite apparent compliance with the operative orthosis and activity restrictions. The patient denied falls or reinjury to the wrist.

As far as potential etiologies of this dislocation, it is possible that the iatrogenic extensor carpi radialis brevis injury in the index procedure had a role. Although it was repaired, it is possible that its

proper length and tension were not fully restored. This could have resulted in loss of dynamic support to the dorsal wrist and may have contributed to its instability. In addition, damage to passive stabilizers of the wrist such as the radioscaphocapitate ligament, which acts as a primary restraint after PRC, could have been a factor in post operative instability.¹⁰ However, damage to the radioscaphocapitate ligament usually results in ulnar translocation of the carpus, not volar dislocation. There was also subtle capitate volar subluxation in the preoperative x-rays, which may have been a sign that this wrist had inherent volar instability before surgery predisposing it to volar dislocation with the proximal row of carpals removed. Finally, the patient had a regional nerve block and sedation for the procedure, and it is possible that the regional nerve block resulted in loss of dynamic stabilization from the muscles or tendons.

Reviewing this case, one could question whether there was a dislocation present from time 0 before the patient left the operating room. The carpals were reduced at the time of closure and stable clinically, but no immediate postoperative imaging was taken. Going forward, we would recommend routine postoperative imaging of all PRC cases in the orthosis to confirm reduction in the operating room given the potential for this rare complication. In addition, some surgeons might have preferred to perform FCA at the time of the index surgery, which might have avoided the complication of dislocation altogether. However, the rationale for performing PRC in this case was based on the pristine appearance of the capitate and the desire to avoid the risk of nonunion in FCA. In cases with instability during surgery, surgeons may also want to consider temporarily pinning the joint in place.

The patient in this report was successfully treated initially with an operative reduction and Kirchner wire fixation and



Figure 5. Four-week follow-up x-rays of right wrist after reduction of carpal dislocation. Anteroposterior, lateral, and oblique views of right wrist show postoperative changes after proximal carpal row resection as well as interval removal of the percutaneous fixation pin. There is no evidence of recurrent dislocation.



Figure 6. Fifteen-month follow-up x-rays of right wrist demonstrate maintained reduction of carpals. However, there is considerable arthrosis of the radiocarpal interface, mostly at the radial capitate articulation.

carpal tunnel release at the same time. In this case, a Kirchner wire was left in place for 2.5 weeks and the wrist was placed in an orthosis for a total of 4 weeks. During that time, the patient had stepwise improvement in symptoms. Through over a year of follow-up, she had no evidence of dislocation, which suggests that this management strategy was effective in providing a lasting, stable reduction in this rare complication. Ultimately, she had a return of wrist pain and evidence of ongoing degenerative changes. This could have been related to pinning of the radial capitate articulation, because that was where degenerative changes were most pronounced. The risk for damage to the articular surfaces is why many surgeons do not routinely pin after PRC, along with risks for septic arthritis and infection. For this reason, we do not recommend routine pinning of all PRC cases, but it is a viable option to use in unstable cases or cases of dislocation.

Proximal row carpectomy is a well-accepted treatment for stage 2 SLAC wrist, and overall complications are low. Here, to our knowledge, we report the first case of carpal dislocation after PRC. This complication was treated with operative reduction and Kirchner wire fixation of the radius and capitate to maintain the reduction, although the patient subsequently developed worsening radiocarpal arthritis. For this reason, we recommend vigilance to avoid this potentially problematic complication.

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