Fractures of the distal radius

Aims

- History of fracture treatment
- Literature supporting current treatments
- Classification
- Clinical case discussions
- Surgical approach

History of distal radial fracture

- Petit - 1723
- Clause Pouteau – 1783
- Abraham Colles – 1814

COLLES AND CARR

Some history of the wrist fracture

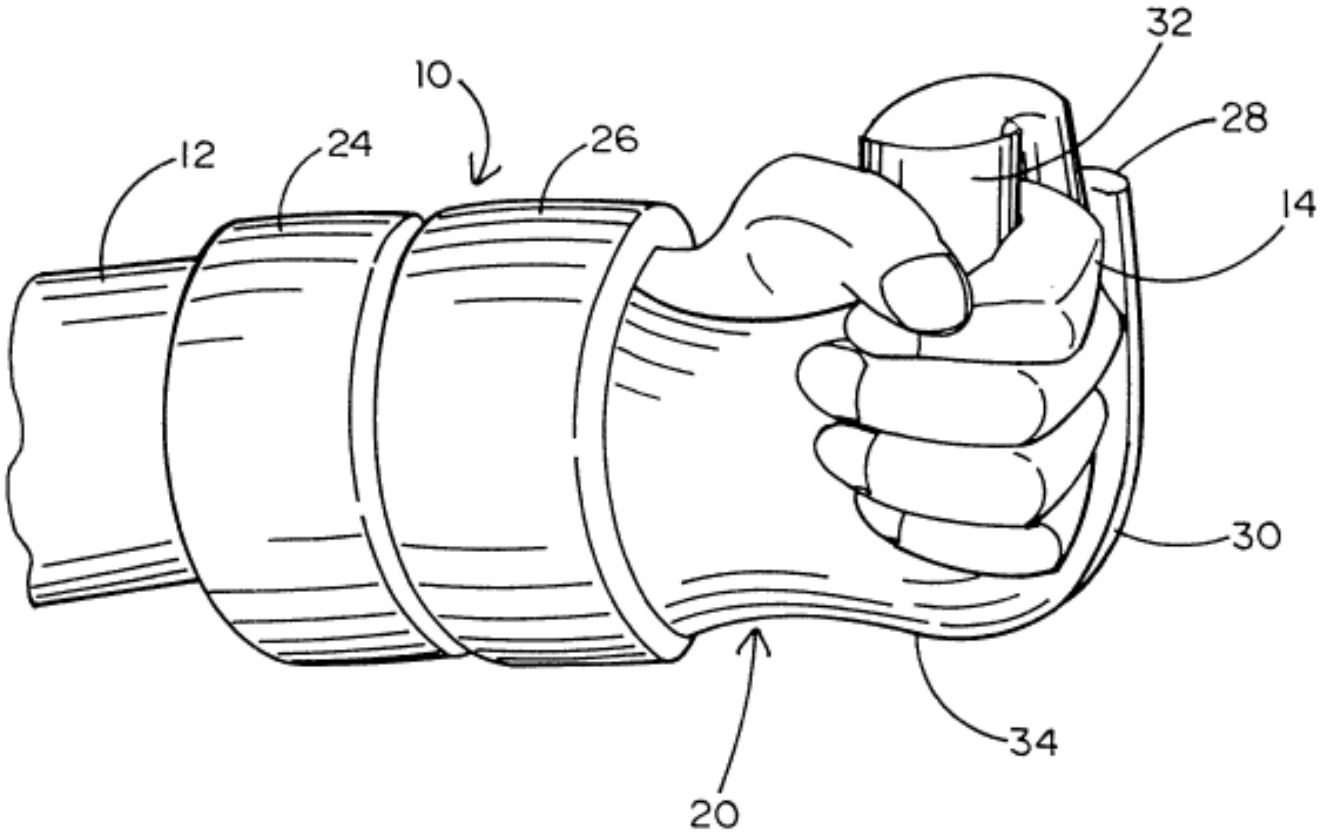
by

St. J. D. Buxton, F.R.C.S.

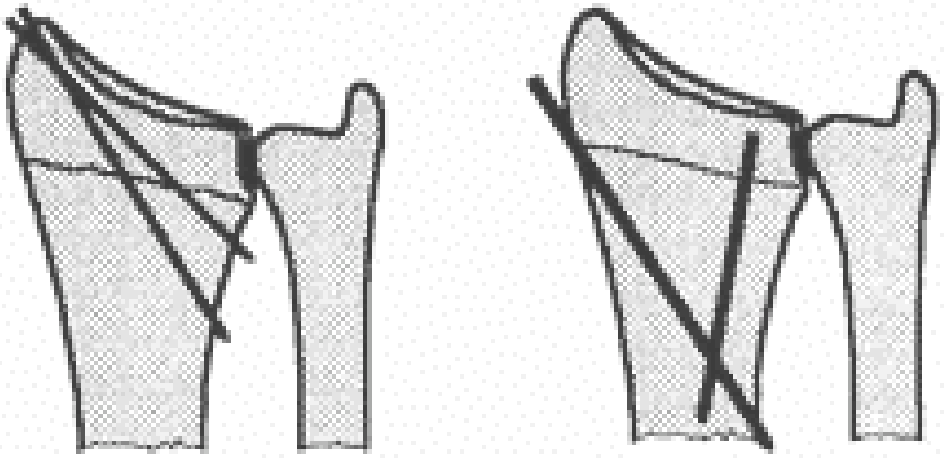
the doctor to guard against the carpal end of the radius being " drawn back ". He recommended that an assistant should hold the limb in a position half-way between pronation and supination and that the reduction should consist of a transverse compression on the anterior surface of the limb. He then applied a tin splint, formed to the shape of the arm,

- "The practitioner can reassure themselves that despite the deformity the injury is easily treated with no long term loss of function."

- Robert William Smith – 1847
- Alonzo Ferdinand Carr - 1879



- Willenegger and Guggenbühl in 1959 – static fixation



- Kapandji dynamic method 1967 – 10% incidence of volar displacement

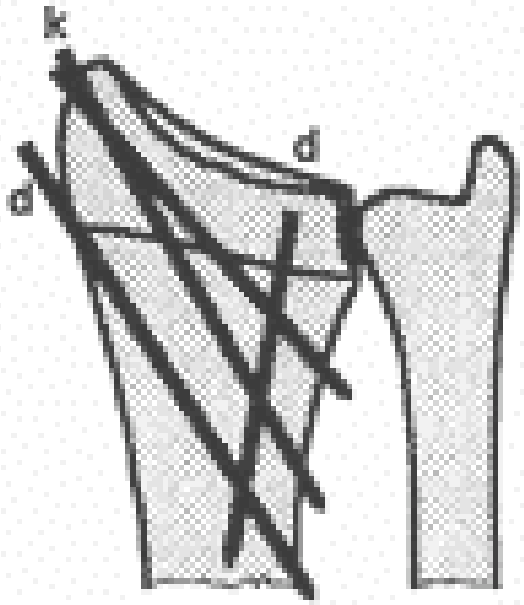
Arch Orthop Trauma Surg (1999) 119:171–178

ORIGINAL ARTICLE

T. Fritz · D. Wersching · R. Klavora · C. Krieglstein
W. Friedl

Combined Kirschner wire fixation in the treatment of Colles fracture

A prospective, controlled trial



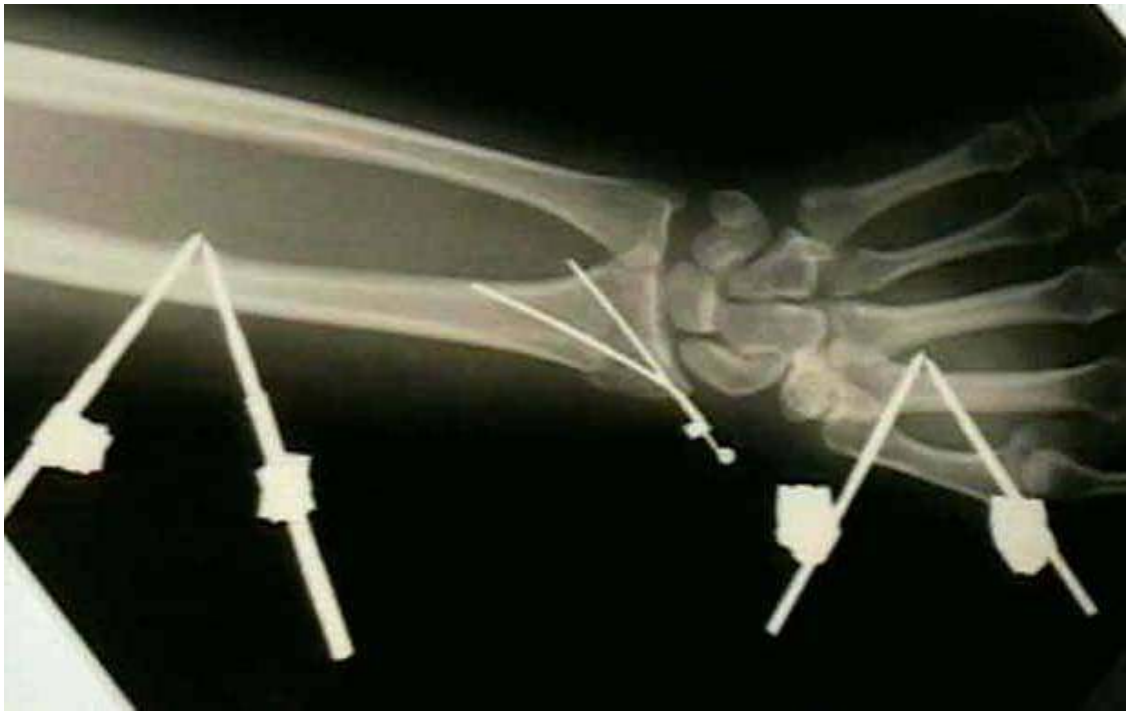
- Strohm 2004 – improved stability with combined method utilising 3 or more k wires
- “A good method for treating extra-articular fractures or simple intra-articular fractures”

- They are not load bearing and are reliant on cortical contact to prevent shortening + and intact metaphyseal segment

Hence poor results for complex intra-articular fractures or those with metaphyseal comminution.

- Advent of internal fixation 1970-80
  - Volar buttress plate + dorsal plate

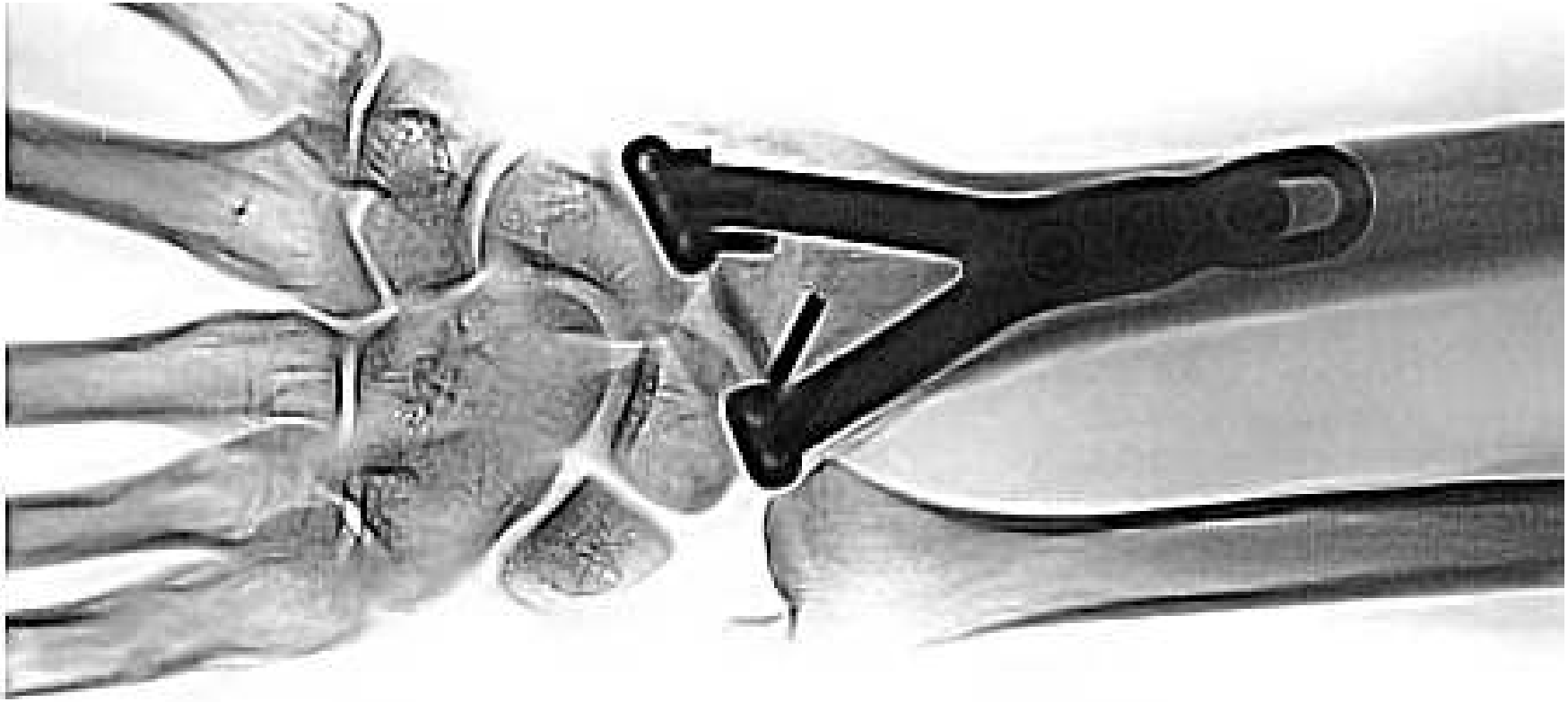
- Relatively high complication rate including extensor tendon attrition / extensor tendon rupture
- High rate of displacement in comminuted fractures / osteoporotic bone



- External fixation +/- augmentation – better radiological result in medium term follow up + rigidity in cadaveric studies.
- However no good evidence to support improved functional long term outcome over K-wiring alone.

- Higher incidence of pain + stiffness in early phase including CRPS
- ? Due to overdistraction

- 2000 – Advent of distal radial locking plates – low profile / pre-contoured / fixed angle devices
- $250 million annual market in US
- 30 devices available



- Why the change in treatment despite no level I-II evidence to support it?

Changes in fracture pattern

- Mortality after wrist fracture is the same if not better than normal population
- Risk of hip fracture after wrist fracture nearly 2 fold in women. 3 fold in men

- **ACTIVE ELDERLY POPULATION WITH HIGHER INCIDENCE OF OSTEOPOROTIC WRIST FRACTURES.**

Increased understanding of radio-carpal function

- McQueen JBJS 1988 – significantly worse function if dorsal angulation >12 degrees or radial shortening > 10mm
- This correlates with more recent biomechanical studies.

- Associated injuries - 63% suffer TFCC tears / 32% scapho-lunate ligament rupture + 17% luno-triquetral tear with hyperextension injuries

Pechlaner

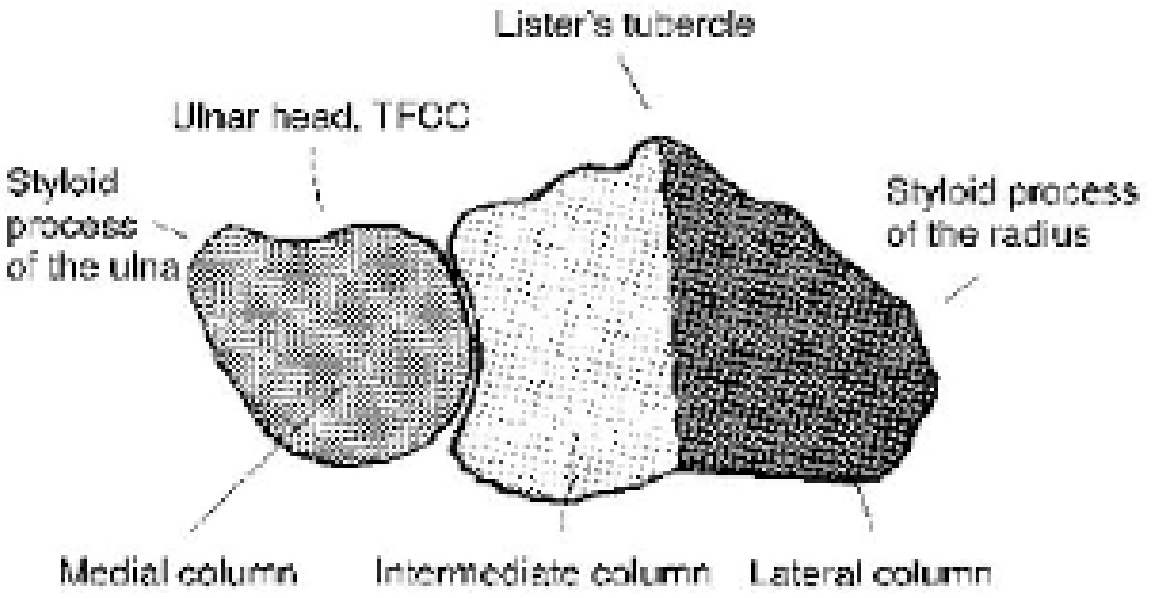
Mikrochir Plast Chir. 2002;34:150-7.

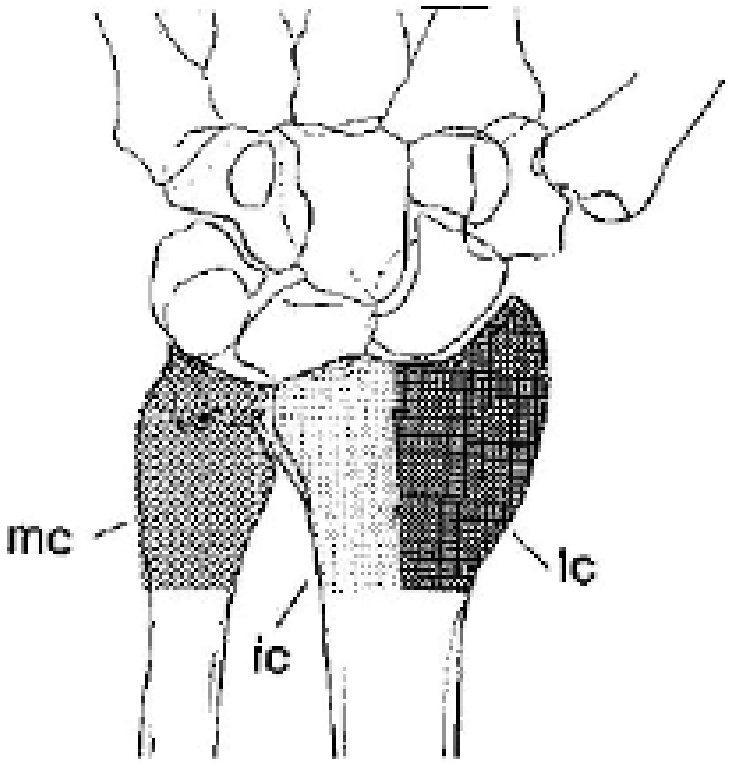
- Articular step-off > 1mm leads to significantly decreased SF-36 score at 2 years

Fernandez

Clin Orthop Relat Res. 1997;341:36-41.

- DRUJ instability leads to poorer outcome
- Instability unlikely with anatomically reduced fractures.
- Higher risk particularly with shortening





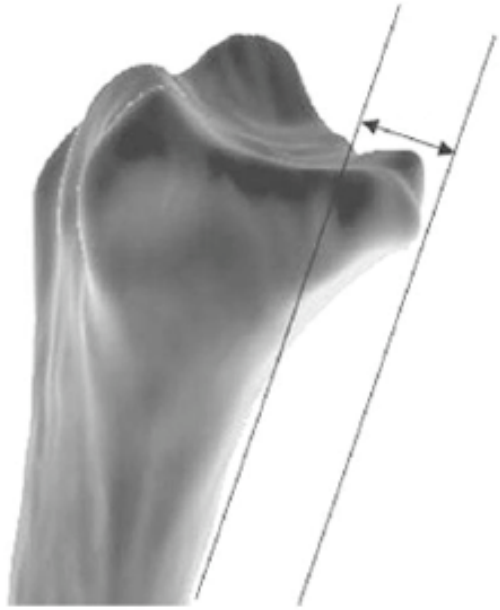
- Lateral collumn – osseous buttress
- Intermediate column – load transmission
- Lateral column – axis for forearm rotation + post for secondary loading.

Plate design

- Lower profile with variable axis for locking screws to allow fragment capture
- Placement of screws >4mm from subchondral bone halves force required for pullout

Drobez

J Hand Surg [Am]. 2006;31:615-22.



Evidence for fixation

- Multiple case series / reports demonstrating good – excellent results of complex injuries with plates

- Intra-articular fractures – ex fix + k wires radiologically significantly better outcome than POP alone.

Young J Hand Surg Br. 2003;28:422-6.

Azzopardi J Bone Joint Surg Br. 2005; 87:837-40.

Harley J Hand Surg [Am]. 2004; 29:815-24.

- Intra-articular fractures – better radiographic outcome at short to medium term with plate compared to external fixation

Wright J Hand Surg [Am]. 2005;30:289-99.

- Complex intra-articular fractures- better load tolerance of plate fixation vs augmented ext fixation

Dodds J Hand Surg [Am]. 2002;27:953-64.

Meta-analysis 2005 – no evidence to support plate fixation over ext. fixation for complex intra-articular fractures

Margaliot *The Journal of Hand Surgery, Volume 30, Issue 6, Pages 1185.e1-1185*

Classification

1. Frykman

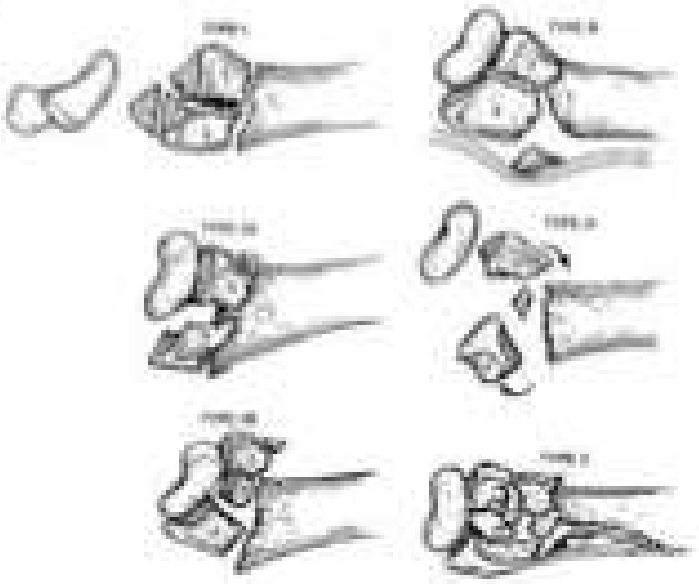
- Descriptive only and does not include variables, such as direction and degree of displacement or comminution

1 and 2	Extra-articular fracture ± distal ulna fracture
3 and 4	Intra-articular fracture involving the radiocarpal joint ± distal ulna fracture
5 and 6	Intra-articular fracture involving the DRUJ ± distal ulna fracture
7 and 8	Intra-articular fracture involving the RC and DRUJ ± distal ulna fracture

3. Melone Classification

- Sub-types of 4-part intra-articular fractures
- Gives some indication to treatment

1	Minimal comminution - stable
2	Die-punch. Comminuted * unstable, dorsal or volar. 2a reducible, 2b irreducible
3	Spike. Displacement of medial complex as a unit + volar spike
4	Split . Wide separation or rotation of the dorsal fragment + palmar fragment rotation
5	Explosion fracture; severe comminution with major soft tissue injury



- NB Chauffeurs fracture
  - Scaphoid fracture / SL ligament rupture

Markers of instability

- >10 degrees angulation
- >5mm radial shortening
- >2mm articular incongruity
- Comminution across the midaxial point on lateral radiograph
- > 12 degrees loss of radial inclination
- Comminution of dorsal + palmar cortex
- Irreducible fracture
- Loss of reduction at follow up

Cases

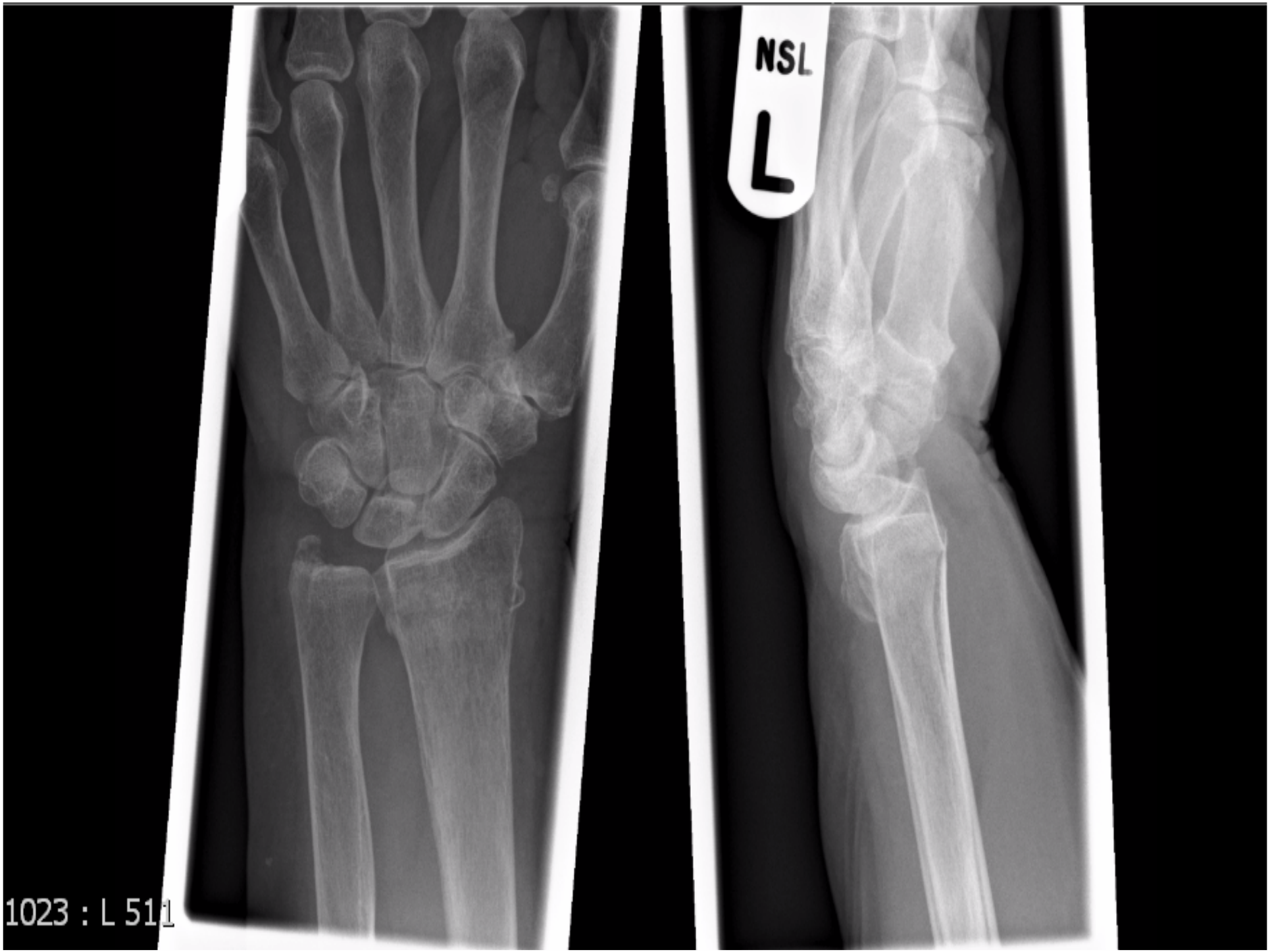

023 : L 511
R

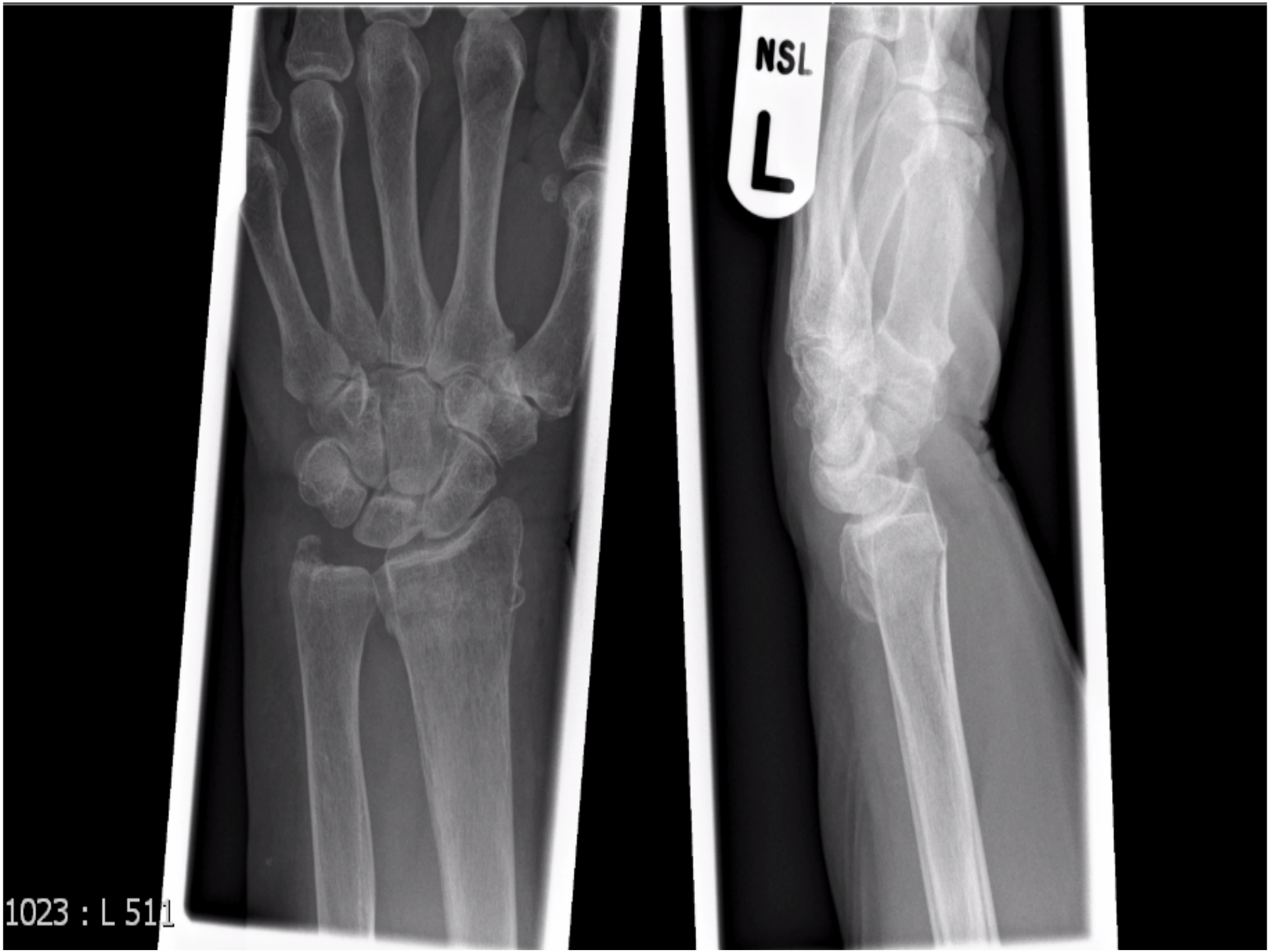

R
55 : L 1.866


L 2048

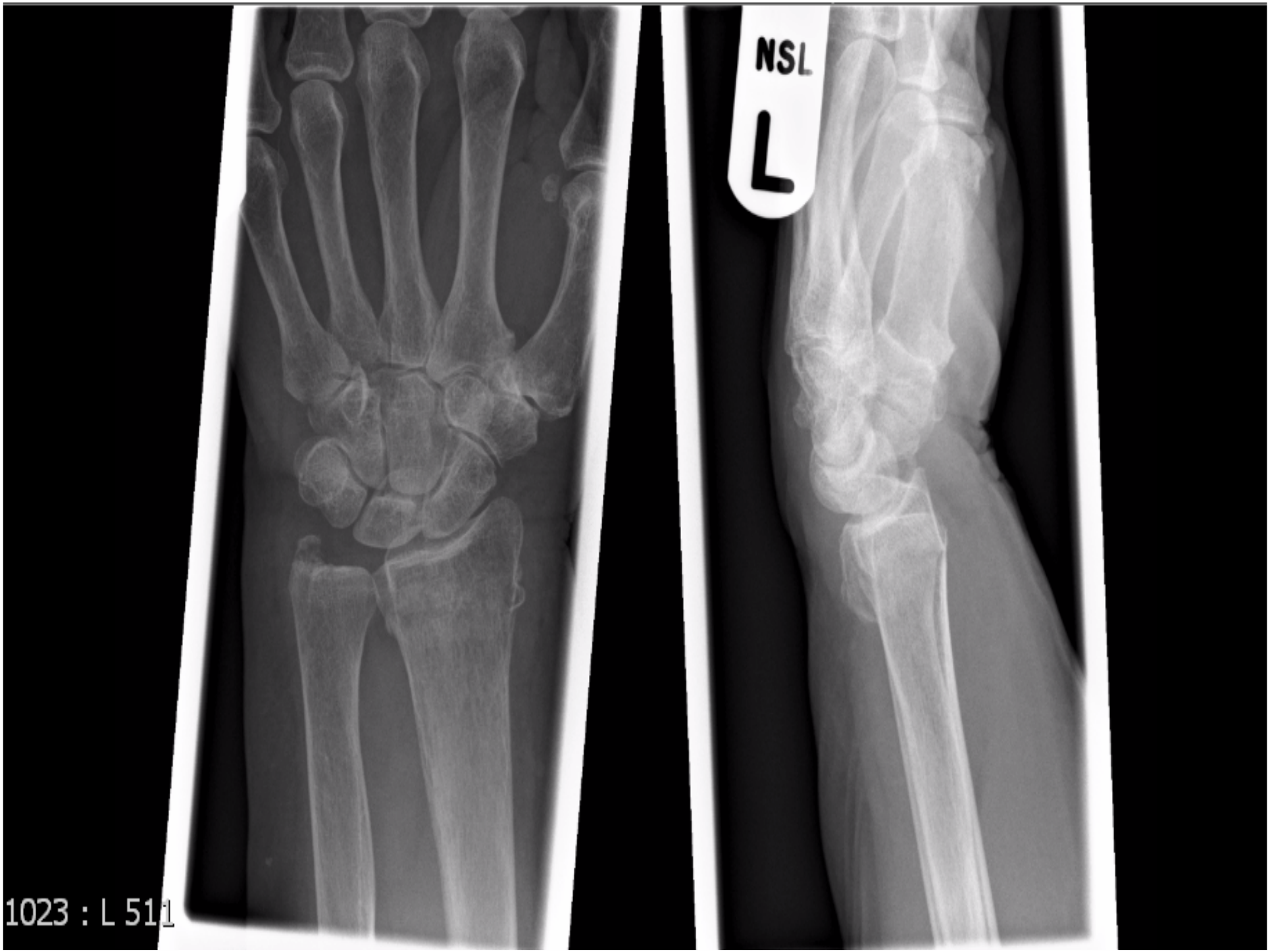

4095 : L 2048

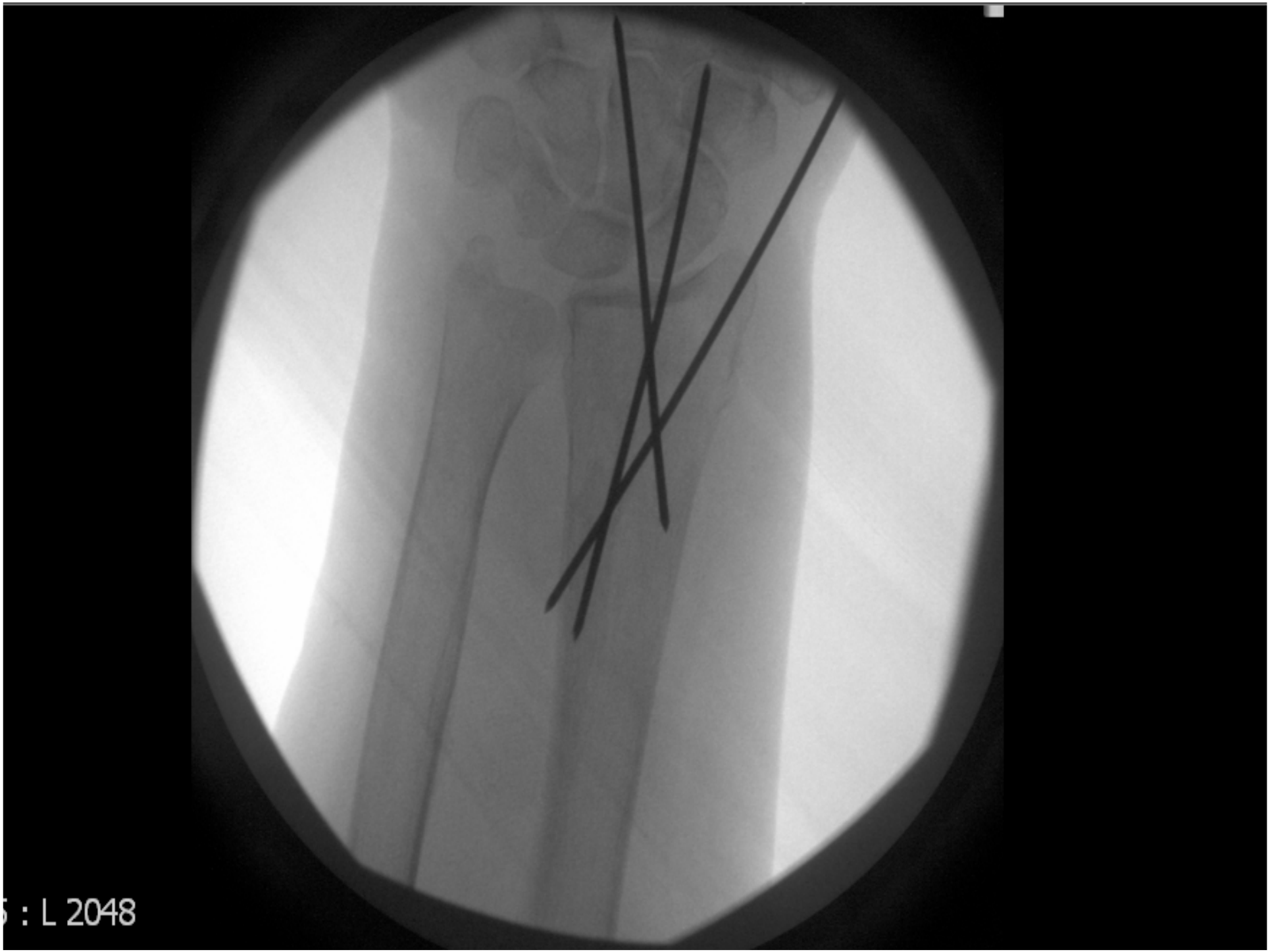

1
R
W 1.546 : L 2.109


NSL
L
1023 : L 511


NSL
L
1023 : L 511


095 : L 2048

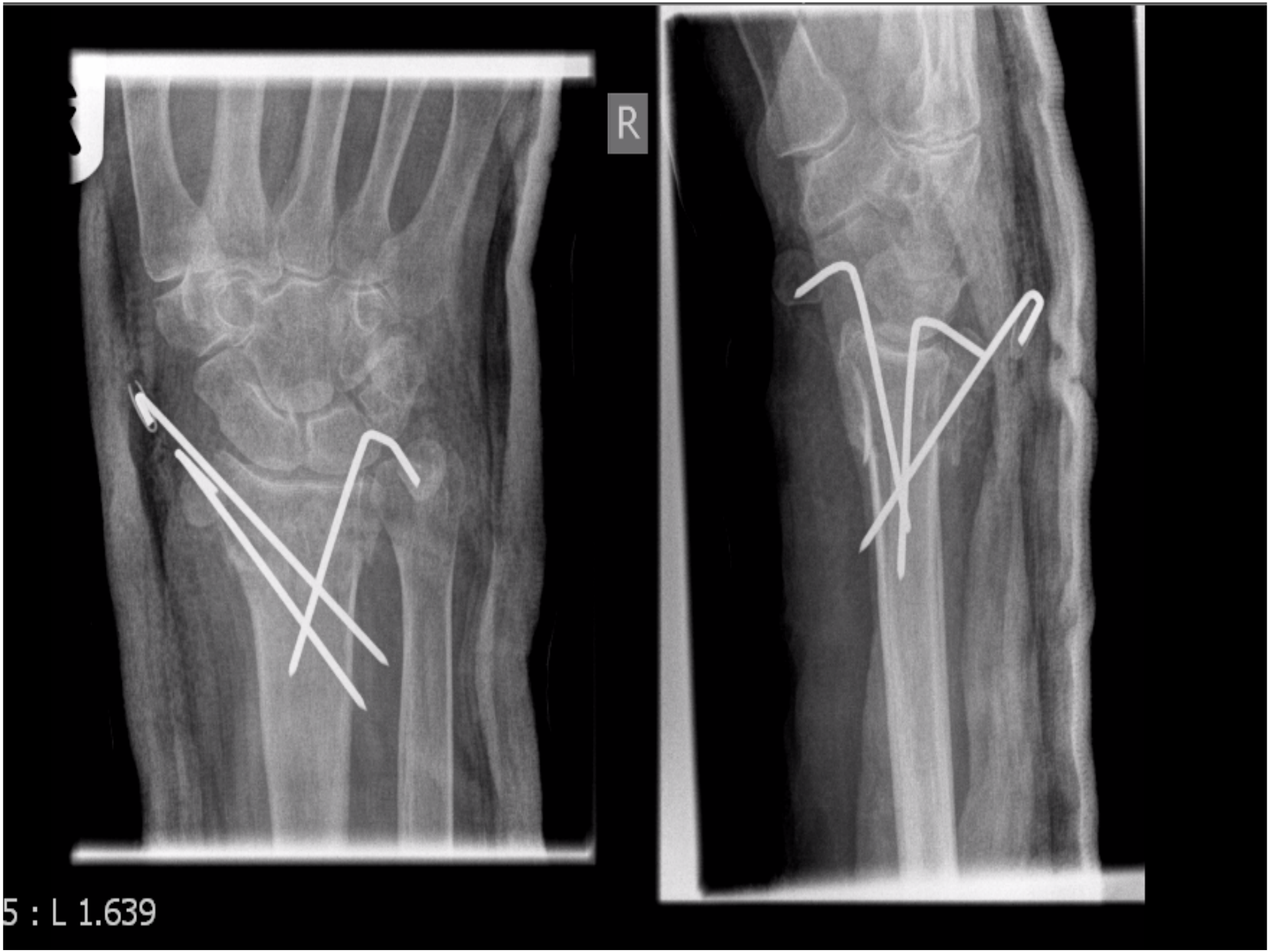

NSL
L
1023 : L 511


: L 2048

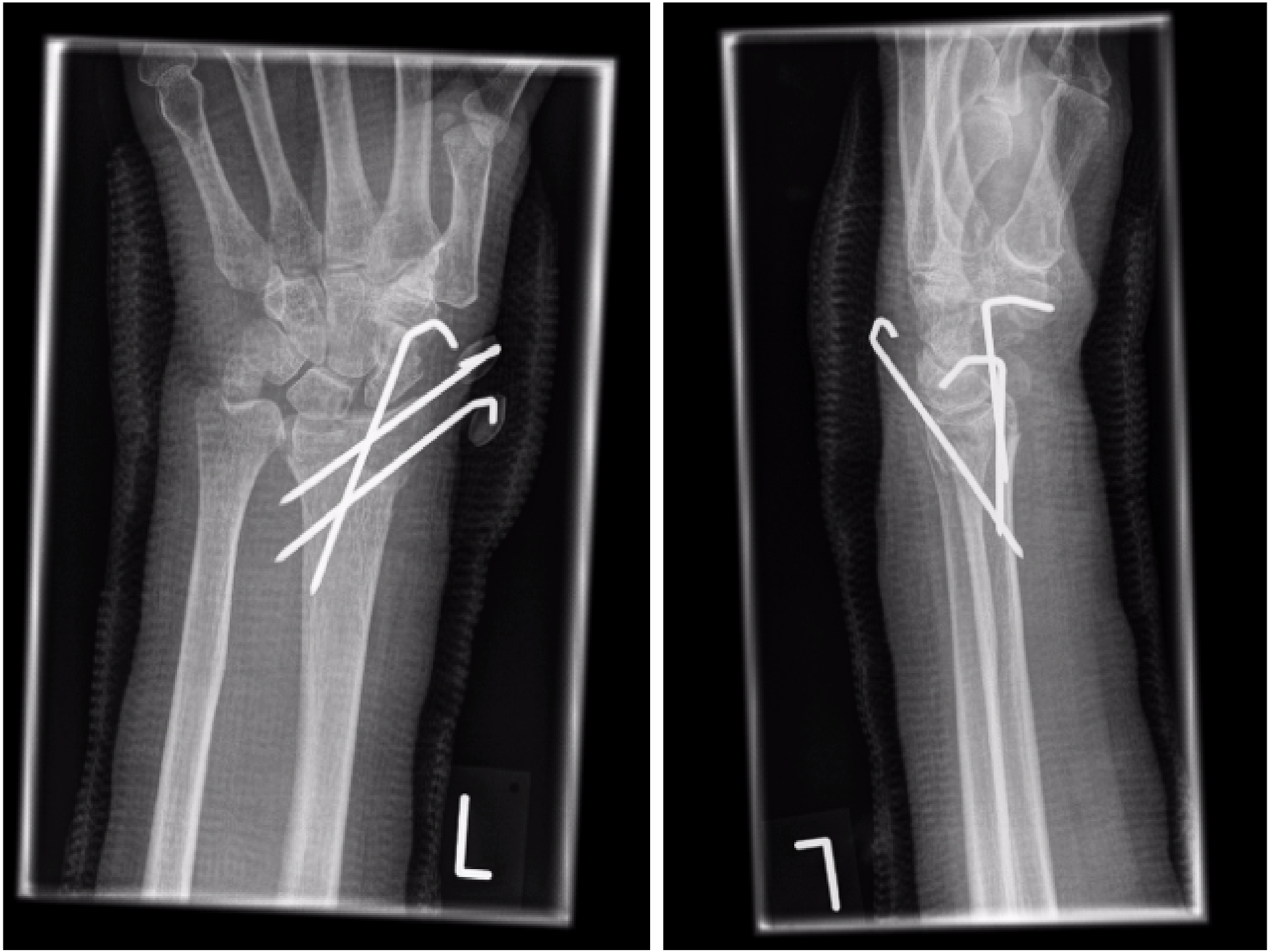

1
L
W 10913 : L 16222


1
W 1023 : L 511


1
R
W 1023 : L 511

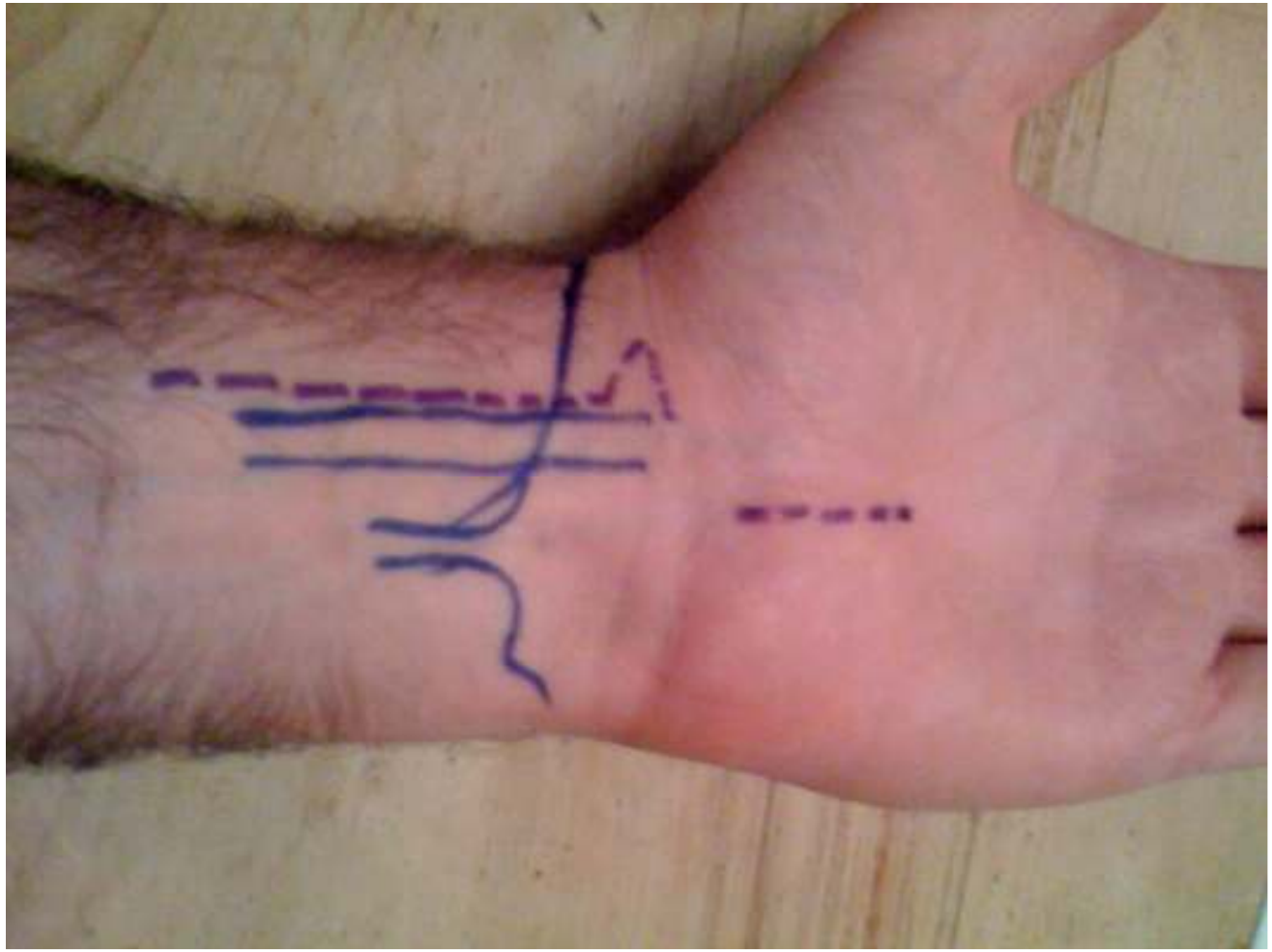

R
5 : L 1.639


L
3 : L 511


L
L

Surgical Approach

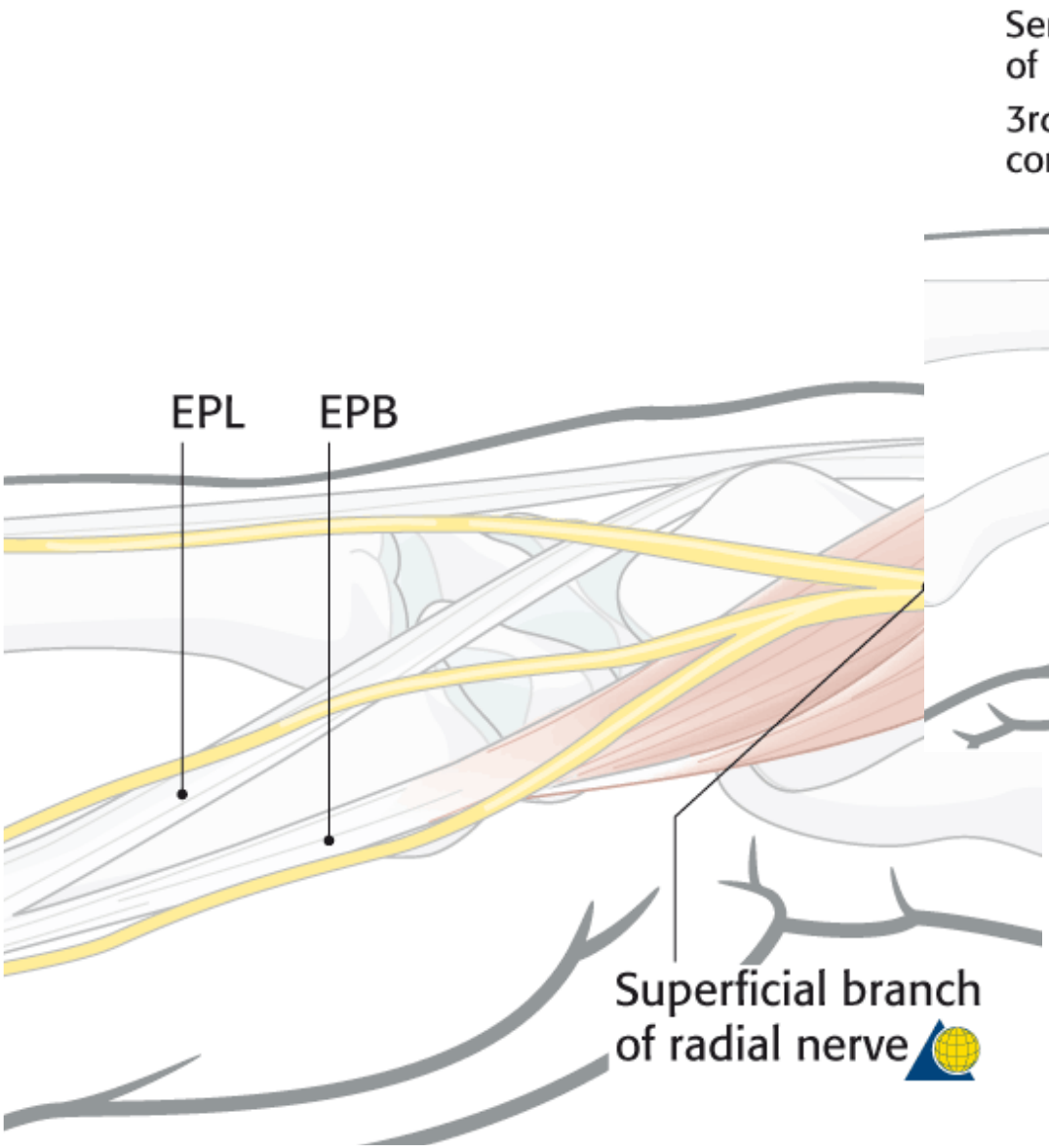
- Bed of FCR

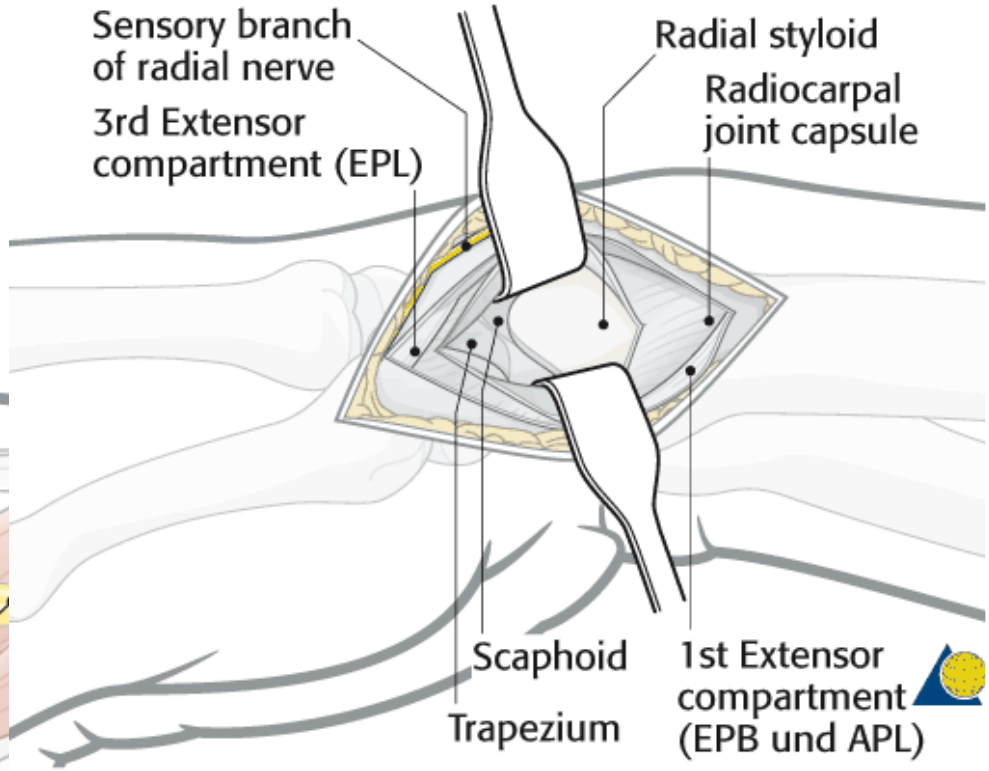


- To aid reduction
  - Patient positioning
  - Open fracture site remove soft tissues
  - Release brachioradialis to expose 1st dorsal compartment
  - Consider lamina spreader in radio –ulnar junction / external fixator

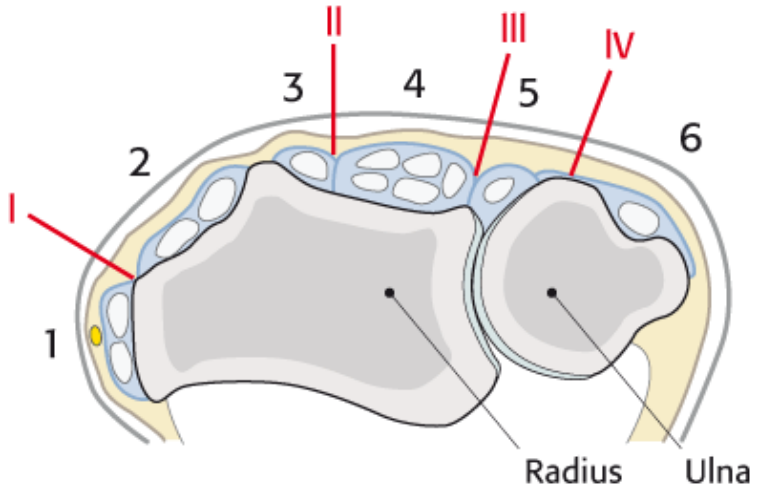
Radial Styloid - junction of EPB / EPL

– Beware superficial branch of radial nerve

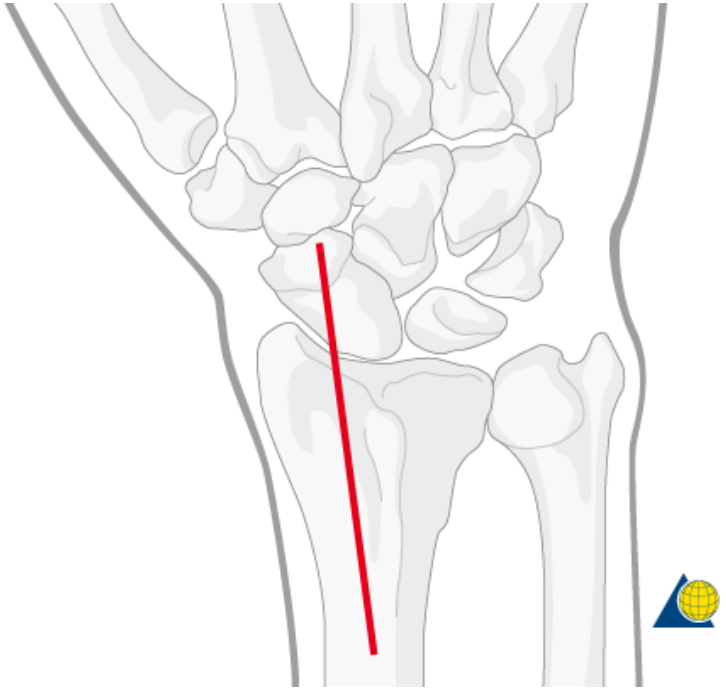




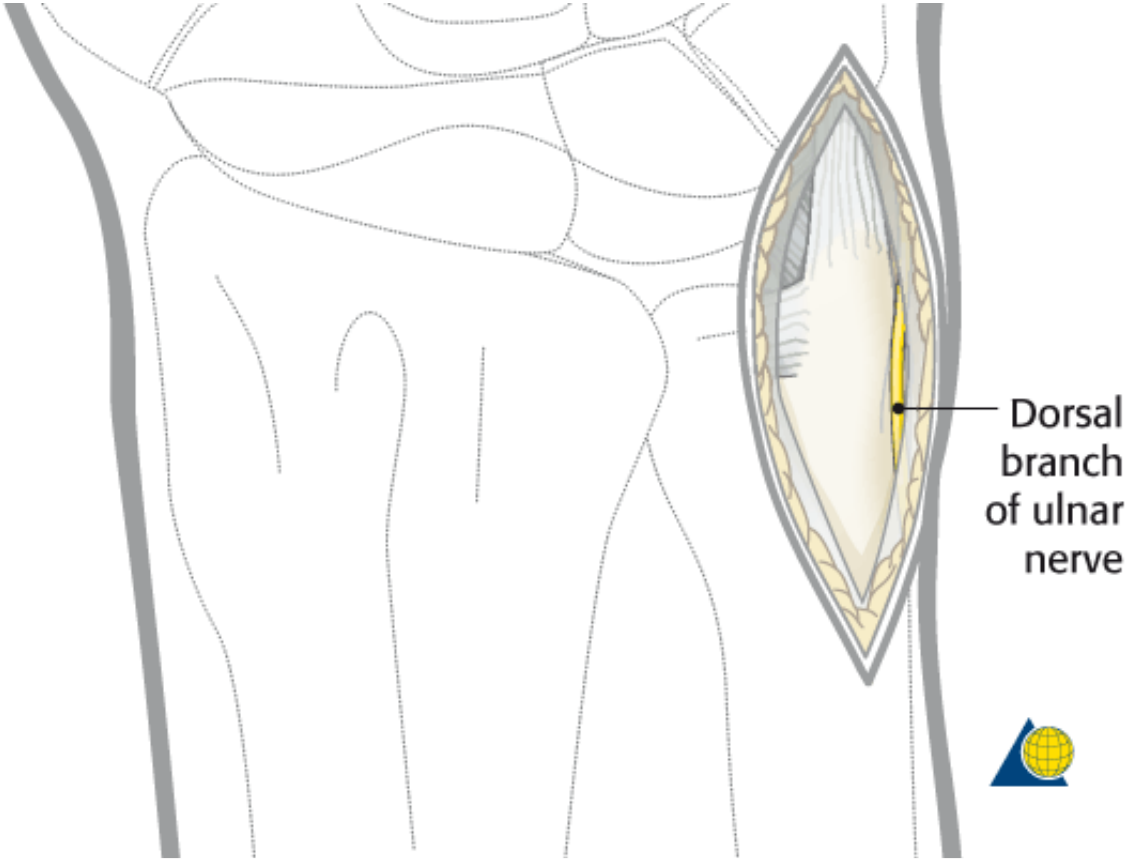
- Dorsal approach through 3rd / 4th dorsal compartment
  - Incise retinaculum / mobilise EPL



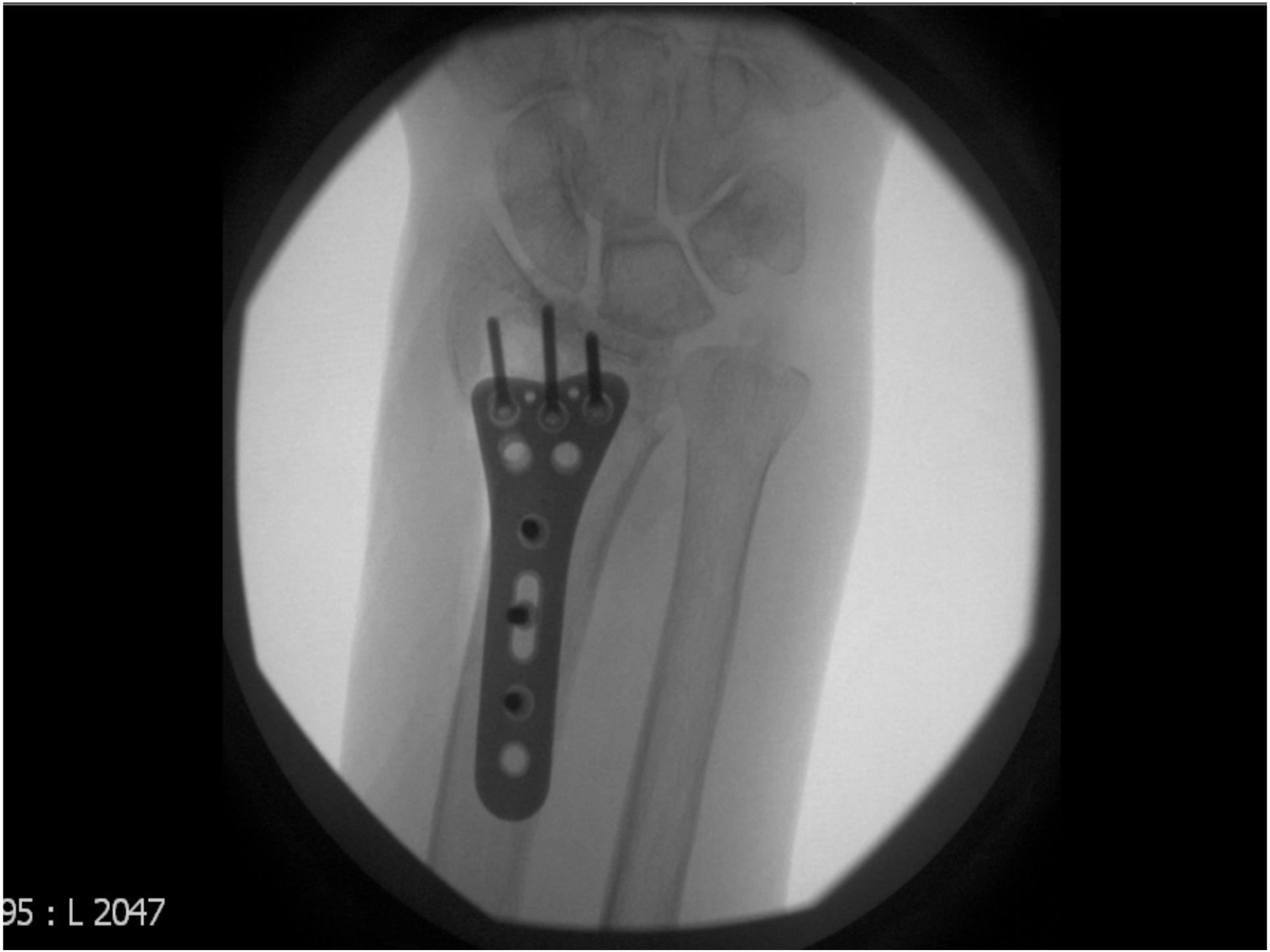
1 Extensor carpi radialis brevis and longus
2 Extensor pollicis brevis & Abductor pollicis longus
3 Extensor pollicis longus
4 Extensor indicis & Extensor digitorum communis
5 Extensor digiti minimi
6 Extensor carpi ulnaris



- Ulnar styloid – direct approach
  - Beware superficial ulnar nerve

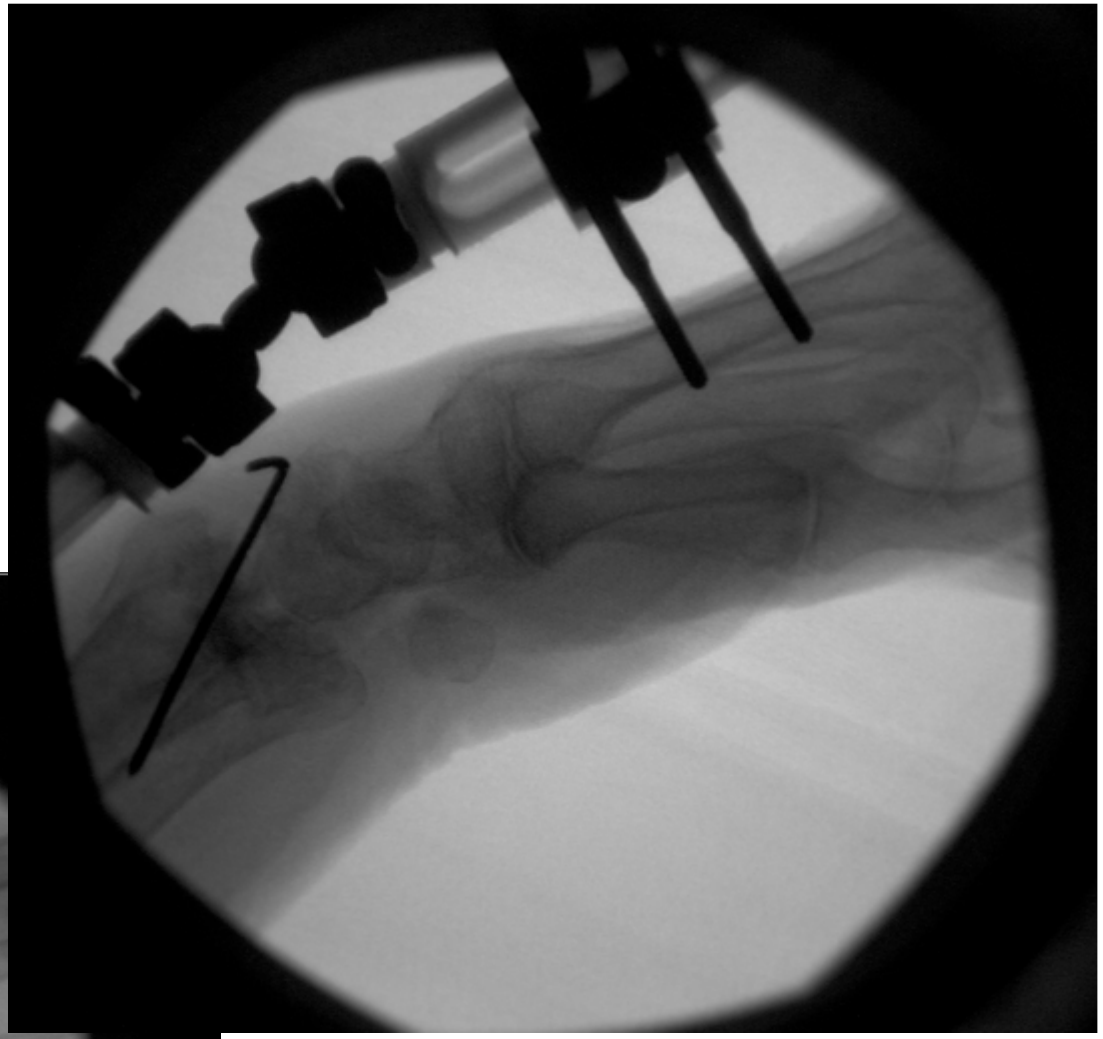


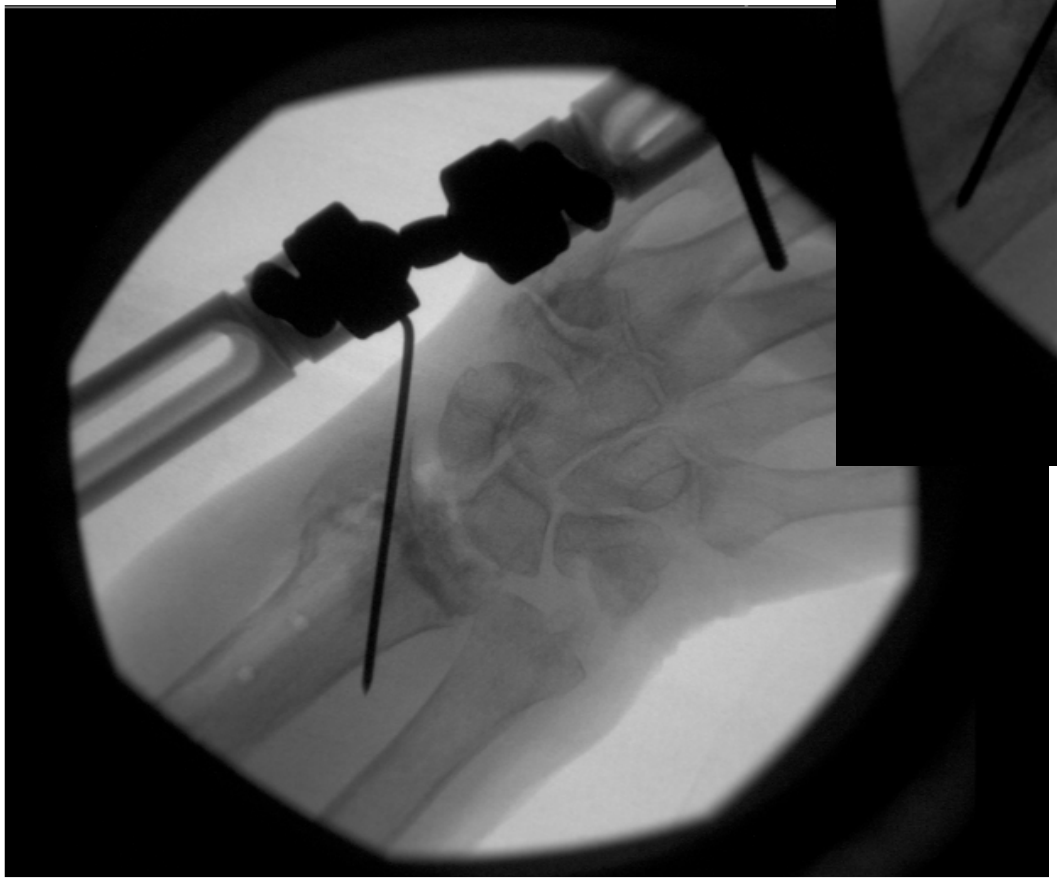

L
1.265 : L 1.685


95 : L 2047


L 2047


1
L
W 12860 : L 20115






1
L
PA
W 1.157 : L 2.272


1
W 1.222 : L 2.108


L
HBL