Kienbock’s disease

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Outline

- Introduction
- Aetiology
- Classification
- Treatment
Introduction

- First described by Peste in 1843
- Described as lunatomalacia by Kienbock (1910)
- Traumatic rupture of the ligaments and vessels around the lunate produced lunate fracture with subsequent collapse.
Introduction

- Condition characterised by wrist pain, weakness and loss of motion secondary to osteonecrosis of the lunate
Anatomy

• Proximally articulates with radius and TFCC

• Distally articulates with capitate alone in 1/3 of cases

• In the rest, articulates with the hamate as well
Blood supply

- Extraosseous blood supply
  - Single volar/ dorsal vessel - 26%
  - Multiple volar/ dorsal vessels without central anastomosis - 8%
  - Multiple vessels with anastomosis - 66%

Blood supply

- Intraosseous blood supply

59% 10% 31%
Blood supply

- Least vascular area of the lunate: subchondral bone adjacent to the radius
Ulnar variance

- Relationship of the distal articular surfaces of the ulna and the radius seen on a PA X-ray of the wrist
Ulnar variance
Ulnar variance

- Hulten noted that 74% of patients with Kienbock’s had negative ulnar variance

In a normal population:
- 61% neutral ulnar variance
- 23% negative
- 16% positive
Ulnar variance

- However
  - More normal subjects with positive ulnar variance in asian and black populations
  - Kienbock’s disease has been reported in those with positive ulnar variance
Biomechanics

- 90.3% of the radio-ulno-carpal force is transmitted to the radius:
  - 61% through radioscapoid joint and
  - 39% through radiolunate joint

- 9.7% through TFCC
Biomechanics

- Load through the lunate depends on:
  - Amount of bone that is not covered by distal radius and
  - Ulnar variance

Schuind et al J Biomechanics, 1995
Biomechanics

- Nutcracker effect
  - Lunate articulates with the rigid capitate and radius on one side and the elastic TFCC on the other
Lunate at risk

- Ulnar negative variance
- Single extra-osseous nutrient vessel
- Poor intra-osseous anastomosis
Aetiology

- Vascular theory
  - Primary circulatory problems, e.g. Sickle cell disease/raised venous pressure

- Mechanical theory
  - Excessive mechanical loads cause repeated microfractures and collapse
  - Role of trauma
Clinical presentation

- More common in men
- Peak incidence: 18-40 yrs
- Most patients are involved in heavy manual labour
- Typically unilateral
Clinical presentation

- Insidious onset wrist pain

*Beware of making a diagnosis of wrist sprain*

- Pain is aggravated with activity, relieved with rest

- Weakened grip strength

- Slightly reduced flexion and extension
Imaging

- PA Xray
- MRI
- CT
Lichtman classification
Treatment

“The greatest danger the world is facing from health professionals is the pressure to investigate, prescribe and intervene in non-existing or futile clinical disorders and diseases.”

Primum non nocere, has now distorted

Now it seems to suggest

“We can do as much harm, as long as it is scientific”

Primum non nocere
First, do no harm!
Treatment

- Little evidence for any particular form of surgical treatment and for its superiority over conservative treatment
  - Schuind et al, JBJS 2008, 90 B:188-89
Treatment

- Stage 1: Immobilisation in a plaster cast
  - If symptoms persist at 2-4 months, one may consider surgery
Stage 2 and 3A

- Negative ulnar variance:
  - Joint levelling procedures
  - Radial shortening or ulnar lengthening osteotomy
Radial shortening osteotomy

- Performed via volar approach
- Avoid excessive shortening (not >4mm)
- Better than ulnar lengthening- higher rate of union
Radial shortening osteotomy

- Best results in patients less than 30
- May lead to revascularisation in younger patients
- May delay the progress of the disease
Radial shortening vs conservative treatment

- Salmon et al, JBJS Br 2000

- 18 pts treated nonoperatively vs 15 treated with radial shortening (stage 2-3)

- Patients treated with radial shortening had less pain and better grip

- Radial shortening slowed the process of carpal collapse
Stage 2 neutral ulnar variance

- Revascularisation procedures
  - Implantation of metacarpal arteriovenous pedicle into the lunate
  - Vascularised bone graft from dorsal radius using the 4,5\textsuperscript{th} intercompartmental supraretinacular artery (4,5 ICSRA)

- Revascularisation may precipitate lunate collapse
Stage 2 neutral variance

- Radial closing wedge osteotomy: Decreases radial inclination and shifts load from the lunate to the scaphoid
  - Not universally accepted
  - Possibly enables better coverage of the lunate
Symptomatic stage 3b

- Goals of treatment
  - Preserve carpal height
  - Maintain scaphoid in its proper position and alignment
Stage 3B

- Options: Conventional procedures
  - Lunate excision and intercarpal fusion
  - Lunate excision
  - Other (weird) procedures
    - Lunate replacement
    - Lunate excision with osteotomy of the capitate
    - Lunate excision and lengthening of capitate
Lunate excision and triscaphe fusion

- Reduces strain across radiolunate joint but increases strain across radioscaphe joint

- Not a popular procedure because of complications and poor results
Lundae excision and scapho capitate

- Achieves the objective of preventing further carpal collapse and reduces strain across radiolunate joint
Scapho-capitate fusion

- Technically easier

- Fusion across one joint

- 14pts, 31 month follow up, 12 were satisfied; all returned to work (Mansat et al, 2007)
Lunate excision alone

- Kawai et al published long term results:
  - 12 year follow up of 14 patients
  - Carpal collapse progressed with time
  - Patients had satisfactory range of motion
  - All could carry out daily activities and 2 could do strenuous work

- JBJS Br 1988 70: 287-92
Lunate replacement

- Silicone replacement:
  - No longer favoured – silicon synovitis, subluxation/dislocation
- Titanium implants
Lunate excision and capitate osteotomy

- Moidified Graner procedure
  - Lunate excision
  - Osteotomy of capitate
  - Curette the articular surfaces of all intercarpal joints except triquetrum and pisiform + bone grafting
Modified Graner procedure

- 15 patients; 80 month follow up

- Results: good in eleven of the patients, fair in two, and poor in two.

- Grip strength 80% of normal

- Radiographic OA changes developed in all patients
  - Takase et al JBJS Am 2001, 83:177
Capitate lengthening
Stage 4

- Salvage procedures
  - Proximal row carpectomy
  - Wrist denervation
  - Wrist fusion
Proximal row carpectomy

- Retains 65% movement at the wrist and 85% of the grip strength
- Articular surfaces of radius and capitate should be satisfactory
Wrist denervation
Wrist fusion

- Better outcome if offered early in some patients with stage 3b and 4
  - Tambe et al, Int Ortho 2005
Summary of treatment

- Stage 1: Immobilisation

- Stage 2 and 3A: Radial shortening OR revascularisation

- Stage 3B: Lunate excision with or without scapho capitate fusion
  May consider PRC/ fusion

- Stage 4: Wrist fusion
Any questions?