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
Teaching Assistants

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- **Fatti (1986):** 7 cases, 5 had to be withdrawn (4 fractures).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- No other publication, the prosthesis has been withdrawn
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.
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: \(3.8 \Rightarrow 1.9\)
  - Arc of rotation: \(118 \Rightarrow 158^\circ\)
  - Grip strength: \(42 \Rightarrow 68\%\)
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
Two personal complications with this prosthesis

Instability

Downward migration
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-prothetetic ossification
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)
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 loosenings, 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 with or without 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)
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?


Herbert’s and Mayo’s implant can restore an almost normal biomechanics

However:

- Anteroposterior stability is not fully restored
- Suturing soft-tissue limits mobility
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!