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Images in medicine

Lunate dislocation causing median nerve entrapment

Gp Capt M. Bhatia^{a,*}, Col Alok Sharma^b, Brig R. Ravikumar^c,
Col V.K. Maurya^a

^a Associate Professor, Department of Radiodiagnosis, Armed Forces Medical College, Pune 411040, India

^b Senior Advisor (Surgery & Plastic Surgery), INHS Asvini, Mumbai 400005, India

^c Professor and Head, Department of Radiodiagnosis, Armed Forces Medical College, Pune 411040, India

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ABSTRACT

Lunate dislocation is an uncommon injury occurring in young adults due to high-energy trauma. The volar displacement of the bone may result in compression of the median nerve within the carpal tunnel and is an uncommon cause of entrapment neuropathy.

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Introduction

Lunate dislocation is an uncommon injury occurring in young adults due to high energy trauma resulting in loading of a dorsiflexed wrist. The volar displacement and rotation of the bone may result in compression of the nerve within the carpal tunnel and is an uncommon cause of entrapment neuropathy involving the median nerve. Diagnosis in these cases can be delayed or missed resulting in chronic disability and pain.^{1,2}

Clinical and imaging findings

A 23-year-old male patient met with a road traffic accident, following which he developed numbness involving the left

thumb, second, third and radial aspect of the ring finger. Since the individual was on leave at the time, he got himself evaluated at a local hospital and was being managed conservatively as a case of brachial plexopathy. He reported to our institute six weeks following the injury with no improvement in his condition. On examination there was swelling along the volar aspect of the left wrist, paresthesia involving the thumb, index, middle and radial side of ring finger. Tinel sign was positive at the wrist. Movements of the wrist were painful and restricted. A clinical impression of median neuropathy was made with the site of involvement of the nerve being around the wrist joint.

Digital radiography of the wrist was done with dorso-palmar and lateral projections. The dorsopalmar projection revealed an overlap of the lunate over the radius and to a lesser extent capitate with a 'triangular' or a 'piece of pie' appearance

* Corresponding author. Tel.: +91 7798980108.

E-mail address: drmukulbhatia@hotmail.com (M. Bhatia).

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Fig. 1 – Radiograph of the left wrist, dorso-palmar view, showing the lunate assuming a 'triangular' or a 'piece of pie' appearance and overlapping the radius. There is disruption of the 'carpal arcs-I and II'.

Fig. 2 – Radiograph of the left wrist, lateral view showing the lunate displaced and angulated volarly, giving a 'spilled tea cup' appearance.

Fig. 3 – Axial STIR image showing the hyperintensity involving the thenar group of muscles, consistent with denervation oedema.

of the bone (Fig. 1). There was disruption of the Gilula's arcs or lines with discontinuity of the arcs I and II. In the lateral view the lunate was seen displaced and angulated volarly giving a 'spilled tea cup' sign (Fig. 2) with loss of its normal alignment with the radius and the capitate.

MRI of the wrist confirmed the radiography findings. The displaced and angulated bone was seen to displace and stretch the median nerve. In addition, T2 and STIR hyperintensity was noted involving the thenar muscles (Fig. 3). A diagnosis of chronic, volar, lunate dislocation was made. The patient was taken up for surgery. Per-operatively volar lunate dislocation was confirmed with the median nerve stretched out over the devascularised lunate, with splayed flexor tendons. The lunate was excised and the carpal tunnel released.

Discussion

Lunate dislocations are typically seen in young adults following high-energy trauma causing loading of the dorsiflexed wrist. It is less common than the less severe perilunate dislocation. It is considered to represent stage IV of perilunate instability.³ A thorough clinical evaluation and imaging play a vital role in the evaluation of these injuries, which often go unrecognised and untreated in the emergency set up, resulting in chronic disability and pain. In a multicentre study by Herzberg et al. missed diagnosis has been reported in up to 25% of cases.⁴ In our patient also, the diagnosis was missed on initial evaluation. It is imperative that good clinical assessment be followed by carefully performed radiography including a true lateral projection of the wrist. The typical radiographic findings of lunate dislocation on antero-posterior projection include disruption of the Gilula arcs or lines. These lines are seen in the normal AP projection of the wrist in neutral position. Arc I outlines the proximal surface of the scaphoid, lunate and the triquetral bones, while arc II outlines the distal surfaces. Arc III outlines the proximal surface of the

Fig. 4 – Post-operative STIR image after 6 weeks showing partial resolution of the denervation oedema.

capitate and the hamate. There was disruption of the carpal arcs I and II in our patient. The lunate, which overlaps the capitate assumes a triangular configuration often described as 'piece of pie' or a 'triangular' appearance. In our patient this overlap of the lunate was more with the radius and less with the capitate. The lateral projection is diagnostic for lunate and perilunate dislocations. Evaluation includes displacement of the lunate or the carpus with respect to the Nelson's lines, which are the volar and dorsal radial lines. In lunate dislocation, the bone is seen displaced and angulated volarly and gives a 'spilled tea cup' appearance. It does not articulate with the capitate or the radius.

The diagnosis entrapment neuropathy is made by accurate history, clinical examination, electrophysiologic testing and imaging. Ultrasonography and magnetic resonance imaging are the two modalities, which play a important role in the evaluation of entrapment and other types of neuropathy. While ultrasound is an operator dependent modality, MRI, wherever available, offers the advantage of demonstrating the cause, in some of the cases, and the effects of nerve entrapment.⁵ The signal intensity changes in the involved nerve may be appreciated as hyperintensity of the nerve on T2 weighted or STIR sequences. The effects on the involved group of muscles may be evident as subacute denervation oedema appearing as hypertensity on T2 weighted or STIR sequences, which typically becomes evident 2–4 weeks after denervation. This finding of muscle oedema on MRI has various causes like autoimmune conditions, mild injuries, infectious myositis

without phlegmon, radiation therapy, compartment syndrome, early myositis ossificans, rhabdomyolysis, sickle cell anaemia, a transient phenomenon following exercise and subacute denervation as in this patient. The pathogenesis of this 'denervation oedema' is poorly understood, however postulated mechanisms are release of vasodilators, local metabolic changes and capillary enlargement. It causes oedema uniformly throughout the involved muscle. If normal innervation is restored the changes eventually return to normal, while fatty change of the involved muscles, evident as high signal on T1 weighted sequences along with volume loss point towards irreversibility of the process.⁶ In our patient an MRI done 6 weeks after the surgery revealed significant resolution of the denervation oedema of the thenar muscles (Fig. 4).

Conclusion

Lunate dislocation is an uncommon injury occurring in young adults. It represents the final stage of perilunate injury and is associated with the highest degree of wrist instability.³ A careful clinical and radiographic assessment is imperative to diagnose this condition, which can often be missed or the diagnosis delayed leading to chronic disability and pain.

Conflicts of interest

The authors have none to declare.

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