

Acute Scaphoidectomy and Lunocapitate Fusion for the Surgical Treatment of Compound Trans Styloid, Trans-Scaphoid, Peri-Lunate Fracture-Dislocation with Extensor Tendon Injury

Divyesh V. Bukalsaria¹, Sachin Kale¹, Prakash D. Samant¹, Arvind Vatkar¹,
Sanjay Dhar¹, Prasad Chaudhari¹

Abstract

Compound fracture-dislocations of proximal carpal bones are very rare. We report a 54-year-old male, laborer, who sustained a compound Gustilo Anderson type III-A dorsal wound with trans styloid, trans-scaphoid, peri-lunate dislocation with an extensor tendon injury. The patient underwent primary scaphoidectomy with Lunocapitate fusion with extensor tendon repair. On follow-up after 3 months, the patient had partial recovery of range of motion around the wrist without any significant discomfort.

Keywords: Compound fracture-dislocation; Primary proximal row carpectomy; Trans-styloid trans-scaphoidperiunate dislocation.

Introduction

The peri-lunate dislocations are the most common wrist dislocations. These are high-energy injuries and are frequently seen in the young age group. The bone stock of the distal radius and the scaphoid needs to be strong enough to resist the amount of torque that is involved in these dislocations. Injuries are associated with disruption of adjoining ligaments and capsular attachments. Perilunate dislocations are also combined with fractures of carpal bones, a distal end of radius fracture, and tendons around the wrist joint [2].

Scaphoidectomy and lunocapitate fusion is advocated as a good option to four corner fusion for SNAC (scaphoid nonunion advanced collapse) and SLAC (scaphoid lunate advanced collapse). Calandruccio et al had shown that decreasing the number of carpal joints fused decreases scarring and preserves range of motion [3].

The major blood supply to the scaphoid is via the radial artery. Seventy to eighty percent of the intraosseous vascularity and the entire proximal pole are from branches of the radial artery entering through the dorsal ridge. Twenty to thirty percent of the bone, in the region of the distal tuberosity, is supplied by volar radial artery branches [4]. But when both the blood supply is stripped from the bone, there are high chances of Osteonecrosis of the scaphoid with SNAC lesion later on. Hence we propose a primary scaphoidectomy with Lunocapitate fusion in high energy compound perilunate fracture-dislocations.

Case Report

A 54-year-old male patient came to the casualty of our institution with an alleged history of trauma (6 hours back) taken conservative management in from splint at a local hospital.

On radiographic evaluation, Perilunate fracture-dislocation was noted (Figure 1). Almost entire scaphoid bone was avulsed from its all ligamentous and capsular attachments and palpable subcutaneously in the volar compartment of the distal forearm.

We found that the dorsal ligaments were torn and there was tendon injury of Extensor Carpi Radialis Brevis, Extensor Indices, and Extensor slip of the Middle finger of Extensor digitorum muscle. The patient was thoroughly investigated with an MRI and CT scan of the wrist joint (Figure 2).

After taking full informed consent from the patient the surgery was performed by two hand surgeons in our institution on 3rd day of injury. The patient was given a Supraclavicular block along with mild sedation. A pneumatic tourniquet was applied.

Thorough wash was given with 5 liters of saline and betadine solution.

The dorsal wound was extended to the first extensor compartment (Figure 3). The volar compartment was accessed from the extended incision and the fractured scaphoid bone was removed as shown in (Figure 4).

There was no triquetrum excision.

The opposing articular surfaces of lunate and capitate were exposed and denuded of their cartilage as shown in the figure below.

2.5 mm headless compression screw was passed from lunate to capitate over a guidewire, under C arm guidance. The space between the fusion sites was packed with cancellous bone graft harvested for scaphoid bone as shown in (Figure 5).

The fractured styloid process of the radius was removed. The dorsal capsulo-ligamentous complex was repaired with a non-absorbable suture and final C arm shoot taken (Figure 6).

Proximal and distal cut ends of Extensor tendons were mobilized and repaired with a modified Kessler approach.

Skin edges were freshened and were closed with Ethilon 3-0 suture. The anteroposterior slab was given and the limb was kept in strict limb elevation for 48 hours.

The patient tolerated the surgery well. The patient was given a wrist splint for support and post operative x-rays taken (Figure 7).

¹Department of Orthopaedic Surgery, D Y Patil Medical College and Research Centre, Navi Mumbai, Maharashtra, India.

Address of Correspondence

Dr. Divyesh Vinod Bukalsaria,
Resident Physician, Department of Orthopaedic Surgery, D Y Patil Medical College and Research Centre, Navi Mumbai, Maharashtra, India.

E-mail: divyeshbukalsaria7@gmail.com

Submission 01/0/2020, Reviewed 17/08/2020, Accepted 12/11/2020, Published 10/01/2020

Trauma International ISSN 2455-538X | Available on www.traumainternational.co.in | DOI- 10.13107/ti.2021.v07i01.013

This is an Open Access journal, and articles are distributed under the terms of the Creative Commons Attribution Non-Commercial-Share Alike 4.0 License (<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which allows others to remix, tweak, and build upon the work non-commercially as long as appropriate credit is given and the new creation are licensed under the identical terms.



Figure 1: Pre operative antero-posterior view and lateral view



Figure 3: Pre operative clinical pictures patient had a 5 cm dorsal compound wound.



Figure 4: Intra operative exposure picture

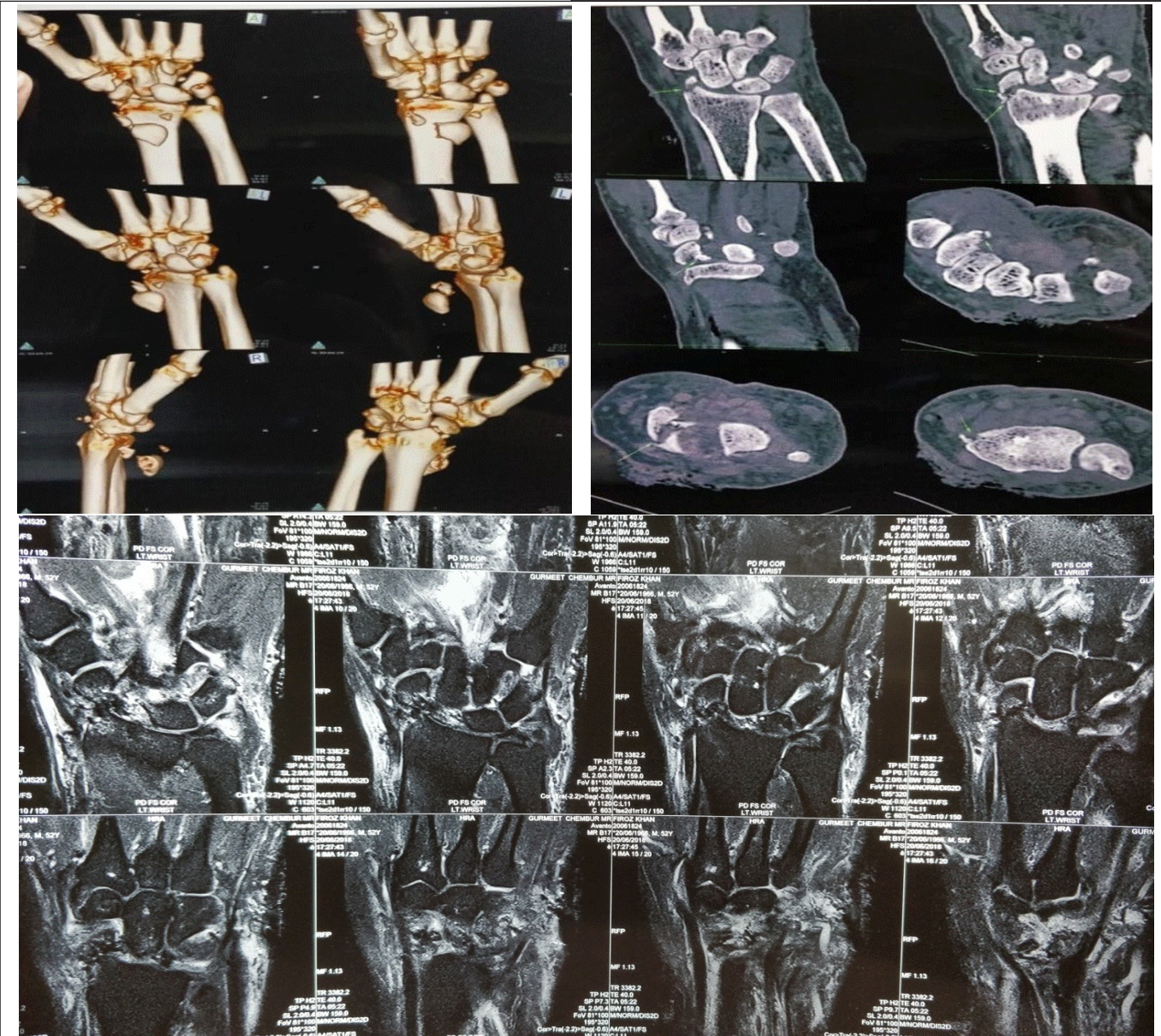


Figure 2: Pre operative CT scan, 3 D-CT scan and MRI



Figure 5: Intra operative bone grafting and fracture fixation



Figure 6: Intra- operative c arm images after fixation

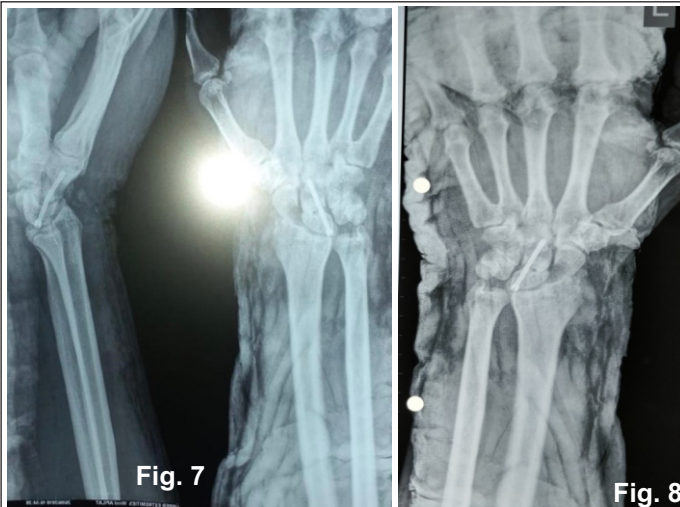


Fig. 7

Fig. 8

Figure 7: Post operative x rays

Figure 8: post operative radiograph showing lunocapitate fusion with scaphoidectomy (3 months follow up)



Clinical Images

Results

The dorsal skin around the compounding wound got avascular and developed eschar. No infection was seen in the wound.

After 6 weeks of surgery, the screw is well placed, ROM of the wrist is 20 degrees of DF and PF. Pronation supination is normal.

There is stiffness in fingers due to immobilization. Physiotherapy has been started for the same.

Discussion

Perilunate ligamentous dislocations are caused by the transmission of force through the lesser arc of the wrist. Mayfield et al described 4 stages of progressive carpal destabilization. When exposed to high energy force, the wrist extends and the scaphoid goes in extension. But the Lunate resists extension due to short and long lunate ligaments attached to it. This causes strain on the scapholunate ligament leading to its tear. If the force supersedes, the Lunocapitate dislocation happens. This is followed by Lunotriquetral dislocation and finally lunate dislocation [5].

In our case, almost the entire scaphoid fragment was completely denuded from its ligamentous attachments and also pushed into the volar compartment of the distal forearm. This had caused a total loss of blood supply of the scaphoid. We had anticipated that if such a large avascular scaphoid fragment is fixed again in its native position, it would undergo osteonecrosis and further cause scapholunate collapse

in a few years. This would have entailed the second surgery of carpal fusion with scaphoidectomy later on.

We discussed with the patient about the options available to him.

We had offered

1. Scaphoid fixation with headless screws and K wire fixation of carpus bones (chances of osteonecrosis of scaphoid explained)
2. Primary scaphoidectomy with Lunocapitate fusion.

After due consultation with the patient, we decided to go for Primary Scaphoidectomy and lunocapitate fusion.

The treatment of perilunate fracture-dislocations has evolved and includes closed reduction with or without pinning, open reduction, and stabilization of fractures or dislocations with or without ligamentous repair, and salvage procedures consisting of proximal row carpectomy [6, 7, 8].

But to our knowledge, Primary Scaphoidectomy with Lunocapitate fusion is not described in the literature.

There is an important proprioceptive role of the triquetrum is the key element in the detection of noniceptive stimuli within the wrist. This proprioceptive function is weakened if the bone is fused to the distal row [9]. We neither performed triquetrum excision nor fusion.

We were compelled to take a dorsal approach due to the compound wound and associated dorsal tendon injuries.

The volar approach is best for cases of suspected volar carpal injury and carpal tunnel syndrome [10].

Although better visualization can be achieved with a combined approach, there is suspicion of increased risk of wound healing complications, swelling, and interruption of blood supply to the carpus [11].

Yu chengyao had studied 10 cases on SNAC and SLAC in which they did scaphoid resection and Lunocapitate fusion. Among these patients, eight developed solid radiographic union while the remaining two patients showed bone resorption and implant migration and needed revision surgeries [12].

The radiolunate joint is protected because of the spherical lunate fossa of the distal radius as the lunate itself assumes a dorsiflexed position. The preservation of this joint offers a unique opportunity to treat wrist trauma and arthritis while retaining radiocarpal joint motion. This treatment is accomplished by removing only the fractured/arthritis changes of the wrist, restoring the carpal alignment between the capitate and lunate, and performing a limited intercarpal fusion between these two carpal bones. The goals of successful surgery are twofold: to eliminate the patient's pain and to preserve as much wrist motion as possible.

Four-CF has become one of the most popular choices of treatment for most surgeons because of the higher fusion rate when compared with LC fusion. However, LC fusion combined with scaphoid excision has been advocated as a reliable treatment method recently.

The advent of headless compression screws offers the possibility of

achieving capitulate fusion through compression arthrodesis. The benefits of this procedure are the omission of the need for a bone graft, improved rate of fusion, avoidance of pin tract infections, the omission of secondary hardware removal procedures, shorter operative time, and earlier return to work [13].

Conclusion

Trans-scaphoid perilunate fracture-dislocations can be challenging to hand surgeons such as in this case. Understanding the blood supply of scaphoid and the mechanism of perilunate dislocation is of prime importance. Explaining the importance of osteonecrosis and non-union of the scaphoid in such high energy cases, to the patient is equally important. The patient needs to understand the complications of retaining an avascular scaphoid. If in such cases, some patients wish for only one final surgery, we should respect their views and act accordingly.

Clinical Message

A displaced scaphoid fracture stripped of all its soft tissue attachments with less chances of union should be managed by primary excision and lunocapitate fusion in patients of lower Socio economic strata with high functional demand, avoiding secondary surgery and favouring early return to work.

References

1. Ali, Nadeem, et al. "Compound Transstyloid, Transscaphoid, Perilunate Fracture Dislocation." *Journal of the Scientific Society*, vol. 40, no. 2, 2013, p. 111, doi:10.4103/0974-5009.115485.
2. Herzberg, G., and D. Forissier. "Acute Dorsal Trans-Scaphoid Perilunate Fracture-Dislocations: Medium-Term Results." *Journal of Hand Surgery*, vol. 27, no. 6, 2002, pp. 498–502, doi:10.1054/jhsb.2002.0774.
3. Calandruccio, James H., et al. "Capitulate Arthrodesis with Scaphoid and Triquetrum Excision." *The Journal of Hand Surgery*, vol. 25, no. 5, 2000, pp. 824–832, doi:10.1053/jhsu.2000.16364.
4. Oehmke, M. J., et al. "The Blood Supply of the Scaphoid Bone." *Journal of Hand Surgery (European Volume)*, vol. 34, no. 3, Dec. 2009, pp. 351–357, doi:10.1177/1753193408100117.
5. Mayfield, Jack K. "Patterns of Injury to Carpal Ligaments." *Clinical Orthopaedics and Related Research*, &NA; no. 187, 1984, doi:10.1097/00003086-198407000-00006.
6. Herzberg G, Comtet JJ, Linscheid RL, et al. Perilunate dislocations and fracture-dislocations: a multicenter study. *J Hand Surg Am*.1993;18:768–79.
7. Herzberg, G., and D. Forissier. "Acute Dorsal Trans-Scaphoid Perilunate Fracture-Dislocations: Medium-Term Results." *Journal of Hand Surgery*, vol. 27, no. 6, 2002, pp. 498–502, doi:10.1054/jhsb.2002.0774.
8. Herzberg, G., et al. "Perilunate Dislocations and Fracture-Dislocations: A Multicenter Study." *The Journal of Hand Surgery*, vol. 18, no. 5, 1993, pp. 768–779, doi:10.1016/0363-5023(93)90041-z.
9. E. Hagert, M. Garcia-Elias, S. Forsgren, B.O. Ljung Immunohistochemical analysis of wrist ligament innervation in relation to their structural composition
10. *J Hand Surg*, 32 (2007), pp. 30-36
11. Moody, Lisa, and Andrew Y. Zhang. "Treatment of an Unusual Trans-Scaphoid Perilunate Avulsion Fracture Dislocation: A Case Report." *Hand*, vol. 10, no. 2, Mar. 2014, pp. 328–332, doi:10.1007/s11552-014-9634-x.
12. Sotereanos DG, Mitsionis GJ, Giannakopoulos PN, et al. Perilunate dislocation and fracture-dislocation: a critical analysis of the volar-dorsal approach. *J Hand Surg Am*. 1997;22:49–56.
13. Yao, Yu-Cheng, et al. "Lunocapitate Fusion with Scaphoid Excision for the Treatment of Scaphoid Nonunion Advanced Collapse or Scapho-Lunate Advanced Collapse Wrist." *Journal of the Chinese Medical Association*, vol. 80, no. 2, 2017, pp. 117–120, doi:10.1016/j.jcma.2016.10.001

Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Bukalsaria DV, Kale S, Samant PD, Vatkar A, Dhar S, Chaudhari P | Acute Scaphoidectomy and Lunocapitate Fusion for the Surgical Treatment of Compound Trans Styloid, Trans-Scaphoid, Peri-Lunate Fracture-Dislocation with Extensor Tendon Injury | *Trauma International* | January-June 2021; 7(1): 15-18.