CASE REPORT

Lunate Dislocation from Chronic Tophaceous Gout of the Wrist: A Case Report

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Background: Lunate dislocation is typically caused by direct or indirect traumatic injury to the carpal ligaments. However, other factors can also lead to this condition.

Case Report: A case of a 72-year-old man presenting with lunate dislocation and ulnar nerve compression at the wrist secondary to chronic tophaceous gout. Following proximal row carpectomy combined with ulnar nerve decompression, the patient demonstrated improved wrist pain and mobility, along with reduced numbness.

Conclusion: This is the first reported case of non-traumatic lunate dislocation resulting in ulnar neuropathy secondary to chronic tophaceous gout.

Keywords: Lunate dislocation; Chronic tophaceous gout; Case report

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Lunate dislocation injuries are primarily caused by trauma to the carpal ligaments, which can occur through direct or indirect mechanisms. Direct mechanisms result from direct force to the hand, such as crushing injuries. Indirect mechanisms, more common in perilunate injuries, involve forces that cause extreme wrist extension, ulnar deviation, and midcarpal supination[1]. Mayfield et al. described a four-stage mechanism for perilunate injuries. In stage 4, with all perilunate ligaments ruptured, only the dorsal capsule and palmar radiolunate ligament remain to hold the lunate in place. In such cases, dorsal displacement of the capitate can push the lunate volarly, leading to lunate dislocation[2]. While trauma is the most common cause of lunate dislocation, other conditions can contribute. In the present case report, chronic tophaceous gout was the underlying cause. To the author's knowledge, this is the first reported case of lunate dislocation resulting from chronic tophaceous gout[3].

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The present study was a case report approved by the Institutional Review Board in Human Research of Khon Kaen Hospital, Thailand (KEXP67085). The participant was informed of the research information and signed a consent form.

Case Report

A 72-year-old male labor presented with a 6-month history of right wrist pain and numbness in the little and ring fingers. The patient had never had any accident on his wrist before, aside from chopping firewood regularly. The patient had chronic tophaceous gout and self-administered medication during pain episodes but did not adhere to continuous therapy. His serum uric acid level was 8.7 mg/dL. Physical examination revealed pain, with a visual analog scale (VAS) score of 8/10, a swollen right wrist, could not fully flex his right fingers and severely limited range of motion of the wrist joint with flexion at 10 degrees, extension at 10 degrees, supination at 20 degrees, pronation at 20 degrees, ulnar deviation at 15 degrees, and radial deviation at 5 degrees. He also had numbness of the little and half of the ring fingers, and slight weakness of the intrinsic muscles, at motor power grade IV. The Mayo Wrist score was 30[4]. After reviewing the patient's plain radiographs and finding a lunate dislocation, a computed tomography (CT) scan was selected to better visualize the nature of the dislocation. Therefore, magnetic resonance imaging (MRI) was not performed, and electrodiagnostic

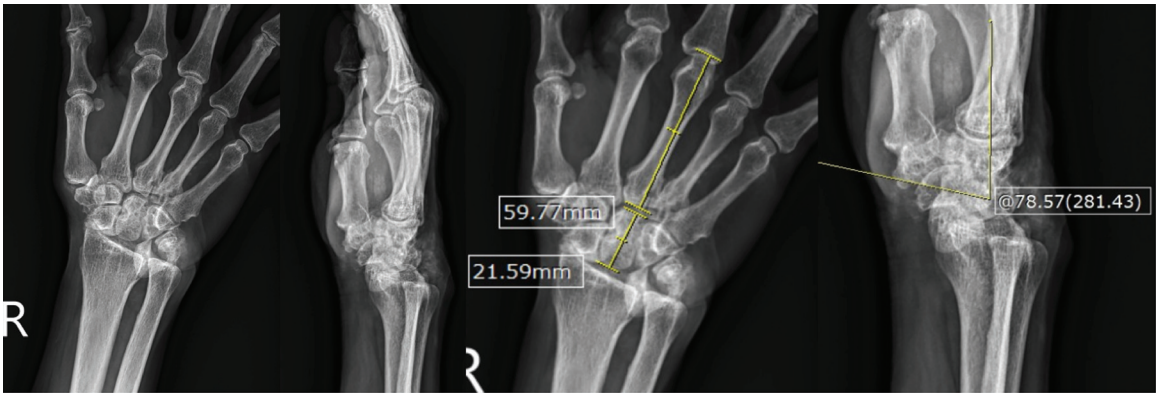

Figure 1. Radiograph, measurement of carpal height ratio, and radioscaphoid angle of the right wrist.

Figure 2. Computed tomography of the right wrist showed lunate dislocated and attached near pisiform bone.

study was ordered to assess nerve function and detect nerve injury.

Plain radiograph and CT scan

The images of the right wrist in posteroanterior (PA) and lateral views showed lunate dislocation located at the palmar surface of the distal ulna and the ulnar side of the pisiform with clockwise rotation. The lunate had sclerosis, flexion deformity, the radioscaphoid angle was 78.57 degrees, compared with a normal range of 30 to 60 degrees, and the carpal height ratio was 0.36, with a normal range of 0.54±0.03. There were punched-out lesions without any fracture of all carpal bones and synovitis of the joint capsule, as shown in Figure 1 and 2.

Electrodiagnosis

The sensory and motor nerve conduction study of the median nerve in the right wrist revealed prolonged distal peak latency and decreased conduction velocity, indicating mild carpal tunnel syndrome. The sensory nerve conduction study of the ulnar nerve in the right wrist showed no response, whereas the motor nerve conduction study was normal at 51 meters per second from a normal range of 52 meters per second. Electromyography of the flexor carpi ulnaris muscle was normal, however, the abductor digiti minimi muscle demonstrated abnormalities, consistent with a low ulnar nerve lesion, as summarized in Table 1.

The initial diagnosis was chronic perilunate injury, Mayfield stage 4, associated with Guyon canal syndrome, Zone 1, in the right wrist, characterized by combined motor and sensory deficits. The surgery was planned for proximal row carpectomy with ulnar nerve decompression. The anterior approach was performed first to remove the lunate and decompress the ulnar nerve, as Figure 3. When the lunate was removed, it was found that there were no ligaments attached, and there were synovitis

Table 1. Shows nerve conduction studies and electromyography

Nerve conduction studies								
Site	Latency		Amplitude		Segment	Distance	Conduction velocity	
	(ms)	Normal	(mV)	Normal		(mm)	(m/s)	Normal
Motor nerve results								
Right median nerve (APB)								
• Wrist	5.6		5.1					
• Elbow	9.7		4.8		Elbow-wrist	210	51	
Right ulnar nerve (ADM)								
• Wrist	8.2	<3.7	1.14	>7.9				
• Below elbow	11.6	-	0.95	-	Below elbow to wrist	175	51	>52
• Above elbow	13.5	-	0.96	-	Above wrist to below elbow	100	53	>43
Sensory nerve results	Latency (peak)							
Right median nerve (stimulation: wrist)								
• Digital II	5.5	<4.0	17		Wrist-Digit II	140	25	>39
Right ulnar nerve (stimulation: wrist)								
• Digit V	NR	<4.0	NR	-	Wrist-Digit V	140	NR	>38

Electromyography											
Side	Muscle	Nerve	Root	Ins act	Fibs	Psw	Amp	Dur	Poly	Recrt	Comment
Right	ADM	Ulnar	C8-T1	Incr	2+	3+	Decr	Nml	1+	Reduced	-
Right	FCU	Ulnar	C8-T1	Nml	Nml	Nml	Nml	Nml	0	Nml	-
Right	APB	Median	C8-T1	Nml	Nml	Nml	Nml	Nml	0	Nml	-

ADM=abductor digiti minimi; FCU=flexor carpi ulnaris; APB=abductor pollicis brevis; Ins act=insertional activity; Fibs=fibrillation; Psw=positive sharp wave; Amp=amplitude; Dur=duration; Poly=polyphasic; Recrt=recruitment; Incr=increase; Decr=decrease; Nml=normal

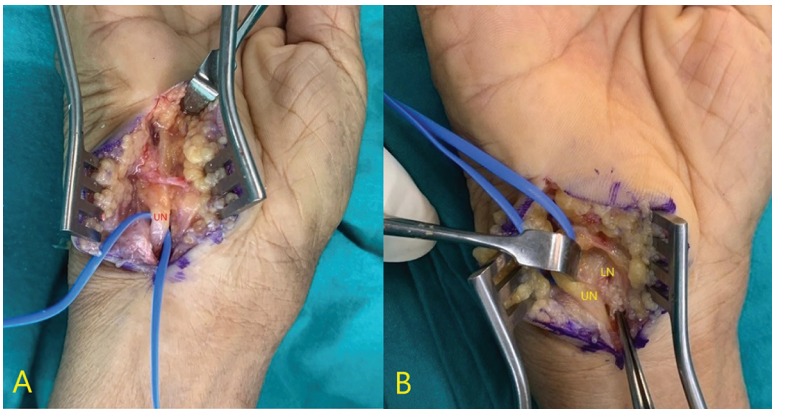

Figure 3. (A) Intraoperative finding found ulnar nerve (UN) was compressed by the dislocated lunate (LN). (B) After decompression of the ulnar nerve.

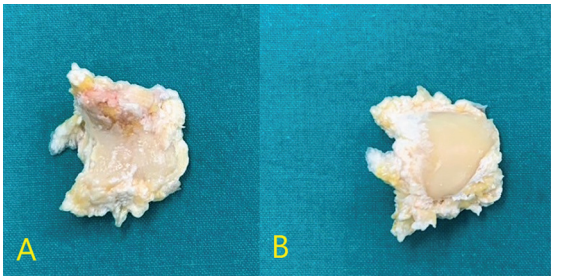

Figure 4. The lunate bone that has no ligament attachment. (A) Superior view, (B) Inferior view.

surrounding it, as shown in Figure 4. Subsequently, the posterior approach was performed to remove the scaphoid and triquetrum, while preserving the radioscaphocapitate on the volar aspect. The articular surface of the capitate head was also found to be intact. No tophaceous material was found on the dorsal aspect of the wrist. The synovium and lunate were sent for pathology reports, confirming that it was crystal deposition disease, consistent with the chronic tophaceous gout process. Postoperative radiographs are shown in Figure 5.

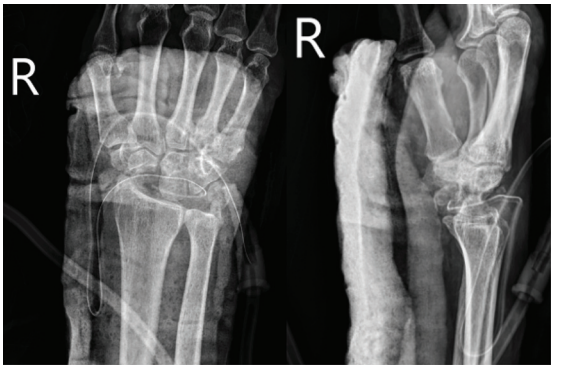

Figure 5. Postoperative after proximal row carpectomy with ulnar nerve decompression.

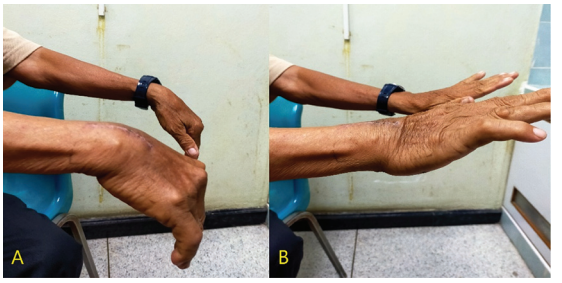

Figure 6. Range of motion of the wrist after surgery for 3 months.

Four weeks postoperatively, the patient had improved in pain score, with a VAS of 3/10, and numbness in the little and half of the ring fingers. The range of motion was increased, flexion was 45 degrees, extension was 20 degrees, supination was 25 degrees, pronation was 30 degrees, ulnar deviation was 20 degrees, and radial deviation was 15 degrees, as shown in Figure 6. At 3-month follow-up, the Mayo Wrist score was 55.

Discussion

Lunate dislocation is usually caused by severe injury damaging the structures around the lunate, which has well-attached ligaments and joint capsule, especially the scapholunate ligament, along with short and long radiolunate ligaments and dorsal capsule. In patients with chronic inflammatory disease such as rheumatoid arthritis, psoriatic arthritis, and systemic lupus erythematosus[3], these diseases can extend into the joint and cause lunate dislocation. However, the mechanism of which is not yet known, but it is likely due to severe damage to the various ligaments involved[5]. In the case of chronic tophaceous gout, there have been reports of scapholunate and lunotriquetral involvement in some case reports, but no reports of volar lunate dislocation[6-9]. There is a report of volar intercalated segmental instability as a result of spontaneous rupture of the supporting ligaments of the wrist due to long-term systemic steroid use[10]. In the present case report, there was no clear history of steroid use, which is known to cause osteonecrosis, such as Kienbock's disease, that can concurrently occur with gout[11].

In the mechanism of chronic tophaceous gout affecting the wrist and hand, it begins with the accumulation of monosodium urate crystals within the joints and surrounding tissues, forming tophi. This leads to chronic tophaceous gout, which can be divided into three phases, the acute phase, characterized by the accumulation of fluid that can be aspirated, the subacute phase, where the fluid starts to become more viscous, and in some patients, may be able to squeeze out, and the chronic phase, where adhesions begin to form with the joint capsule, tendons, and bone. Histopathological examination of tophi reveals urate crystals within necrotic debris, surrounded by a zone of inflammatory exudates composed of histiocytes, monocytes, polymorphonuclear leukocytes, and multinucleated giant cells. When tophi occur in tendons or bone, they can exhibit a permeative pattern of destruction. At the wrist, the flexor or extensor compartments are commonly involved. Prolonged gouty inflammation of the wrist can lead to tendon infiltration, tendon rupture, and, rarely, skin ulceration. While gout involvement of the radiocarpal, intercarpal, and distal radioulnar joints is uncommon, if it does occur, it could result in severe articular destruction[12,13].

The occurrence of lunate osteonecrosis combined with volar lunate dislocation may be an infrequent finding but potentially associated with the condition. Research by Lamas et al. in 24 patients revealed focal osteonecrosis in only two cases. However, it is believed that when the lunate bone is deprived of blood supply, an angiogenesis mechanism for regeneration exists, as supported by histopathology studies. This aligns with research by Arner et al., who reported a case of a patient with rheumatoid arthritis and complete volar dislocation. While X-rays and MRI showed no sclerosis or collapse, subsequent histological examination revealed complete necrosis of the bone marrow and bone cells, but also some degree of spontaneous revascularization[3,14].

In non-traumatic cases, volar lunate dislocation can displace and compress nerves, such as the median nerve, potentially leading to carpal tunnel syndrome[15]. However, there are no reported cases

of ulnar neuropathy at the wrist caused by lunate dislocation in non-traumatic settings. Other etiologies of ulnar nerve compression at the wrist include trauma, space-occupying lesions, and inflammatory arthritis. Additionally, there has been a single reported case of combined median and ulnar nerve compression secondary to pseudogout[16,17].

In the present case report, the patient had a history of poorly controlled chronic tophaceous gout, leading to chronic wrist arthritis. This progressed to involve and destroy the internal joint tissues, resulting in lunate dislocation and compression of the ulnar nerve. Initially, the patient was diagnosed with a chronic perilunate injury, characterized by lunate dislocation with a fixed deformity of the scaphoid. The standard recommended treatment for this condition is proximal row carpectomy and ulnar nerve decompression[18]. However, in this particular case of lunate dislocation arising from chronic inflammatory joint disease, similar to rheumatoid arthritis, isolated removal of the lunate might be a treatment option.

The present study is limited by its single-case report design, which reduces generalizability and precludes causal inference. Furthermore, the lack of long-term follow-up beyond three months prevents evaluation of the durability of functional recovery and the risk of recurrence. In addition, preoperative MRI was not performed, restricting detailed assessment of ligament integrity, soft tissue involvement, and potential osteonecrosis.

Conclusion

The present case report represents the first documented instance of lunate dislocation occurring as a consequence of chronic tophaceous gout. Furthermore, it is the first reported case of a non-traumatic lunate dislocation leading to ulnar neuropathy. Following surgical intervention involving proximal row carpectomy with ulnar nerve decompression, the patient experienced improved range of motion and a reduction in numbness.

What is already known about this topic?

Lunate dislocation can result from causes other than traumatic injury, such as chronic inflammatory diseases such as rheumatoid arthritis, psoriatic arthritis, and systemic lupus erythematosus, or long-term use of steroid medications.

What does this study add?

Lunate dislocation can be caused by chronic tophaceous gout, which often causes persistent wrist pain and swelling. Over time, this leads to ligament damage around the lunate, resulting in lunate dislocation.

Conflicts of interest

The author declares that there have been no conflicts of interest and no financial or other benefits have been received from a commercial party related to the subject of this article. No funds have been received to support this research.

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