History of ulnar head replacement

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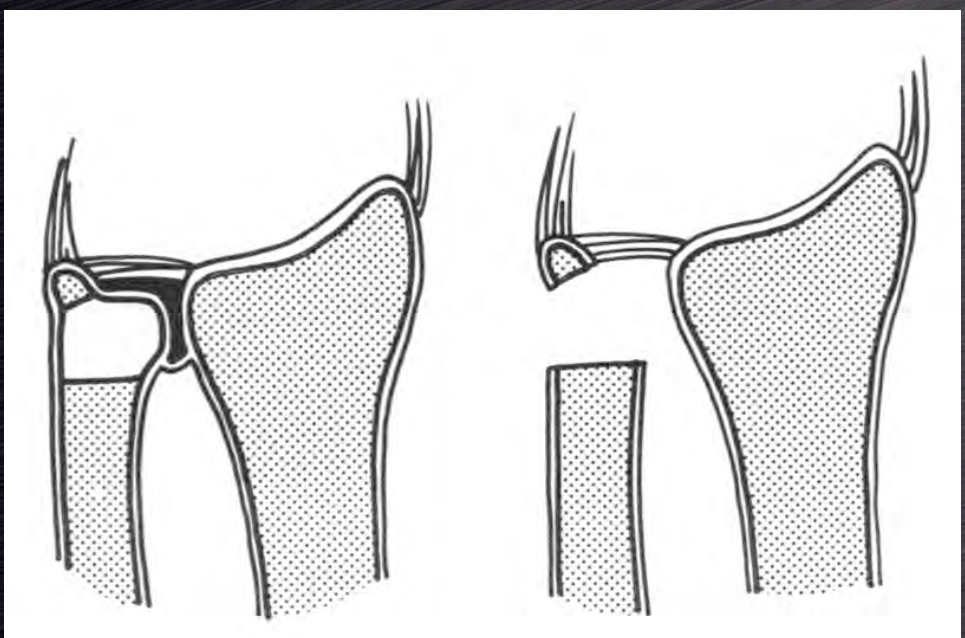
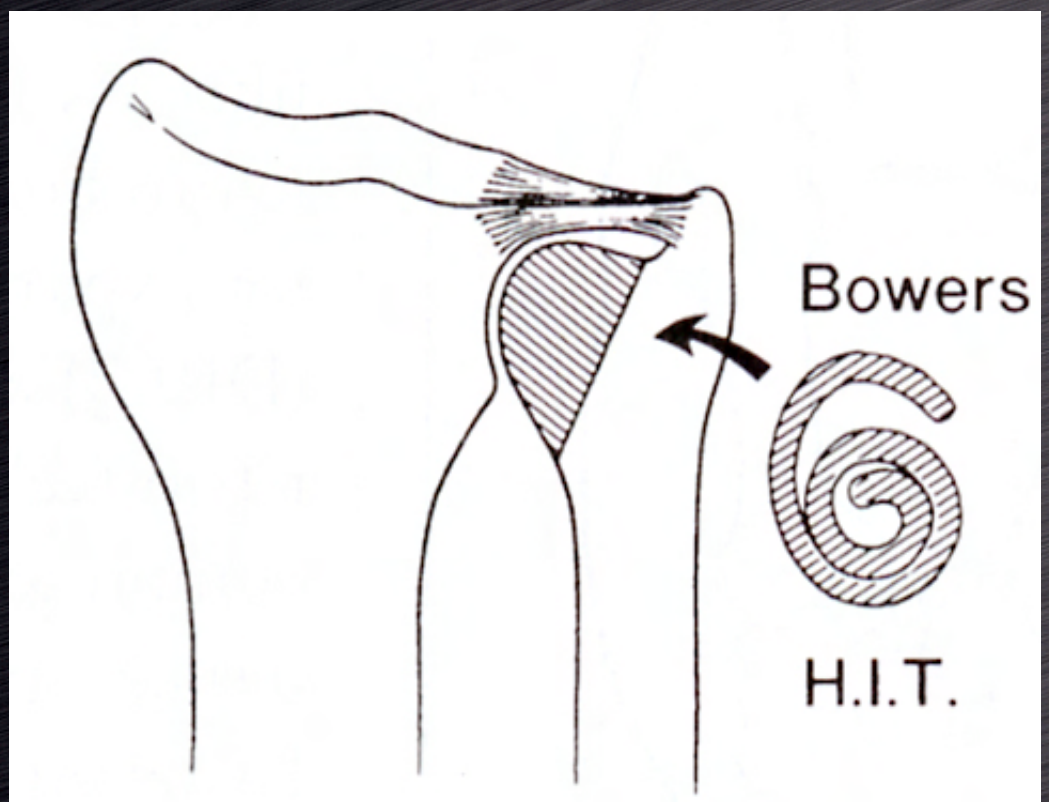
Ulnar head arthroplasty

- Darrach distal ulna resection (1912) was first described by Moore (1880) for fresh lesions and Lauenstein (1887) for sequelae



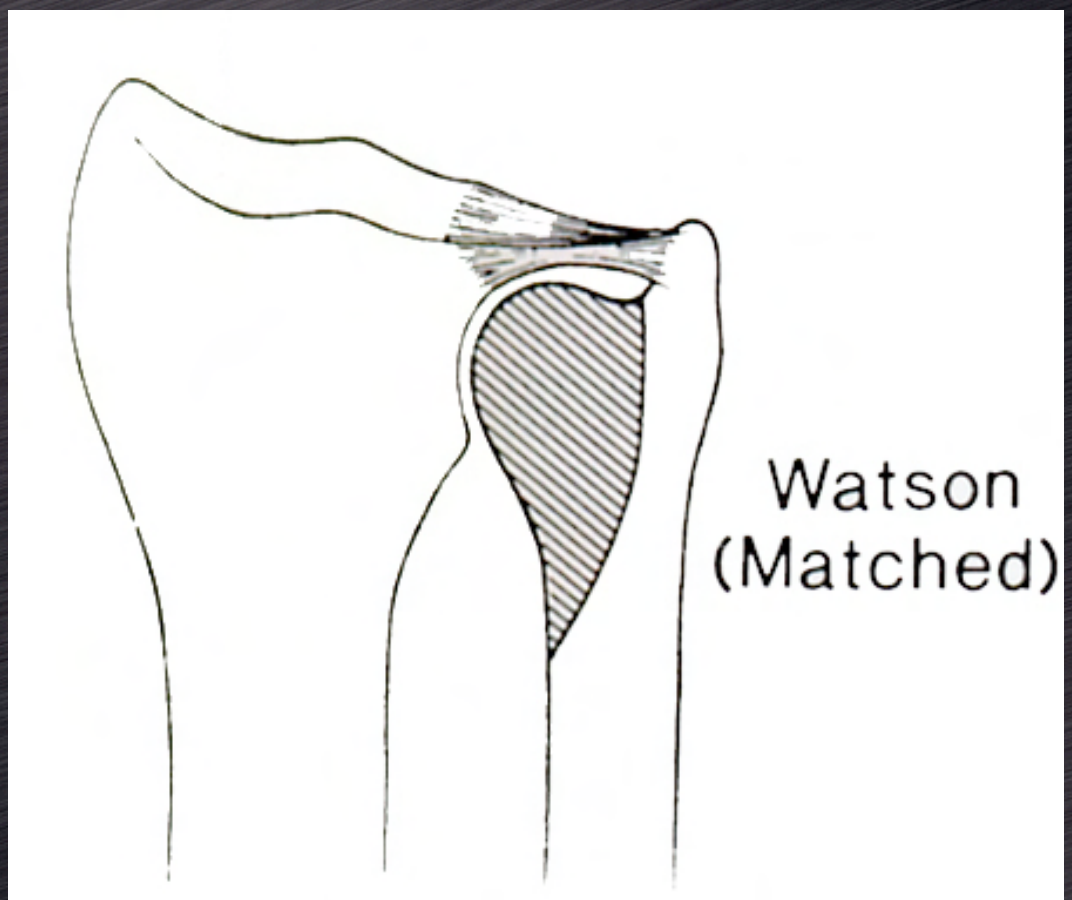
Variations

- Bowers (1985) described hemi-resection arthroplasty



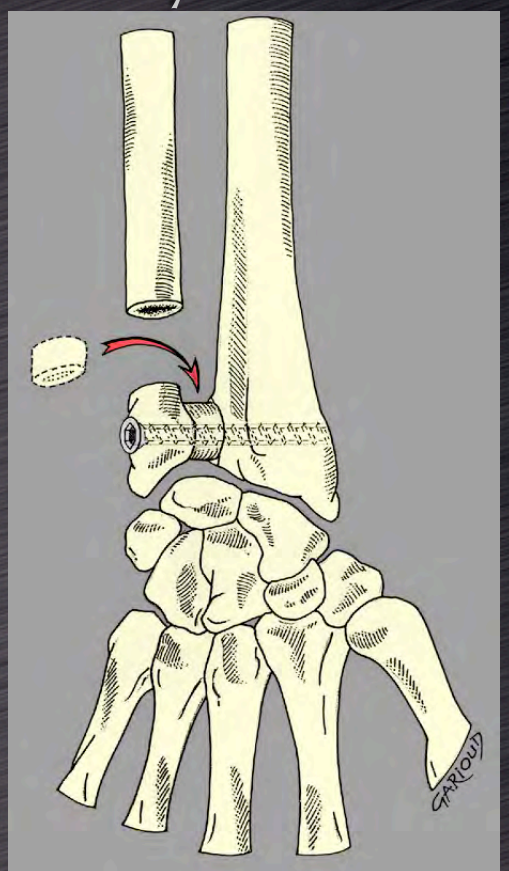
Variations

- Watson (1986) reported modeling of the ulnar stump



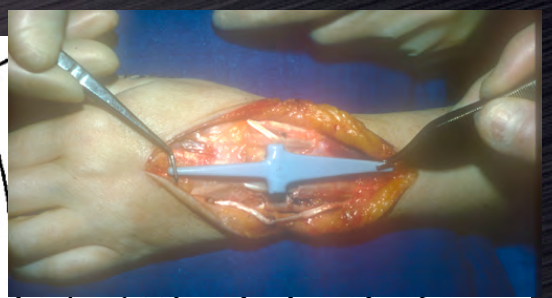
Variations

- Sauvé & Kapandji (1936) described radioulnar arthrodesis with voluntary ulnar pseudarthrosis



First implant : Swanson

- 1972 (1973 ?) first description of silicone ulnar head implant
- Goal: to limit the amount of ulnar resection needed when using a Swanson wrist implant and protect the wrist implant from bony spurs of the distal ulna



First publications ➥ first deceptions

- **Fatti (1986):** 7 cases, 5 had to be withdrawn (4 fractures). One left in place is broken
- **White (1986):** 18 cases of distal ulna resection with (7) or without (11) ulnar head implant : found no difference

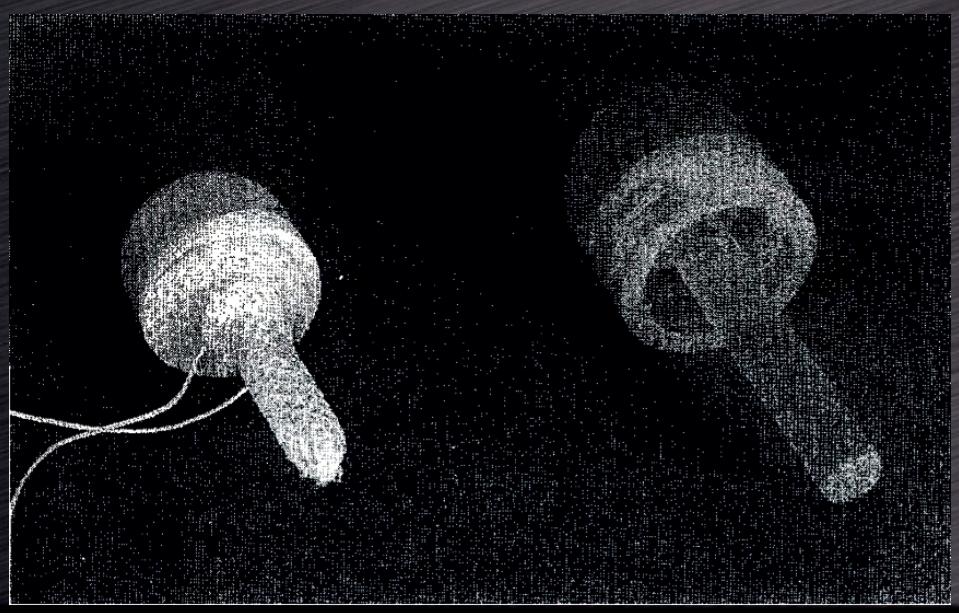
Abandoned in the 90's

- Mc Murtry (1990): 40 cases, 2 yrs FU
  - 78% good results
  - Bone resorption: 4,4 mm on average
  - 10% re-opération

- **Stanley & Herbert (1992):** 22 cases, 44 months FU
  - 70% good results
  - 100% bone resorption
  - 40% deviation
  - 15% Fracture

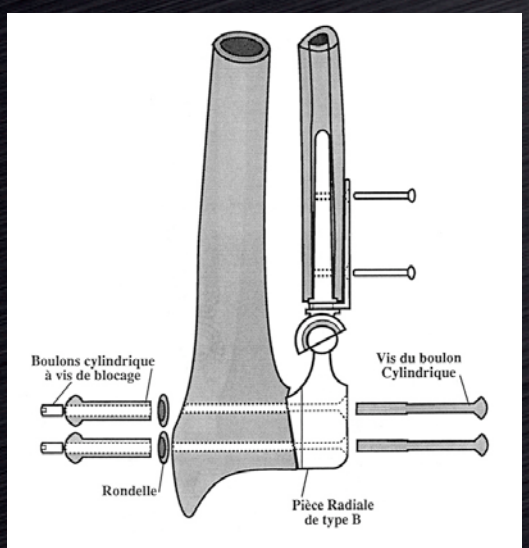
Swanson modified (dacron coated)

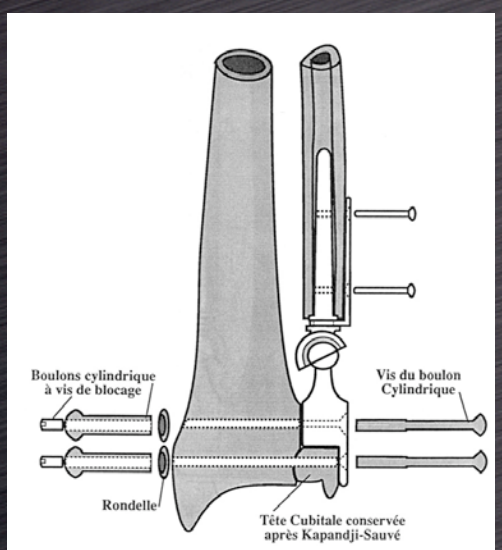
- Sagerman (1992), 45 cases, 91 months FU
- 63% have migrated or were broken



Ulnar head prosthesis

- Kapandji (1992) first to reported the use of a prosthesis of the ulnar head
- 2 models (with or without previous Sauvé-Kapandji)





Kapandji

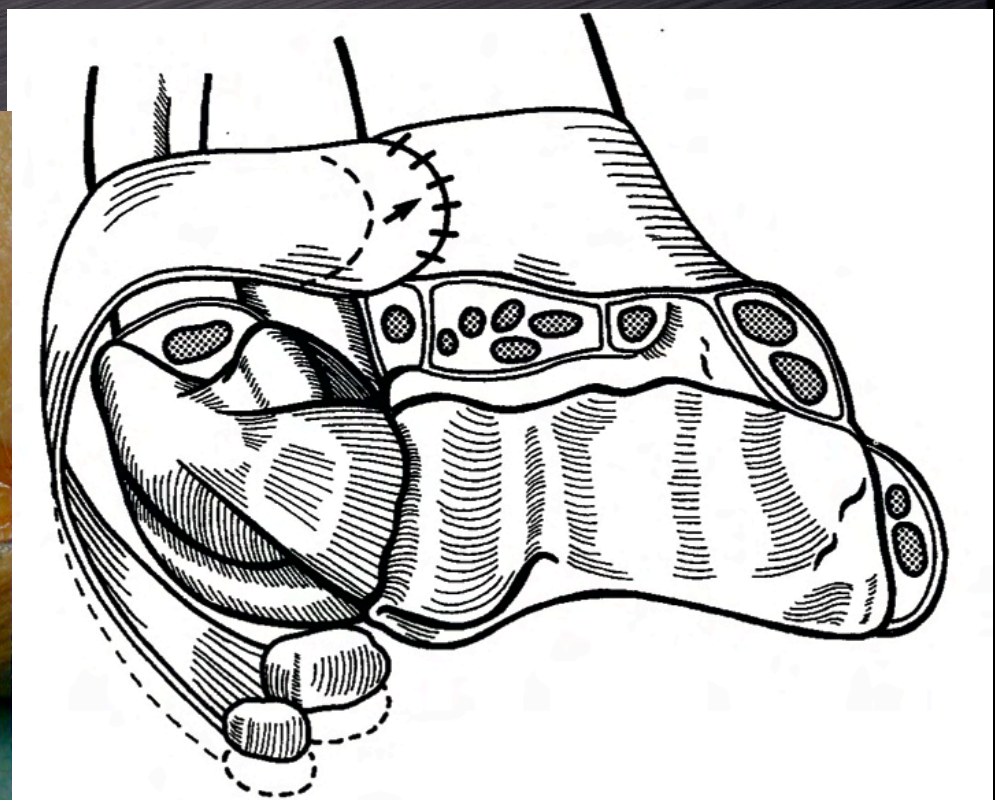
- 2 cases, 10 months FU, 1 patient had to be re-operated
- No other publication, the prosthesis has been withdrawned

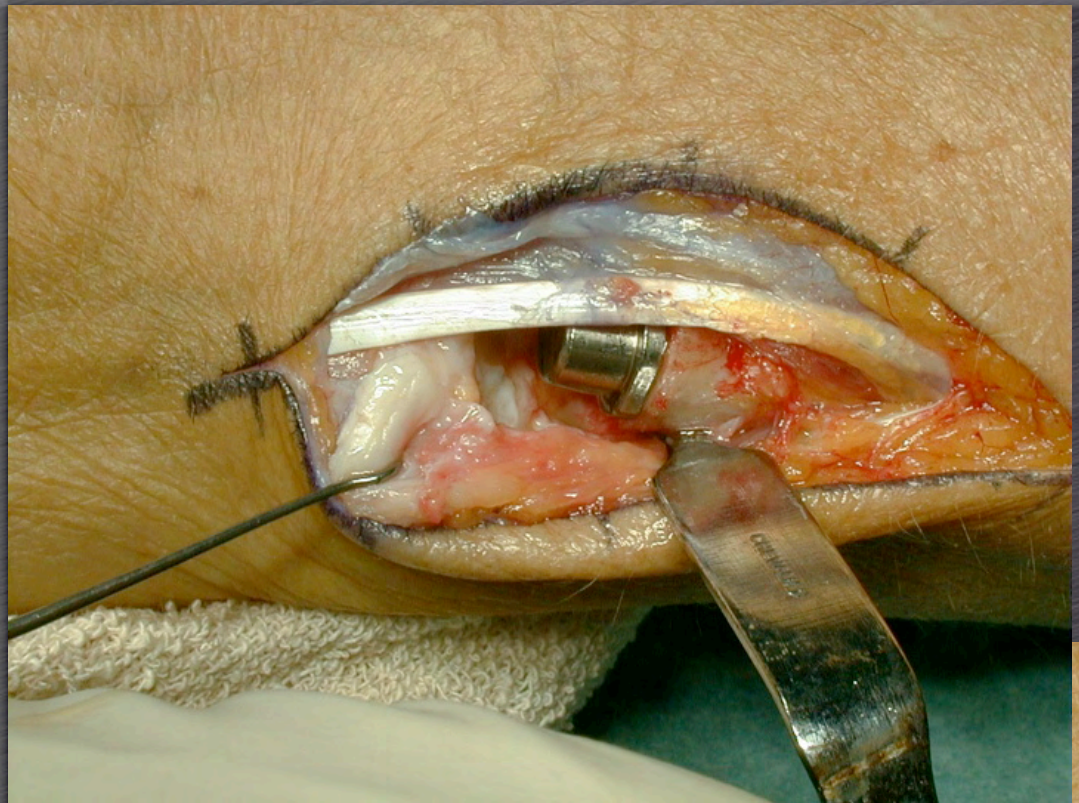
Herbert (1998)

- Von Schoonhoven & Herbert report the use of a modular ulnar head prosthesis with a titanium stem and a ceramic head they started to use in 1995

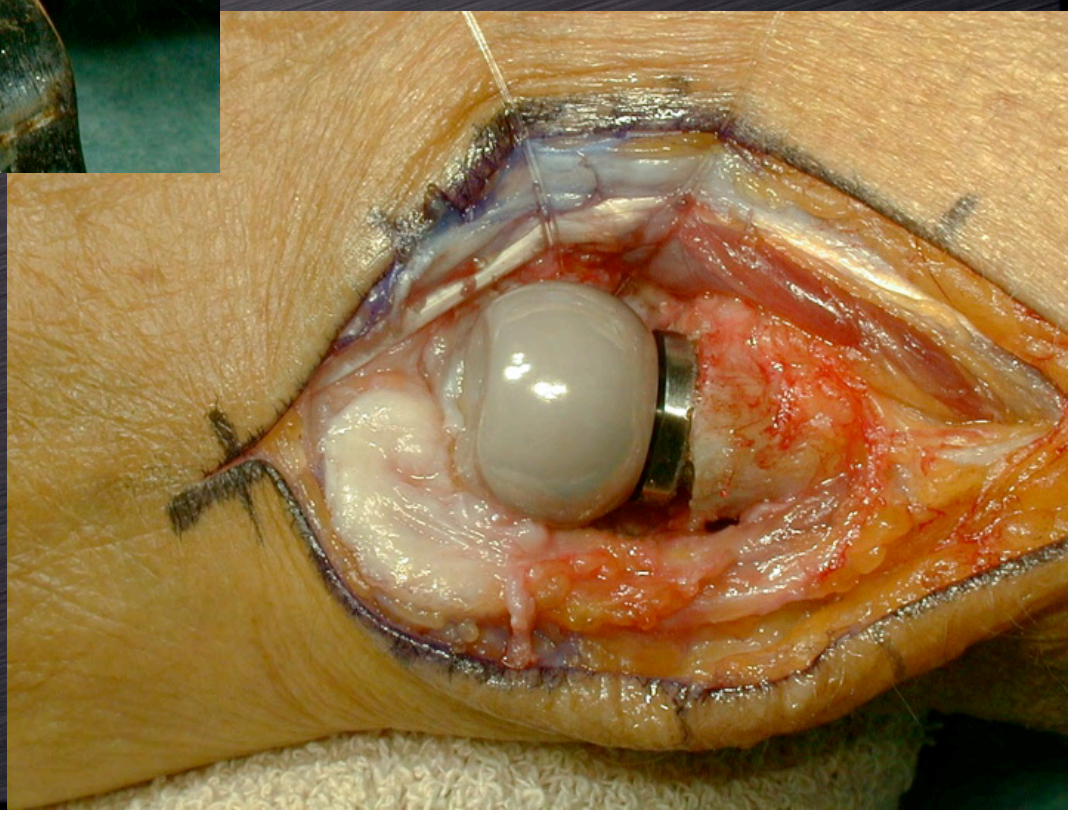
Herbert (1998)

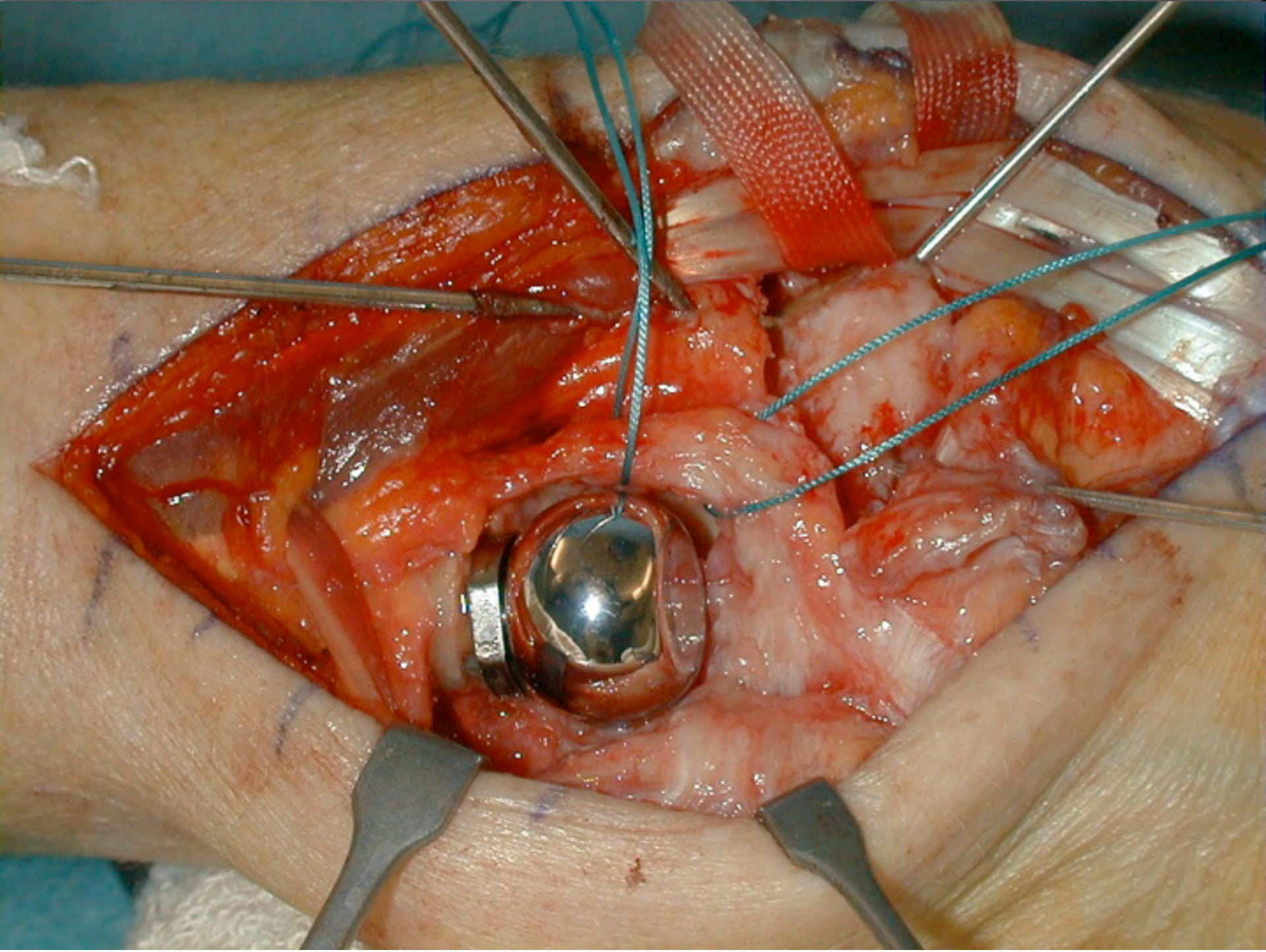
- They also use a capsulo-retinacular flap they described in 1992 to stabilize the implant





Titanium stem,
ceramic head





Herbert's prosthesis

- Von Schoonhoven (2000): 23 cases
  - 1 removal due to infection, 1 loosening
  - Bone resorption around the collar in all cases, 1-2 mm
  - Good results
    - Pain: 3,8 ↘ 1,9
    - Arc of rotation: 118 ↗ 158°
    - Grip strength: 42 ↗ 68%

Herbert's prosthesis

- Van Schoonhoven (2003): 57 cases (35 DRUJ instability, 22 OA), 38 m FU
- Pronation: 63 ↗ 78°
- Supination: 43 ↗ 76°
- Grasp: 51 ↗ 77%
- Pain: 3,6/4 ↘ 1,7/4
- All stable but 3

Instability

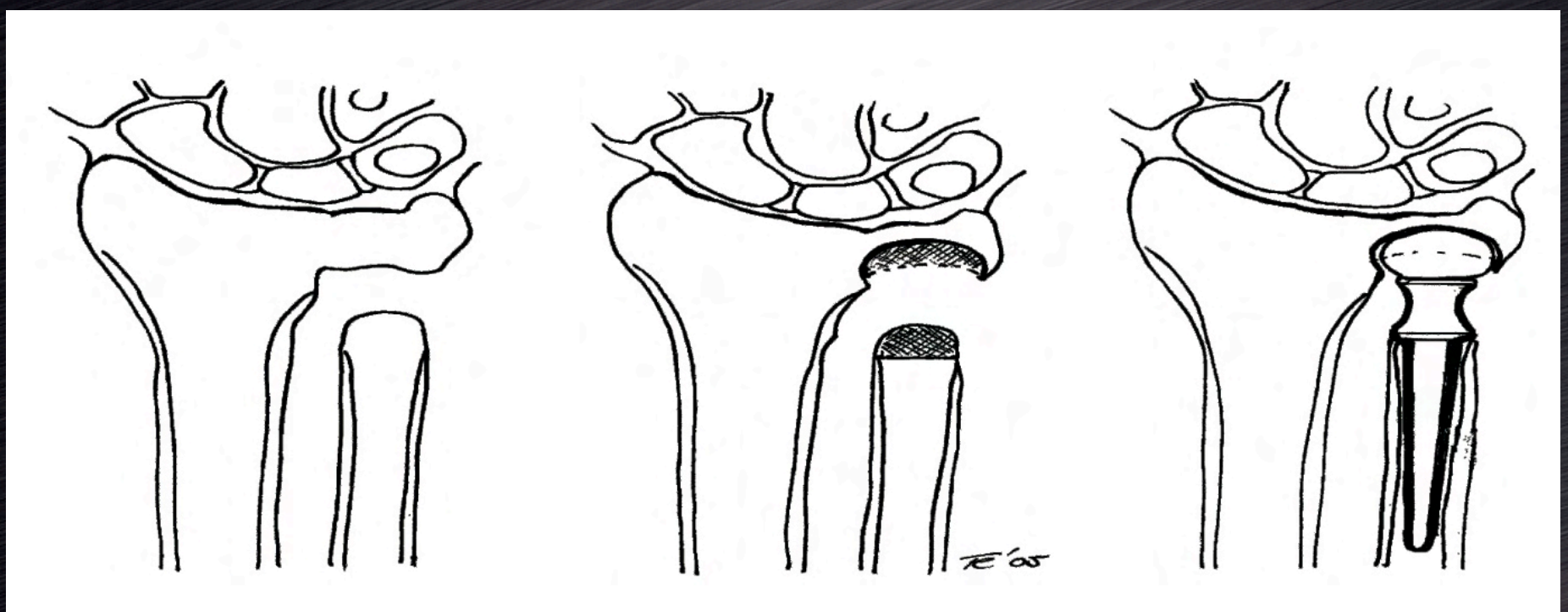
Downward migration

Two personal complications with this prosthesis

Other series with Herbert's prosthesis

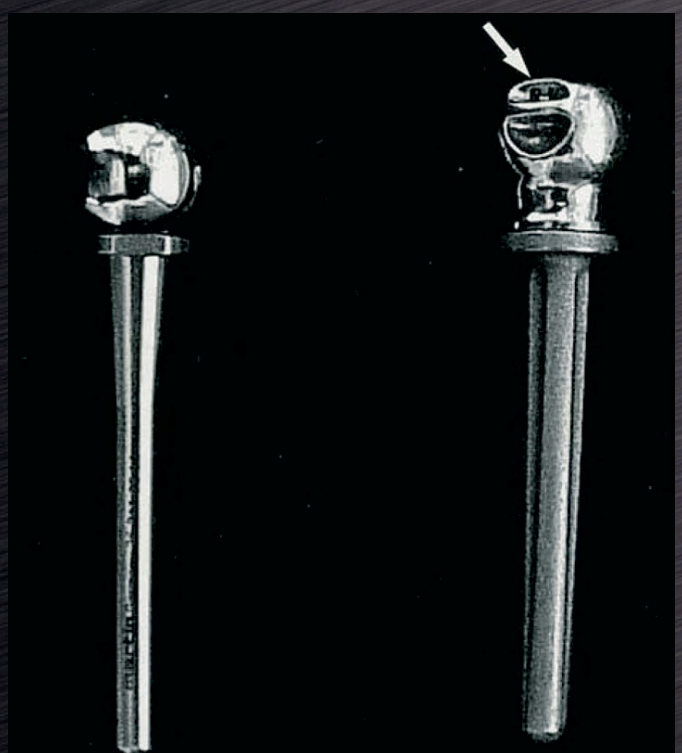
- **Grechenig (2001):**
  - 1 case for ulnar head fracture, 10 m FU
- **De Smet (2003):**
  - 3 cases for failure of Sauvé-Kapandji, 7-22 m FU,
  - 1 fracture of the prosthesis after a fall

- Fernandez (2006): 10 cases for failure of Sauvé-Kapandji, 2,6 yrs FU
  - Head placed in the bony block (2 fractures)
  - Strength: 27% ➚ 55%
  - Mobility: increase 7, worse 2, unchanged 1
  - 1 peri-prothetic ossification



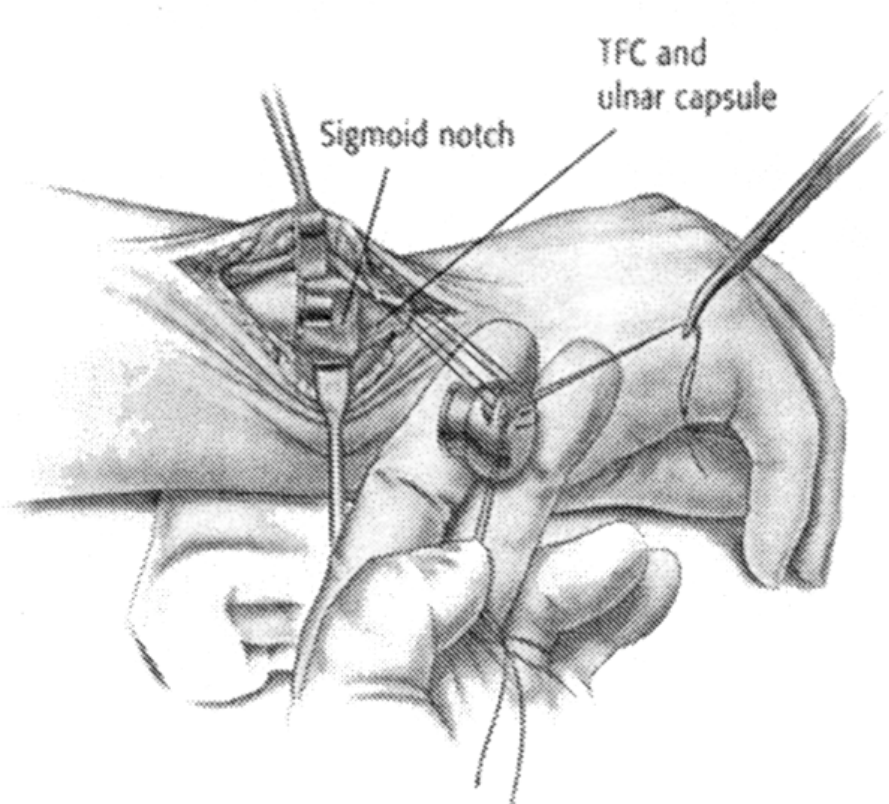
The « Rival»

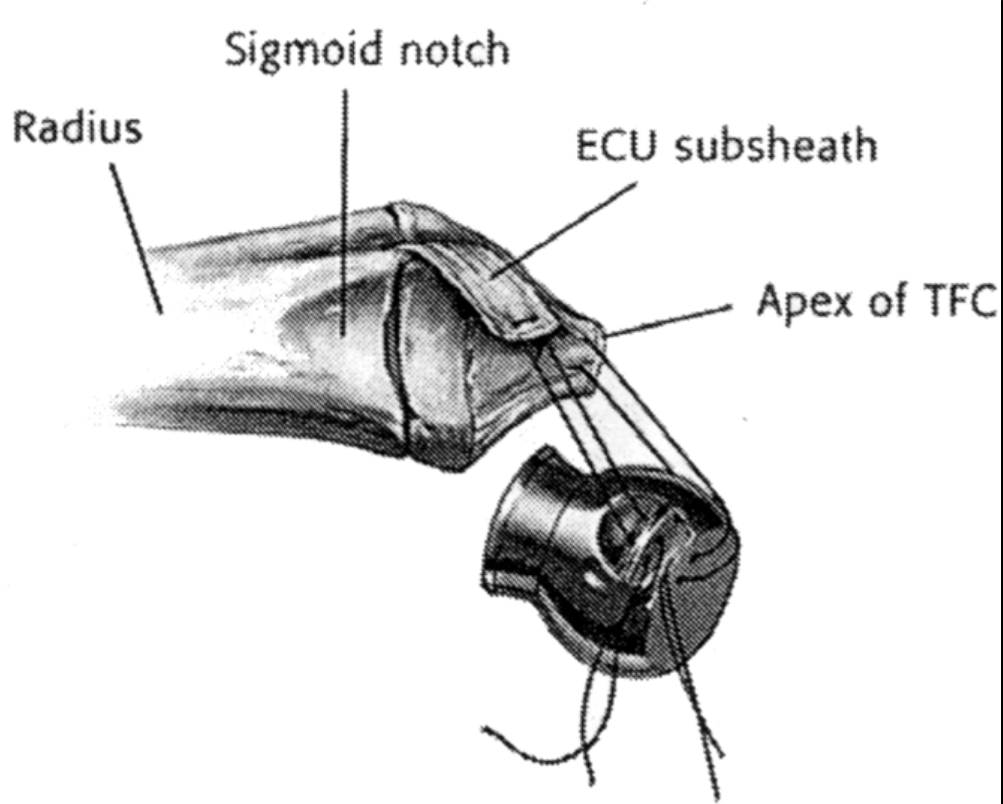
- In 2002, Berger reports of his model which is very similar to Herbert's prosthesis (Avanta, SBi)

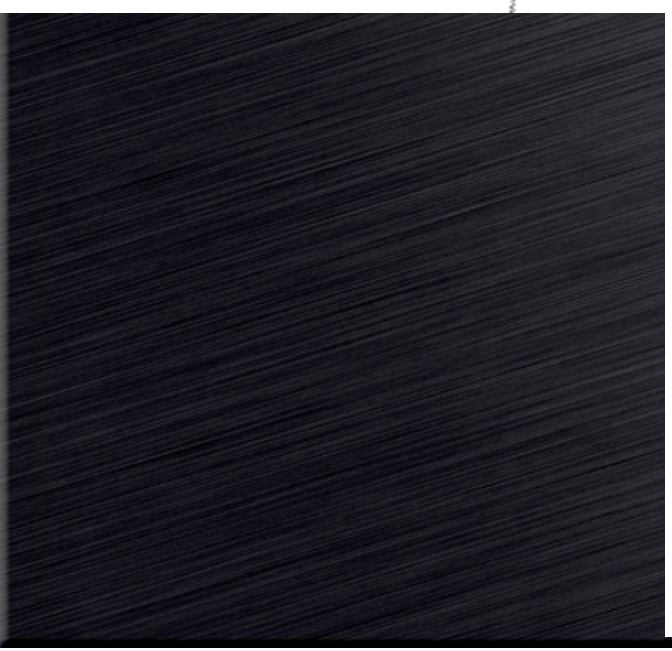


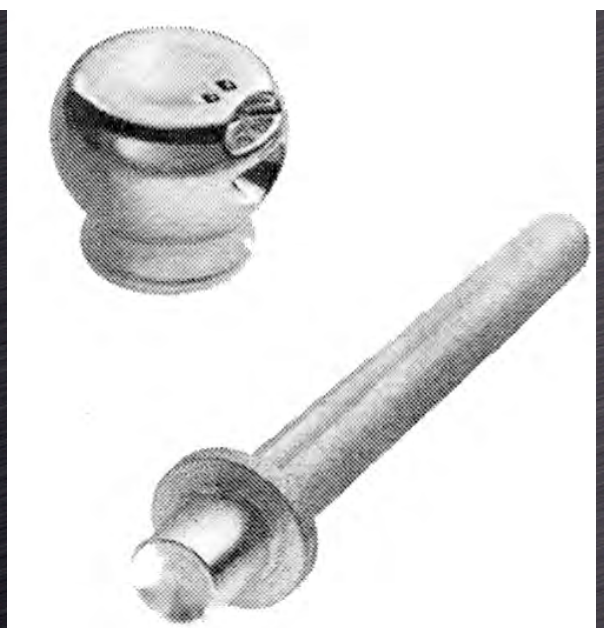
The « Rival»

- Modular (9 stem sizes, 3 head)
- A gutter for the ECU
- Holes for attachment of soft-tissues (TFCC)


TFC and
ulnar capsule
Sigmoid notch

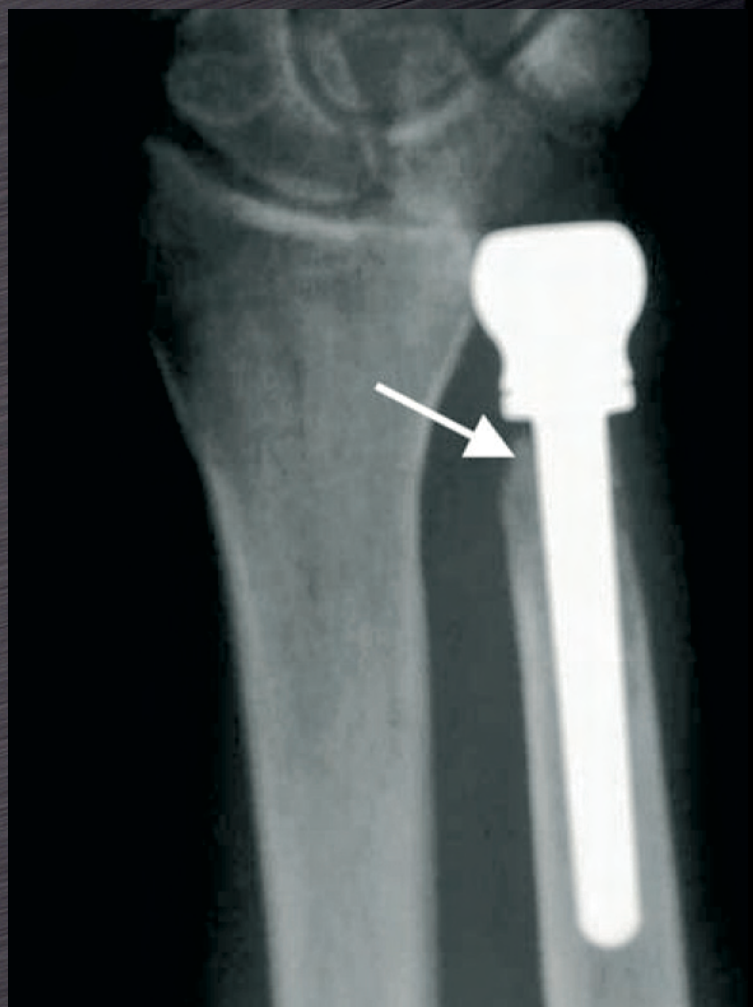

Sigmoid notch
Radius
ECU subsheath
Apex of TFC



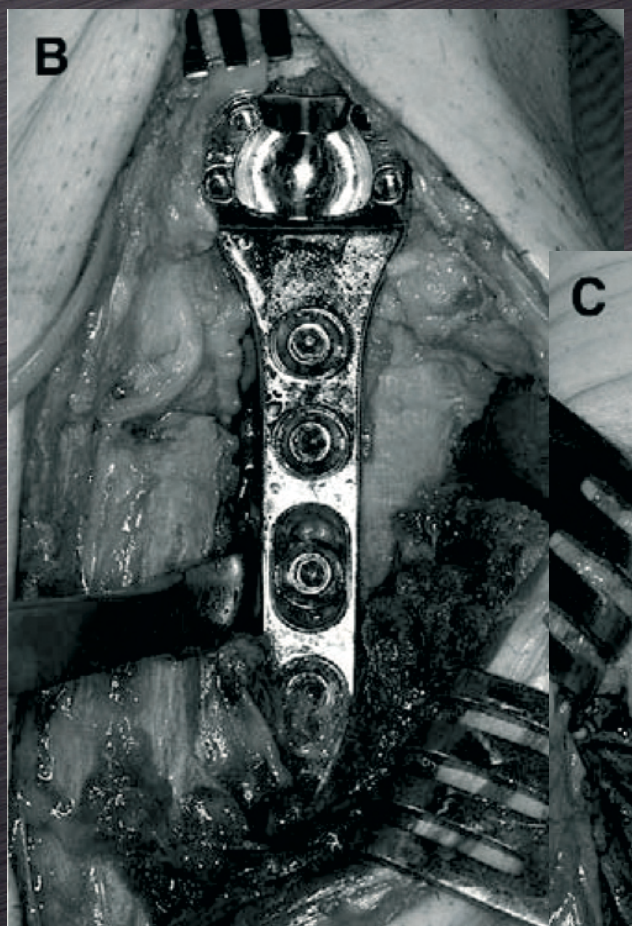


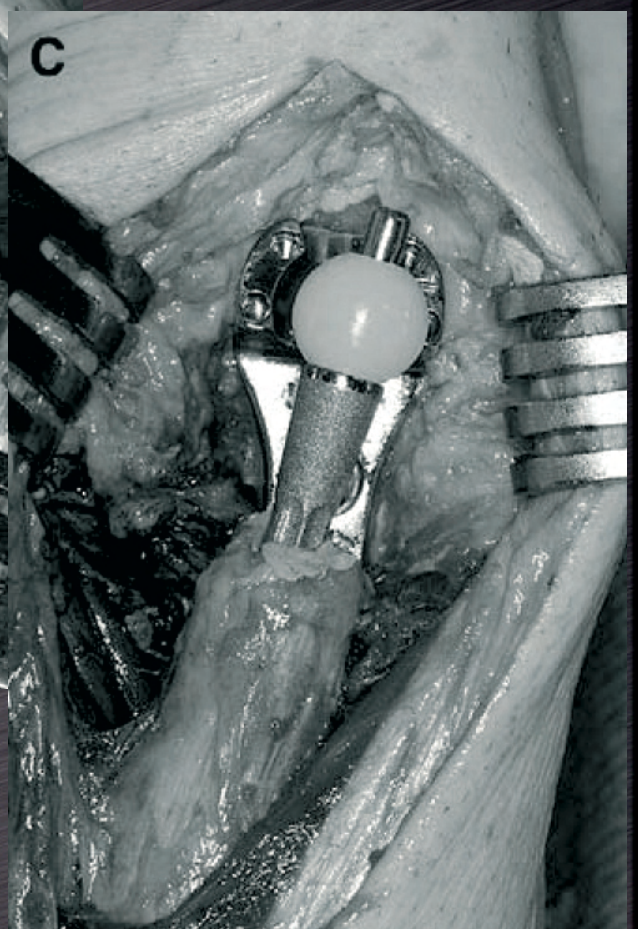
Mayo's prosthesis

- 19 cases (22 cases ?), 2 yrs FU
- Bony resorption of 3 mm between 6 & 12 months without further evolution
- 18 good results
- 2 loosening, 2 re-operations for instability



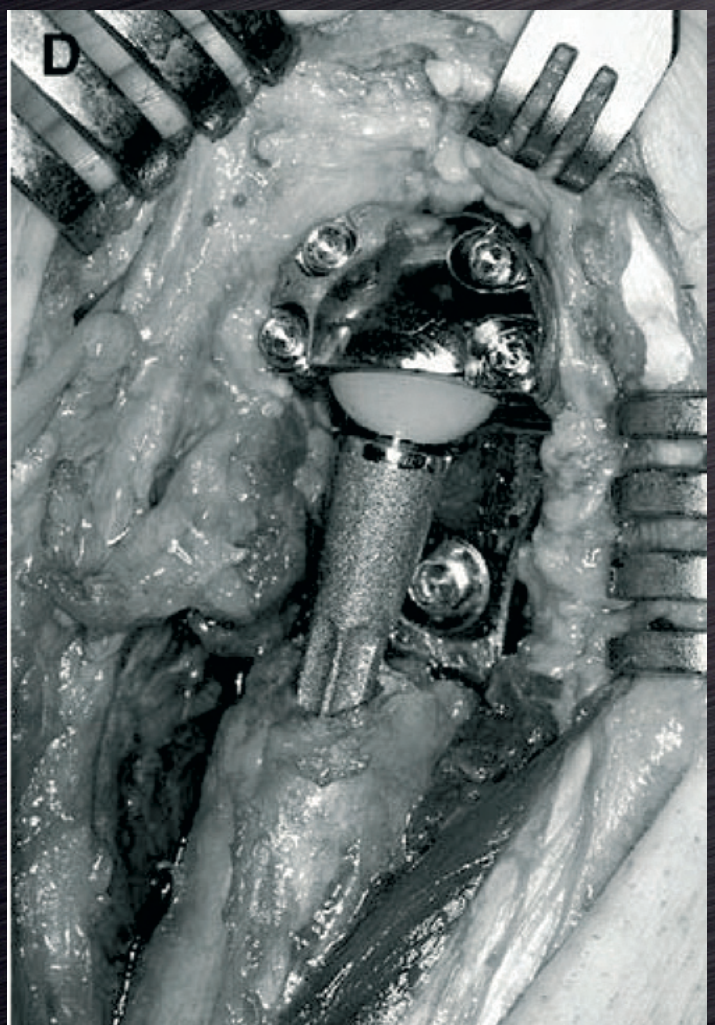
Other prosthesis

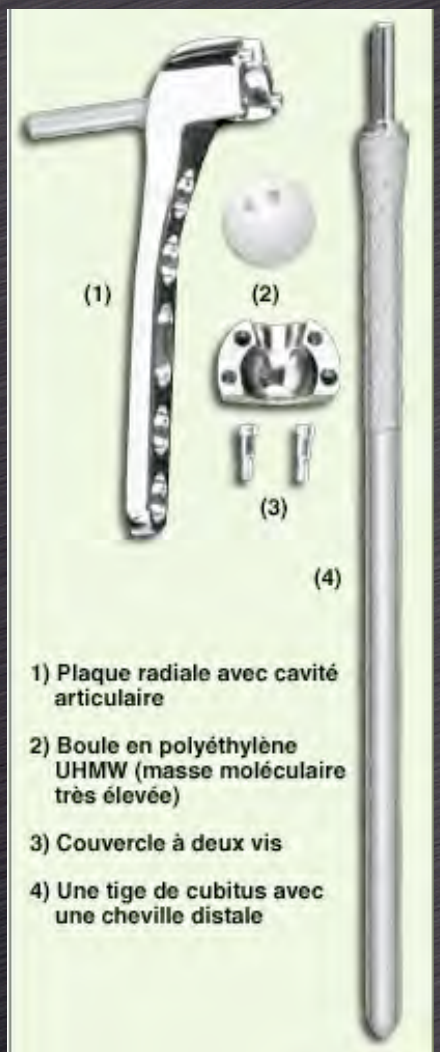


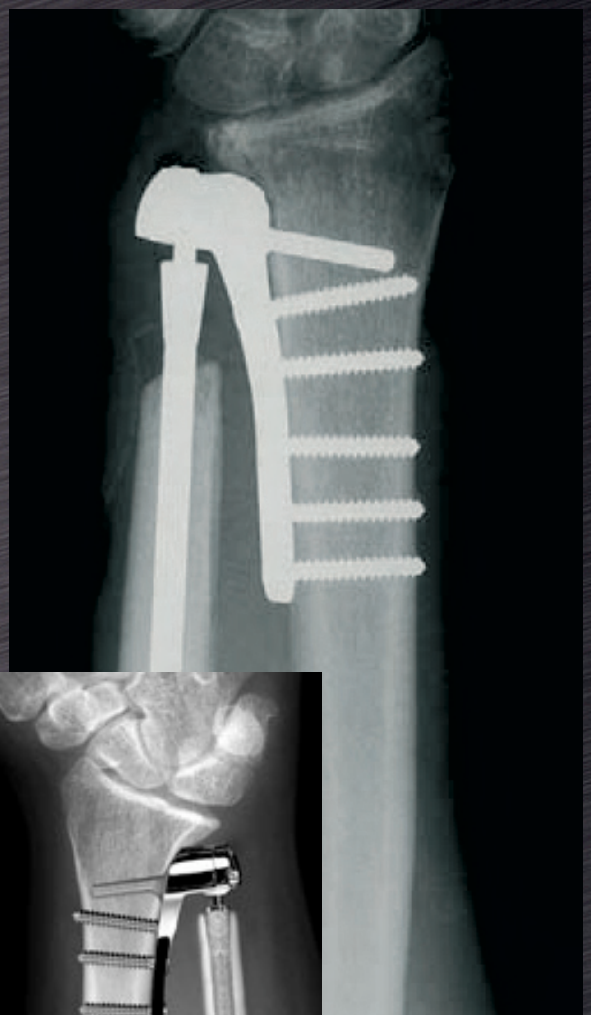


- Scheker (2001) reported 23 cases of his own design (Aptis) which is a total Radio-ulnar prosthesis

- To limit the constraints, the ulnar stem slides into the head during rotation





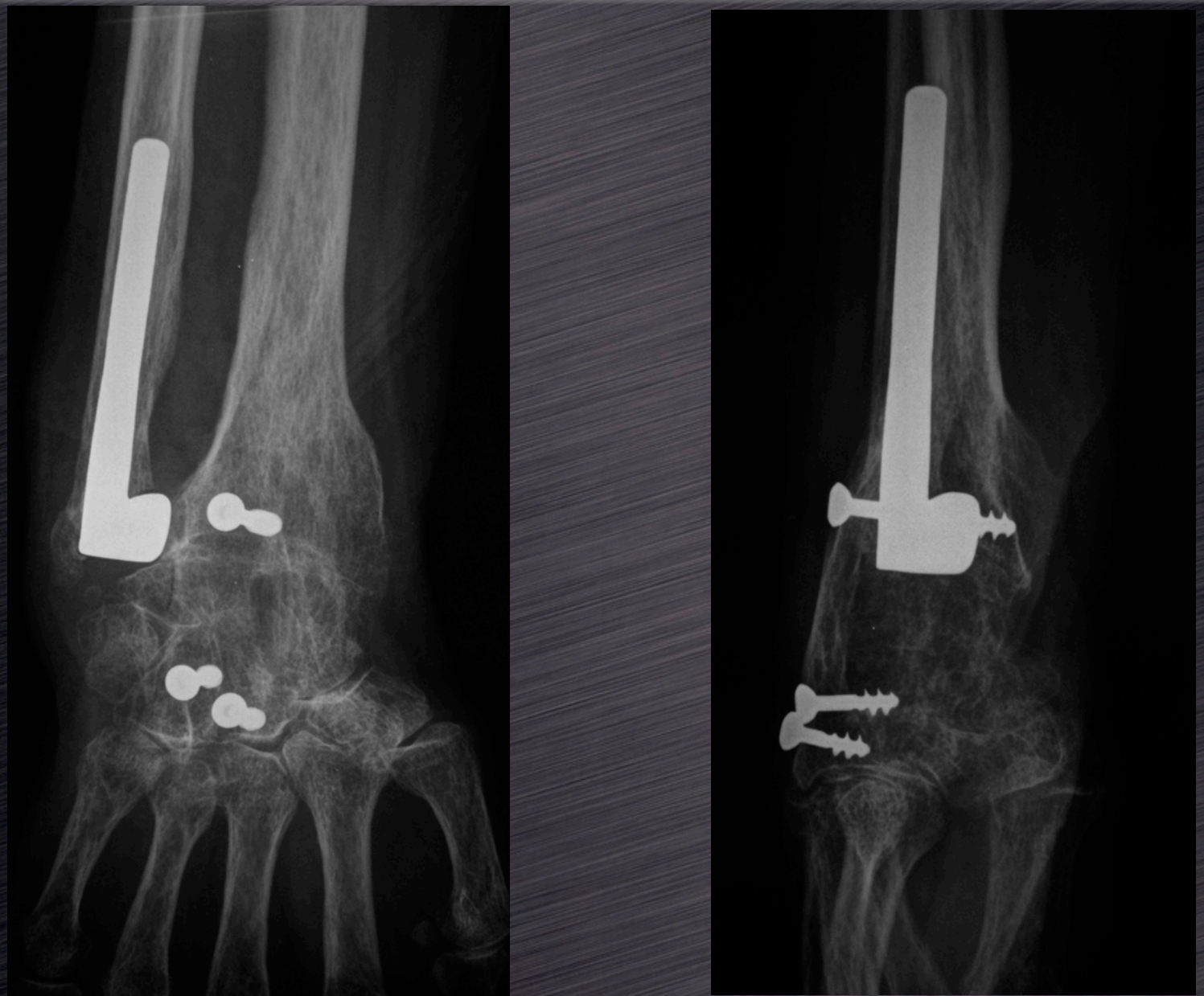


E-centrix (Wright)

- K. Gordon has designed with G. King a new ulnar head prosthesis with excentricity

1st choice DRUJ (Ascension)

- Two models: A partial resurfacing DRUJ and a modular head

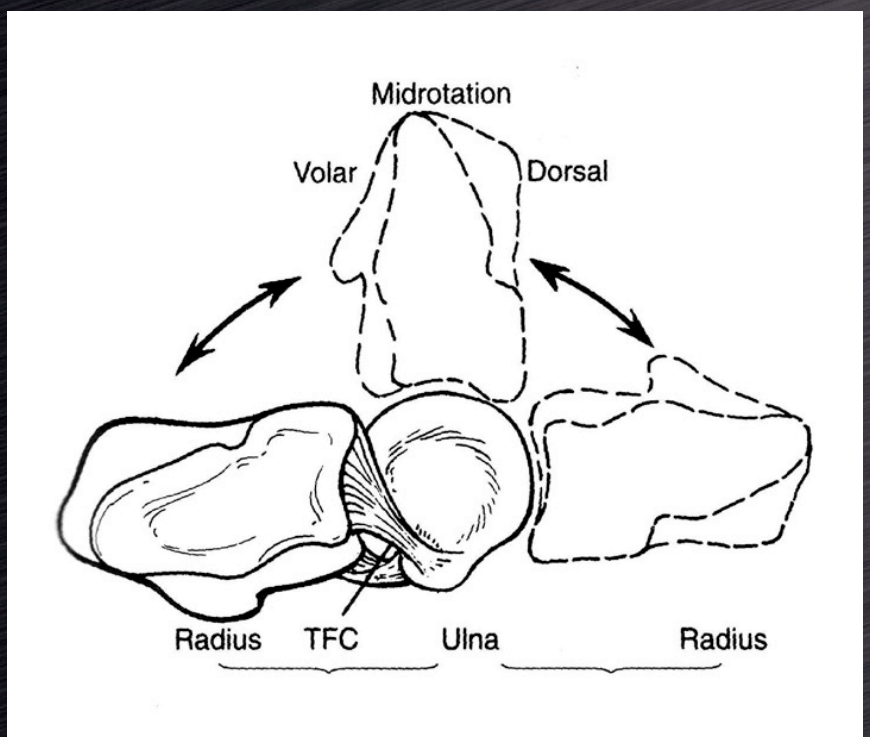


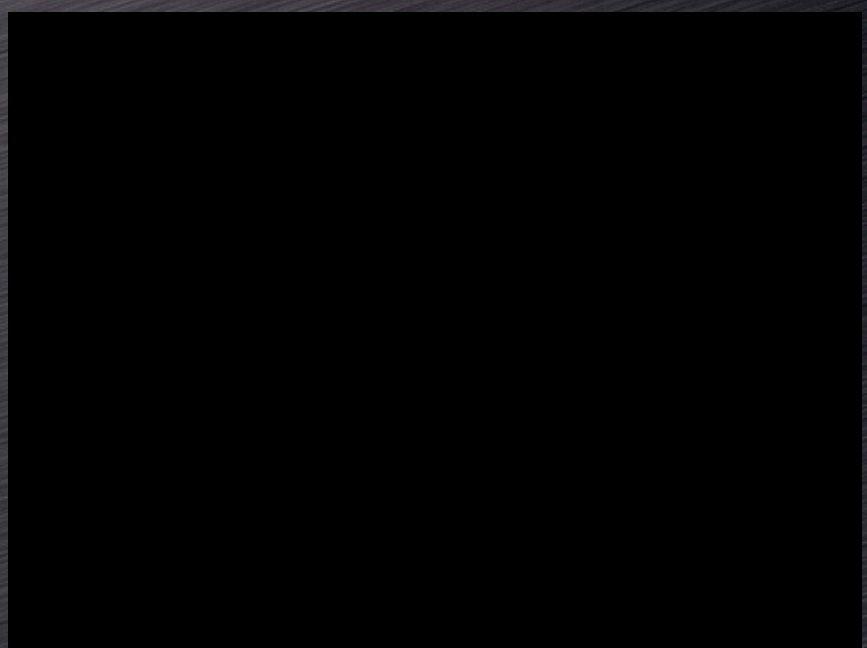
74 yrs old lady, painful forearm rotation 20 years after wrist fusion

2 questions ?

Rationale for ulnar head replacement ?

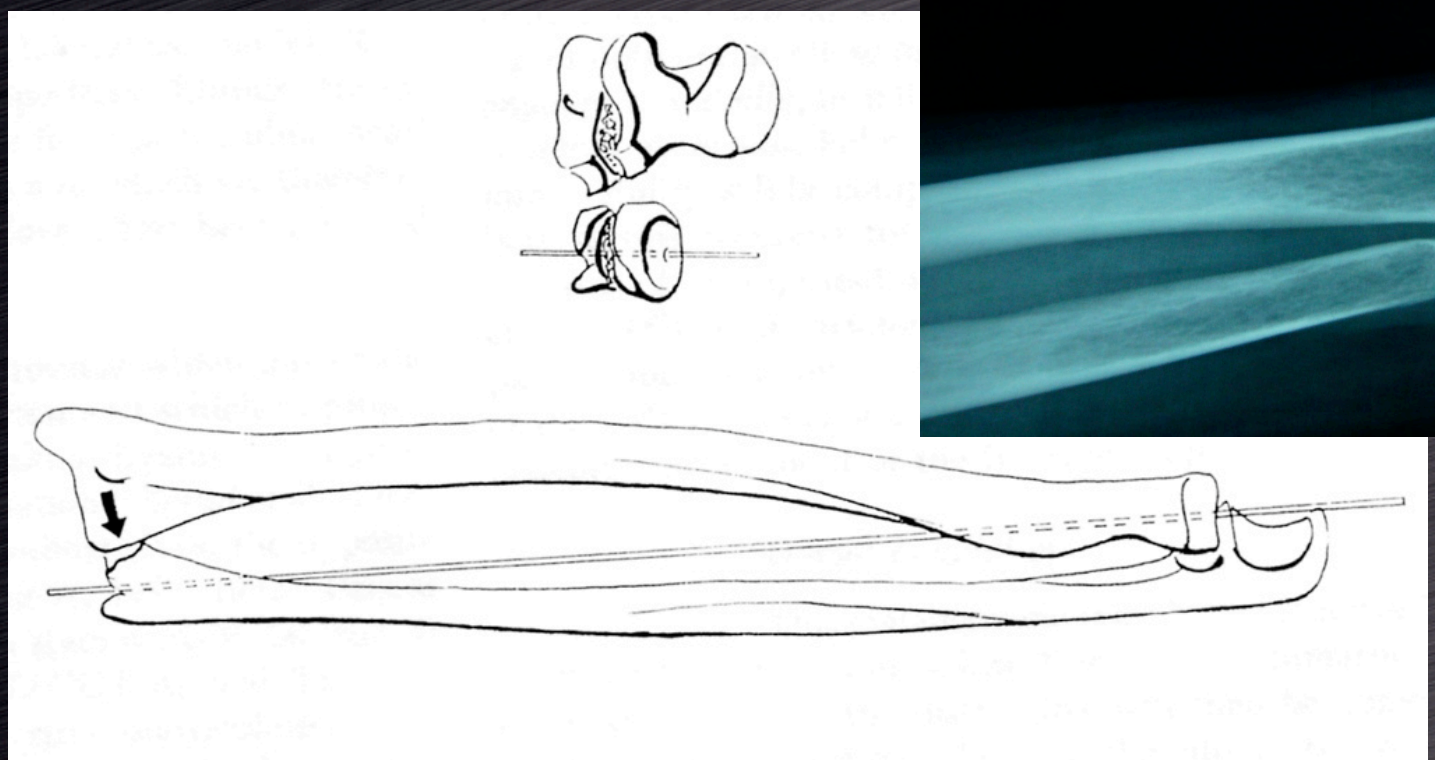
- At the wrist, the ulna does not move (the radius turns around the ulnar head)





Rationale for ulnar head replacement ?

- The ulna is the support of the wrist and hand (Hagert)



Rationale for ulnar head replacement

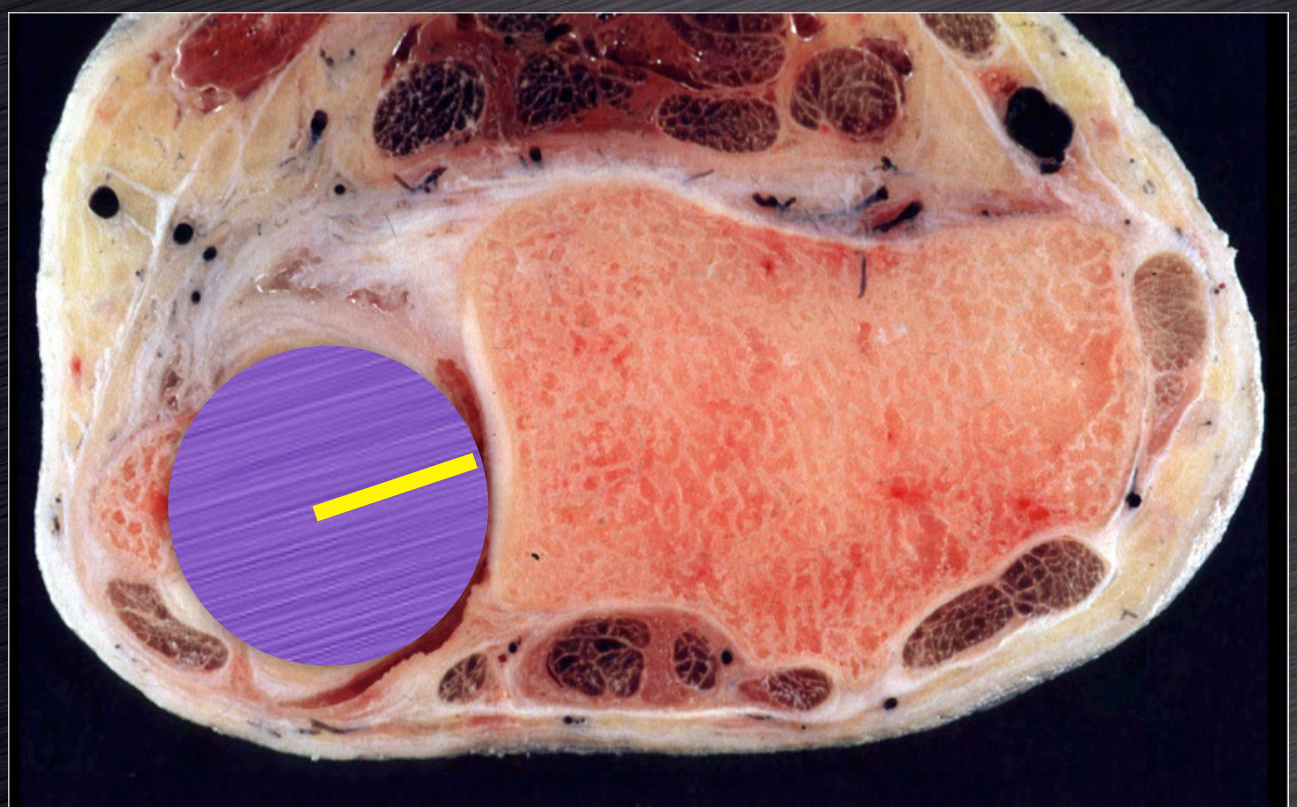
- Instability w/wo Radio-ulnar abutment is frequent after resection,
- When badly tolerated, it is very difficult to treat

Are ulnar head prosthesis adapted to DRUJ biomechanics ?

- Anatomical work
  - Af Ekenstam & Hagert (1985)
  - Gordon et al (2002)

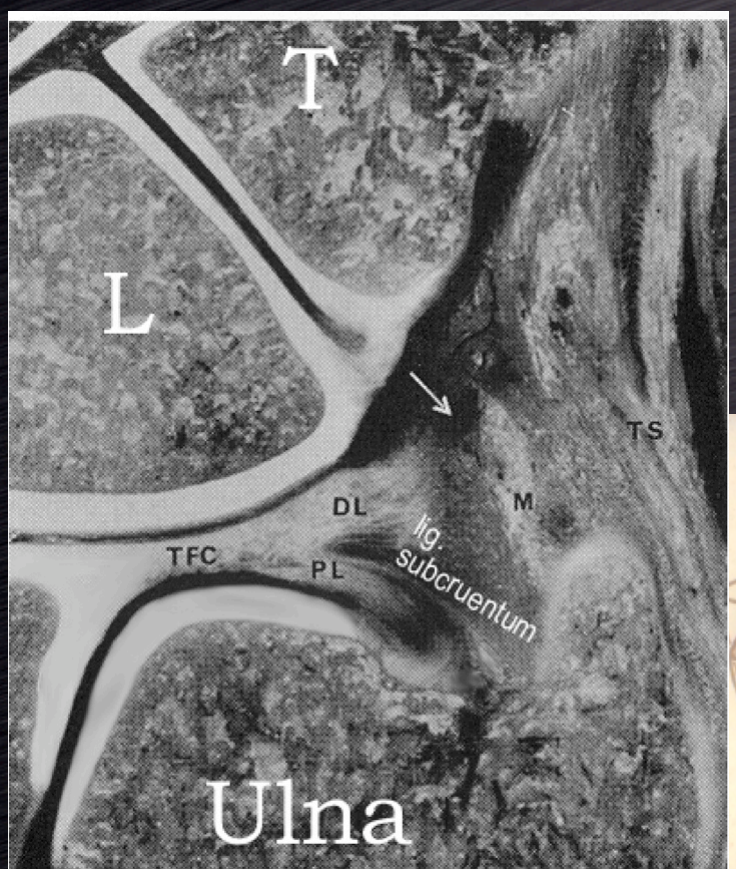
Anatomy of the ulnar head

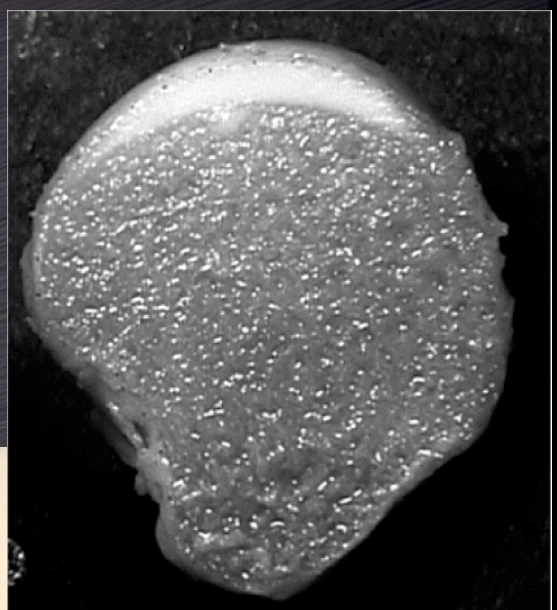
- Ulnar head Diameter: 16,8 +/- 1,6 mm
- Diaphysal diameter: 8,3 +/- 1,6 mm

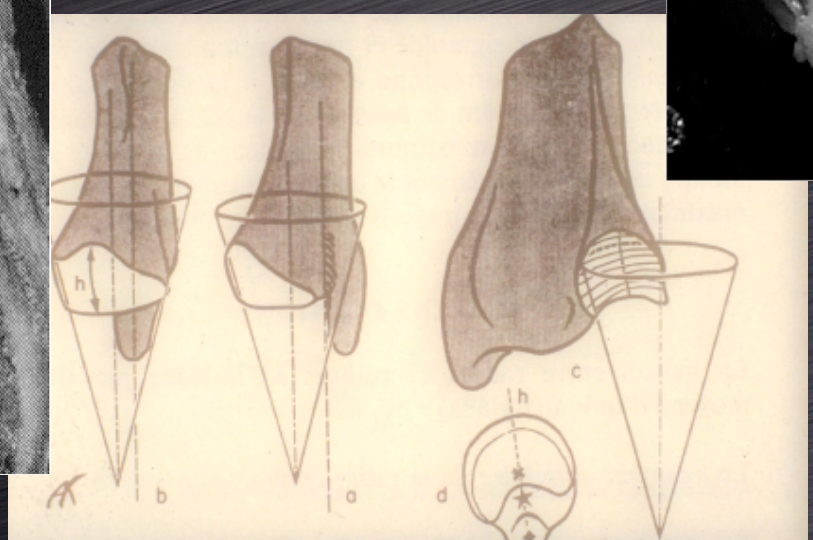


Anatomy of the ulnar head

- Arc of ulnar head: 176,9° = sphere

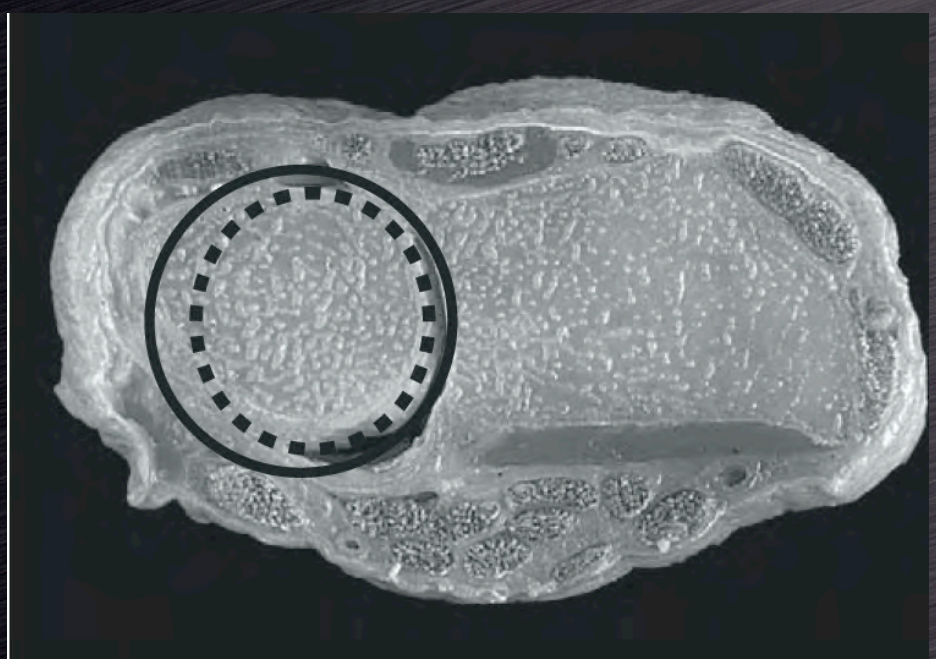






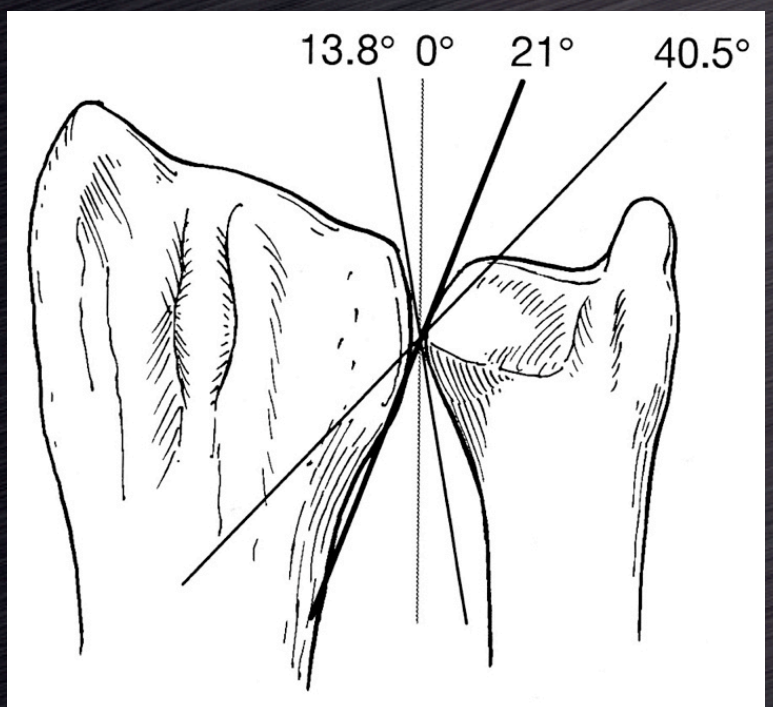
Anatomy of the ulnar head

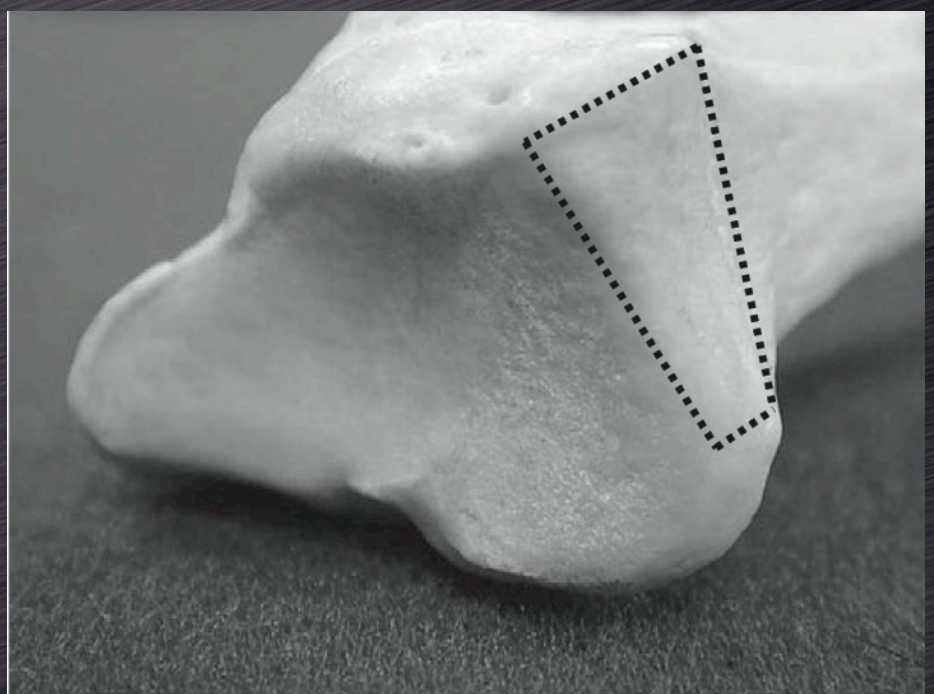
- Excentricity:
  2,5 +/- 1,4 mm



Radio-ulnar relationship ?

- The radio-ulnar joint may be conical, cylindrical or elliptical





Are ulnar head prosthesis adapted to biomechanics ?

- Masaoka (2002), Sauerbier (2002), Gordon (2003)
- Herbert's and Mayo's implant can restore an almost normal biomechanics
- However:
  - Anteroposterior stability is not fully restored
  - Suturing soft-tissue limits mobility

Conclusion

- Ulnar head replacement seems logical, regarding the importance of the ulnar head in the forearm stability and physiology
- The available designs seem roughly adapted to the demand
- However, there is still a large place for improvements regarding ulnar head excentricity, or radio-ulnar relationship

It's now time for practice under the supervision of an international leader !

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DISTAL RADIOULNAR JOINT SYMP

Distal Radioulnar Joint Replacement

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