LUNATE FRACTURES

“The Spirit of the New Moon” (detail), oil on canvas, Arthur Loureiro, 1888, National Gallery Victoria
Before time was only chaos - Chaos and two primordial spirits, the god Uranus, representing the male essence and progenitor of the sky and the starry night and the goddess Gaia the female essence and the progenitor of mother Earth. Uranus joined with Gaia and time and space were born. The fruit of the union of Uranus and Gaia was a race of giants called Titans, who ruled over the Earth and the heavens in the time before humanity. The Titans assumed many different forms that infused vital spirits into an inanimate Universe. Many were horrible and malignant entities but others were beautiful and noble. Among the latter were Oceanus, who embodied the great Ocean that flowed around the Eurasian land mass, that to the ancients formed the entire known world, Mnemosyne, mother of the Muses and Hyperion. Hyperion joined with the goddess Theia, and their children included Helios (Apollo to the Romans) - god of the Sun and Selene, (Luna to the Romans) - goddess of the Moon.

Each day Apollo would ride a great chariot across the sky carrying the Sun with him, to give light the world and on each night that followed the day his sister, Selene, would ride a magnificent horse across the night sky, carrying the Moon with her, in varying forms - sometimes a full moon sometimes a crescent Moon, to cast a more gentle light upon the Earth. In her wake trailed a transparent gossamer silk cloak, just barely visible to mortals as the faintest of luminescent moonbeams. Selene was a lustful woman who had many lovers, though not so many as her sister Eos, the Dawn. The offspring of her unions with various gods were gods or goddesses themselves, but also on occasions when her lust got the better of her she would produce fearsome creatures which fell to the Earth from the Moon. She had three beautiful daughters by Zeus, but on a fourth particularly lustful union with the great god she produced a monstrous lion which she banished to the Earth. This was the Nemean lion, which the Greek demigod Hercules was required to subdue as the first of his twelve labours.

Of all Selene’s lovers, however she loved none more than a poor mortal shepherd - named Endymion. Every night she would pause on her journey across the sky, descend to the Earth and make love to Endymion, by whom she had no less than fifty daughters! But Endymion was mortal and Selene could not stand the thought of him growing old and eventually dying, leaving her alone. So to keep Endymion for herself for all eternity she showered him with enchanted moonbeams which put him into an eternal sleep, during which he would never age. As a rough type of justice, sometime later, Selene herself would suffer an imprisoning enchantment. She had caught the eye of the ferociously lustful god Pan, who she had no desire to be with on account of his ugliness. Not to be denied relief from his burning passion however, Pan transformed himself into a faint misty white cloud and crept up to Selene one night on her journey across the night sky. He surrounded Selene and blackened the moonlight and in the darkness she became confused and disoriented, during which time Pan ravished her, just as she had so ravished her sleeping Endymion.

The Lunate bone is so named for its beautiful crescent moon-like shape. Injuries to this bone often remain obscure to us on conventional radiology - as if surrounded by the cloud like manifestation of the lustful god Pan - a great mischief is being hidden from our view. When our suspicion for mischief is high, we must penetrate this cloud of obscurity by our own Twenty-First century magic, undreamed off by the ancient gods - in the form of the CT or the MRI scanner!
LUNATE FRACTURES

Introduction

Isolated fracture of the lunate bone, like other isolated carpal bone fractures - apart from the scaphoid - are rare.

They are much more commonly seen in association with other injuries.

More of these fractures however, like other carpal bone fractures, are being detected by the increasing use of CT or MRI scanning.

Missed lunate fractures may lead to Kienböck's disease - an avascular necrosis of the bone, resulting in chronic pain and disability.

Anatomy

The left Lunate Bone (Gray's Anatomy 1918)

The lunate is well protected as it lies within the lunate fossa of the distal radius.

It receives its blood supply on both the volar and dorsal aspects, yet despite the dual arterial supplies, there is a high incidence of ischaemic bone injury following fracture.

It articulates:

- Medially with the triquetrum
- Laterally with the scaphoid
- Proximally with the radius
- Distally with the capitate.

Classification

Teisen classified lunate fractures into 5 main types:
<table>
<thead>
<tr>
<th>TEISEN TYPE</th>
<th>A-P VIEW</th>
<th>LATERAL VIEW</th>
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<tbody>
<tr>
<td>Type I: Volar Pole</td>
<td>![Image]</td>
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<tr>
<td>Type II: Chip Fracture</td>
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<tr>
<td>Type III: Dorsal Pole</td>
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<tr>
<td>Type IV: Sagittal</td>
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<tr>
<td>Type V: Transverse</td>
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*Associated Injuries*

Complex dislocations of the carpus:

- Lunate dislocation
- Perilunate dislocation
Scapho-lunate dissociation.

**Mechanism**

Like other carpal bone injuries, apart from the scaphoid, these are usually due to high energy mechanisms in younger patients.

The lunate can be injured by:

- A fall onto an outstretched hand
- A direct blow.

Associated risk factors include occupations or sports associated with repetitive pressure to the base of the hand with the wrist in extension (such as gymnasts or jack hammer operators).

**Complications**

Complications include:

- Compartment syndrome is an important acute complication of carpal fractures.
- Avascular necrosis (*Kienböck's disease* of the lunate)
- Non-union
- Secondary degenerative arthritis.

**Clinical Features**

There may be diffuse swelling of the wrist.

Bony point tenderness may be elicited over the lunate.

The lunate can be appreciated by palpation on the dorsum of the wrist just distal to the radius (or more specifically - the radial or Lister's tubercle) in line with the third (middle) metacarpal.

**Note that in some cases patients may not even recall a specific injury event, but simply present with chronic wrist pain due to avascular necrosis and/ or secondary osteoarthritic changes.**

Indeed lunate fracture patterns have been classified into 4 stages based on the lateness of presentation and the consequent radiographic findings:

**Stage I:** Has no significant radiographic changes.
Stage II: Shows some degree of bone fragmentation is present without evidence of collapse.

Stage III: Shows fragmentation and collapse.

Stage IV: Shows fragmentation, collapse, and secondary arthritic changes.

Investigations

Plain radiography

Standard views include:

- A-P
  - On the AP view look also for any widening of the scapho-lunate space (scapho-lunate dissociation) as a clue to possible occult lunate injury.
- Lateral
- Oblique

As for all fractures of the carpal bones, lunate fractures are frequently difficult to diagnose on plain radiography, and injuries will be missed if this modality alone is used to exclude a fracture.

When clinical suspicion for injury remains high, despite a normal plain radiograph, then CT scan or MRI scan should be done.

Patients with late presentations may have radiographs showing evidence of osteonecrosis with a relatively mottled and radiodense area of the lunate. This can progress to frank sclerosis, cystic change, fragmentation and eventually complete collapse of the lunate.

CT scan

As is the case for all carpal bone injuries this may be done in cases where plain radiographs have not provided a clear diagnosis and clinical suspicion remains.

MRI Scan

This is the best imaging modality.

It is a further option in cases when plain radiographs are non-diagnostic, yet clinical suspicion remains high.

MRI has the added ability to detect early vascular compromise within carpal bones.

It is also desirable when radiation needs to be avoided, as in children or pregnant women.
It is a sensitive tool in the follow-up of avascular necrosis and fracture healing (resolution of oedema).

**Management**

Non-displaced fractures are generally treated with plaster cast immobilisation for a minimum period of 6 weeks.

More complex injuries will usually require ORIF.

Presentations that are later than stage I will also generally require surgical intervention.

**Disposition**

Because of the high risk for non-union and osteonecrosis, **all** patients with lunate fractures should be referred to a specialist hand surgeon.
Appendix 1

Normal radiography of the carpus

Left: Normal A-P radiograph of the left carpus. Right: Diagram of the normal anatomical alignments of the radius lunate and capitate, as seen on a lateral radiograph. The scapho-lunate angle should fall within a range of 30 - 60 degrees, (from Wikiradiology)
Appendix 2

Type V lunate fracture

Left: beautifully demonstrated Teisen type V transverse fracture of the lunate bone on lateral radiograph of the wrist, (red arrow).

Note also the equally beautiful positive pronator quadratus fat pad sign! (blue arrow). The fat pad is displaced forward, and indicates occult fracture - though the injury in this case is readily apparent.)
“The Vision of Endymion”, oil on canvas, Sir Edward Poynter, 1913
References


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