The Coonrad-Morrey Total Elbow Replacement

Clinical results and personal experience

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COONRAD-MORREY ELBOW (1979)

- sloppy hinge (semiconstrained) with polyethylene bushing with 7 degrees of laxity
- „anterior flange”
- Tivanium (Ti-6Al-4V) alloy
- triangular humeral and quadrangular ulnar component
- 12 humeral and 10 ulnar components
- complete interchangeability

Rheumatoid arthritis

1992 - Morrey and Adams - 54 RA cases
- 91% excellent and good at 2-8 years
- no loosening

1998 - Gill and Morrey - 76 RA cases
- 88% excellent and good at 10 to 15 years
- 92.4% prosthesis survival rate !!!

1999 - Connor and Morrey - 22 JCA cases
- 90% excellent and good at 7.4 years
- 10% loosening

Humeral nonunions

1995 - Morrey and Adams - 36 humeral nonunions

- 86% excellent and good at 4.2 years
- no loosening

2008 – Cil at al. – 92 humeral nonunions

- 85% excellent and good at 5.5 years
- 44 complications, 32 reoperations, 23 revisions
- 96% survival at 2 years, 82% survival at 5 years, 65% survival at 15 years

Post-trauma cases

1997 - Schneeberger et al. - 41 post-trauma cases

83% excellent and good at 5.8 years

no loosening but 12% ulnar comp. fracture

2007 – Matsumoto at al. – 13 elbows with periop. condylar fractures and 27 intact elbows

no difference of Mayo score strength and ROM at 4.8 years

Acute fractures

1997 - Cobb and Morrey - 21 acute fractures

- 96% excellent and good at 3.3 years
- no loosening

2005 – Muller at al. - 49 acute fractures

- 5 revisions performed at 7 years

2008 – Prasad and Dent – 15 acute fractures and 17 post-trauma cases

- less complications and better survival in acute cases 93% versus 76% at 7 years

Instability

1999 - Ramsey et al. - 19 instability cases

84% excellent and good at 6 years, no instability

1 humeral comp. loosening, 2 ulnar comp. fractures

2005 - Mighell et al. – 6 chronic dislocations

no loosening at 5.8 years, no instability

1 periprosthetic fracture, 1 bushing exchange

Fused or ankylosed elbow

2008 – Peden and Morrey - 13 cases

- 7 good and excellent at 12 (2-26) years
- 37 to 118 degrees of flexion
- but high complication rate
  - more than half had been reoperated
  - 2 soft tissue breakdown
  - 1 ulnar comp. fracture
  - 3 deep infections
  - 3 manipulation under anesthesia

FAILED IMPLANT

EXCISION ARTHROPLASTY

poor results with highly unstable elbow

ARTHRODESIS

technically difficult, poor functional results

REVISION

costume made TEA

nonconstrained TEA

semiconstrained TEA

+/- bone grafting

Revisions

1997 - King et al. - 41 revisions

- 85% excellent and good at 6 years
- 41% intra-op. and 32% post-op. complications
- 8 additional op., 3 re-revisions, 4 excision

2007 – Shi at al. – 30 revisions

- at 5.5 years Mayo score was 84
- the survival was 64%

Revision for prosthetic fractures

2006 – Athwal and Morrey

- 27 revision TEA for 17 ulnar and 10 humeral component fracture of different designs
- 7 cortical perforations, 5 nerve injuries, 3 triceps avulsions, 1 deep infection
- less complications if cement in cement revision performed

Bushing exchange

1.5% in 21 years

12 out of 923 TEA at Mayo Clinic

Bushing wear 2.3 ± 4%

Dissembling 1.7 ± 1%

INFECTION

3.8% infections out of 600 TEA at Mayo Clinic, USA

1.9% infections out of 305 primary TEA at Endoklinik, Germany

Causes of infection:

- Superficial joint
- Immunsupression
- Previous operations
- Long surgical time

TREATMENT OF INFECTION

1998 - Yamaguchi et al. 25 infected TEA

14 irrigation and debridemant

6 staged revisions

5 excisions

2006 – Gille at al. 6 infected TEA

5 successful one-stage revisions

1 excision

2008 – Cheung at al. 29 reimplantations after excision arthroplasty

at 7.4 years Mayo score 66 (20-100)

8 reinfections observed (28%)

Bone grafting

2002 – Sanchez-Sotelo – 11 periprosthetic fractures

strut allograft + humeral comp. exchange

10 unions at 3 years

2004 – Mansat – 13 revisions

allograft-prosthesis composite

4 infections, 2 nonunion, but good functional results

2005 – Loebenberg – 12 revisions

impaction bone grafting of 4 ulna, 6 humerus, 2 both bones

8 good bony integration at 6 years

1 infection, 1 ulnar comp. fracture, 2 loosening

Pathologic fractures

2005 - Athwal et al. - 20 tumor cases

70% died but 75% had local control of tumor

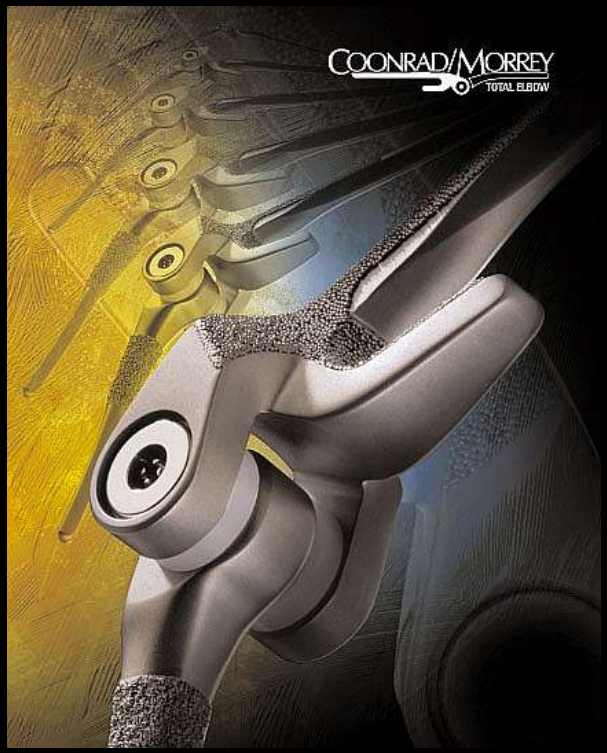
Mayo score improved from 22 to 75

but 35% had early complications and 20% were revised

10 to 31 year survival analysis

2006 – Aldridge at al. – survival of 41 elbows

- 21 were functional 10-14 years
- 10 were functional 15-19 years
- 10 were functional 20-31 years
- 14 complications
- 13 revisions



Personal experience 1999-2010
53 patients
64 Coonrad-Morrey elbows

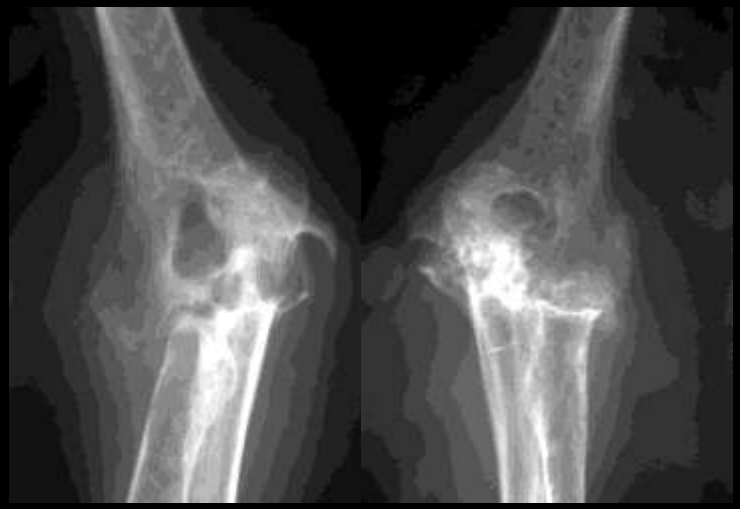
- 53 primary op. (2 bilateral)
- 11 revisions (6 patients)
- 53 patients (30 women, 23 men)
- Age 59 years (25-84)
- 64 elbows
  - 35 right, 29 left
  - 41 dominant, 23 non-dominant

Diagnosis

Rheumatoid arthritis	15 elbows (13 patients)
Osteoarthritis	4 elbows
Hemophylia	1 elbow
Post infection OA	1 elbow
Post-trauma cases	27 elbows
◆17 pseudoarthrosis	
◆2 chronic dislocation	
◆4 post-traumatic arthritis	
◆4 stiff elbows	
Comminuted fracture	5 elbows
Prosthesis failure	11 elbows (6 patients)

15 additional procedures

- external fixator + cement spacer + soft-tissue reconstruction with local flaps and split skin in 2 cases
- bone grafting in 7 cases
- latissimus dorsi pedicle flap transfer in 2 cases
- radial forearm island flap + triceps transfer in 1 case
- tension band wiring of olecranon fracture in 1 case
- closure of synovial sinus 1 case
- excision of heterotopic bone 1 case



56 y. o.
male

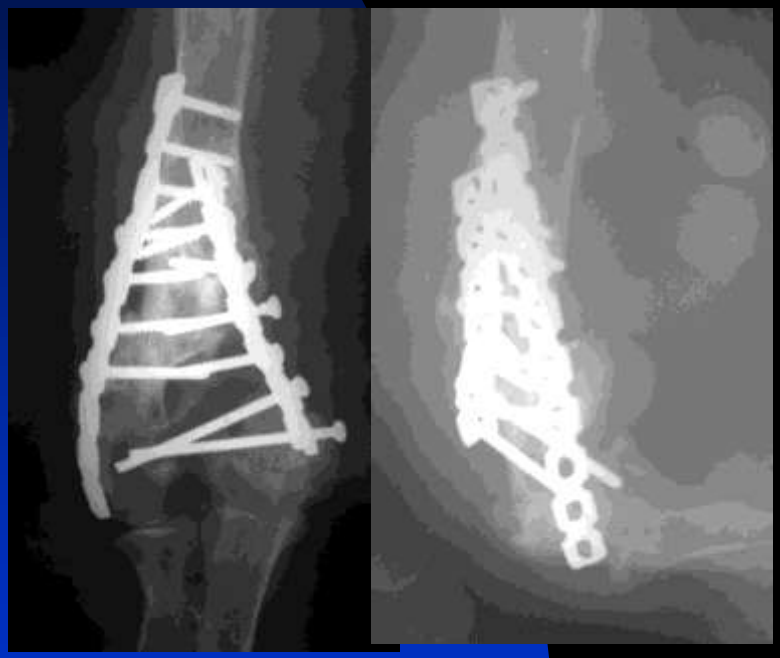
rheumatoid
arthritis

56 y. o. male rheumatoid arthritis

function at 2 years

62 y.o. man pseudoarthrosis

pre-op.



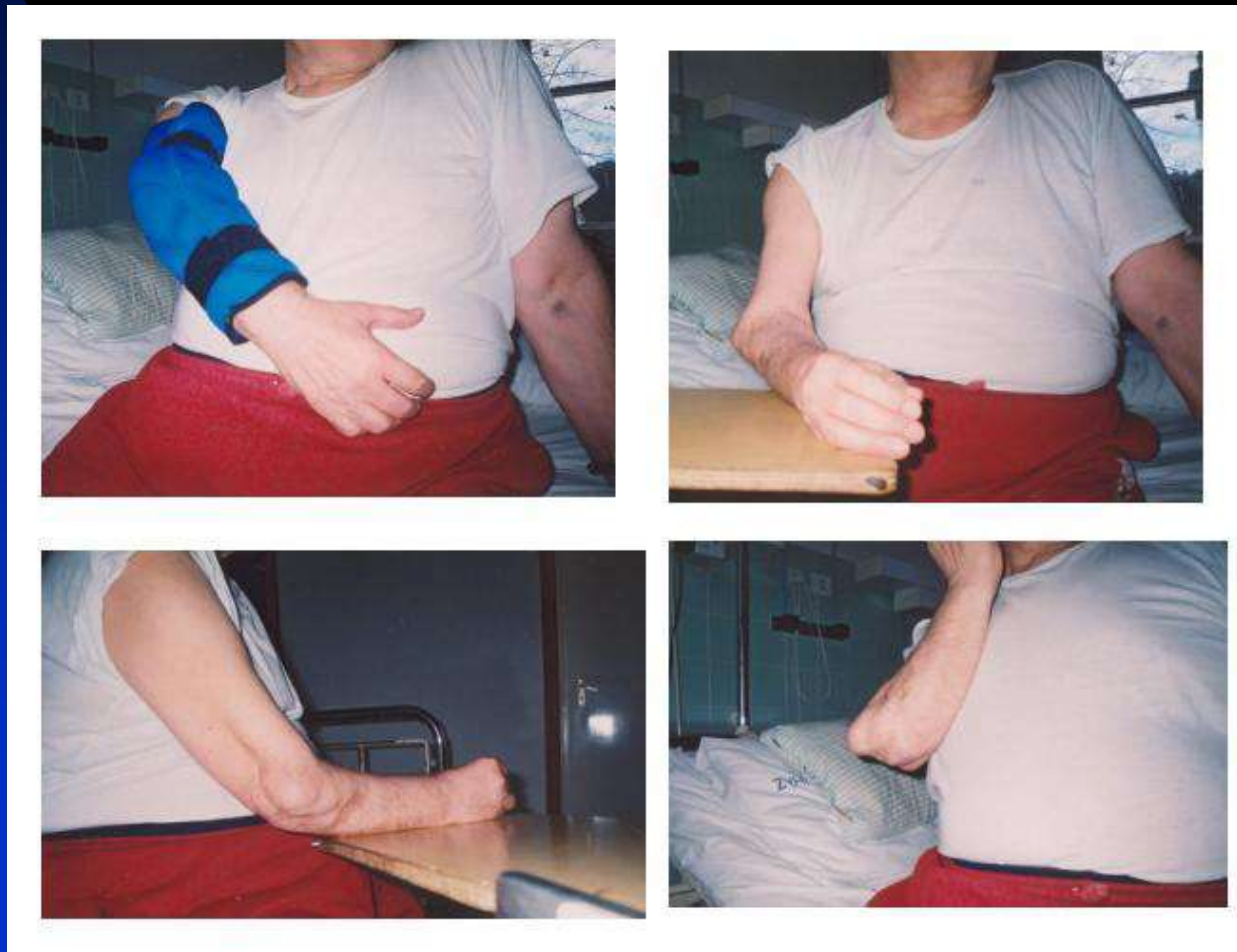
post-op.

62 y.o. man pseudoarthrosis

function at 2 years

60 y.o. man
post-septic arthritis case

pre-op. function



60 y.o. man
post-septic arthritis case

pre-op.

post-op.

60 y.o. man
post-septic arthritis case

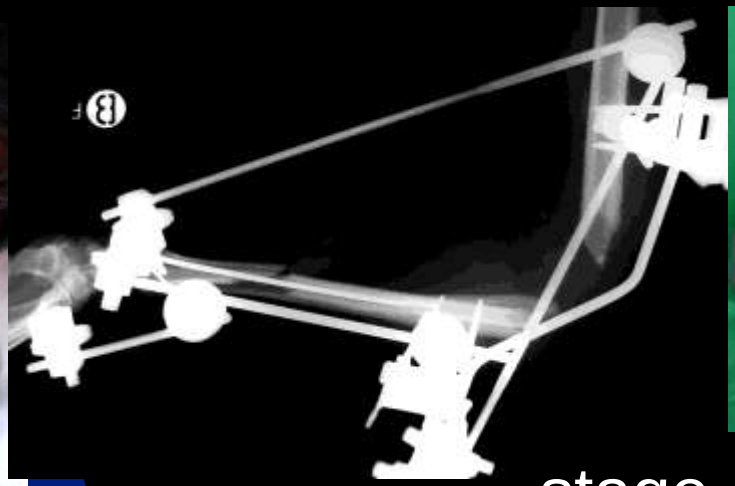
function at 3 months

62 y.o. man
stiff elbow

62 y.o. man stiff elbow

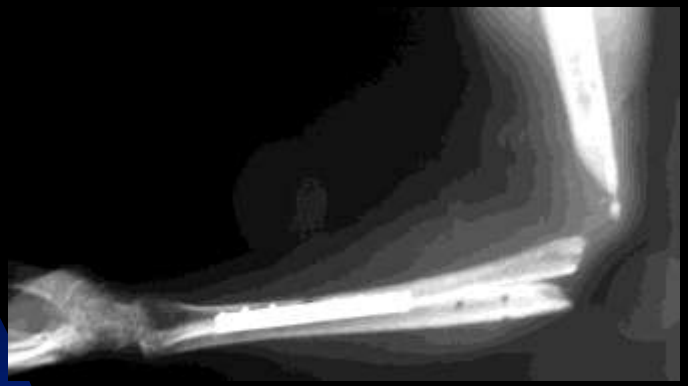
4 m. later

58 y.o. man - comminuted open fracture



stage 1

58 y.o. man - comminuted open fracture



stage 4
at 5 months

58 y.o. man - comminuted open fracture

Function and
X-ray at 4 years

Early complications

Complication	Action taken
intraop. ulna fissure	cerclage
intraop. humerus fissure	cerclage
penetration of ulna cortex	revision at 1 day
olecranon fracture	tension-band wiring
hematome	evacuation
synovial synus (2 cases)	closure
skin necrosis (2 cases)	1 latissimus dorsi flap 1 radial forearm flap
ulnar nerve neuritis (4 cases)	1 decompression
complete radial nerve palsy	no action
transient radial nerve palsy (2 cases)	no action

71 y.o. woman - pseudoarthrosis

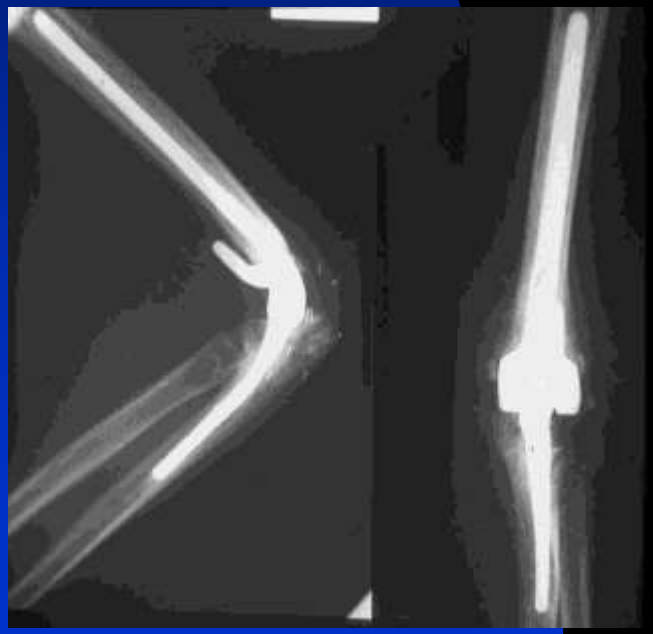
pre-op.

olecranon fracture
at two weeks

tension-band
wiring

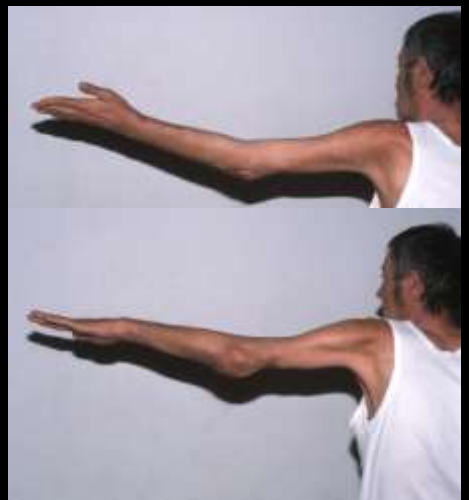
58 y.o. man – post-trauma OA

wound brake down at 3 weeks



radial forearm flap

function
at 1 year

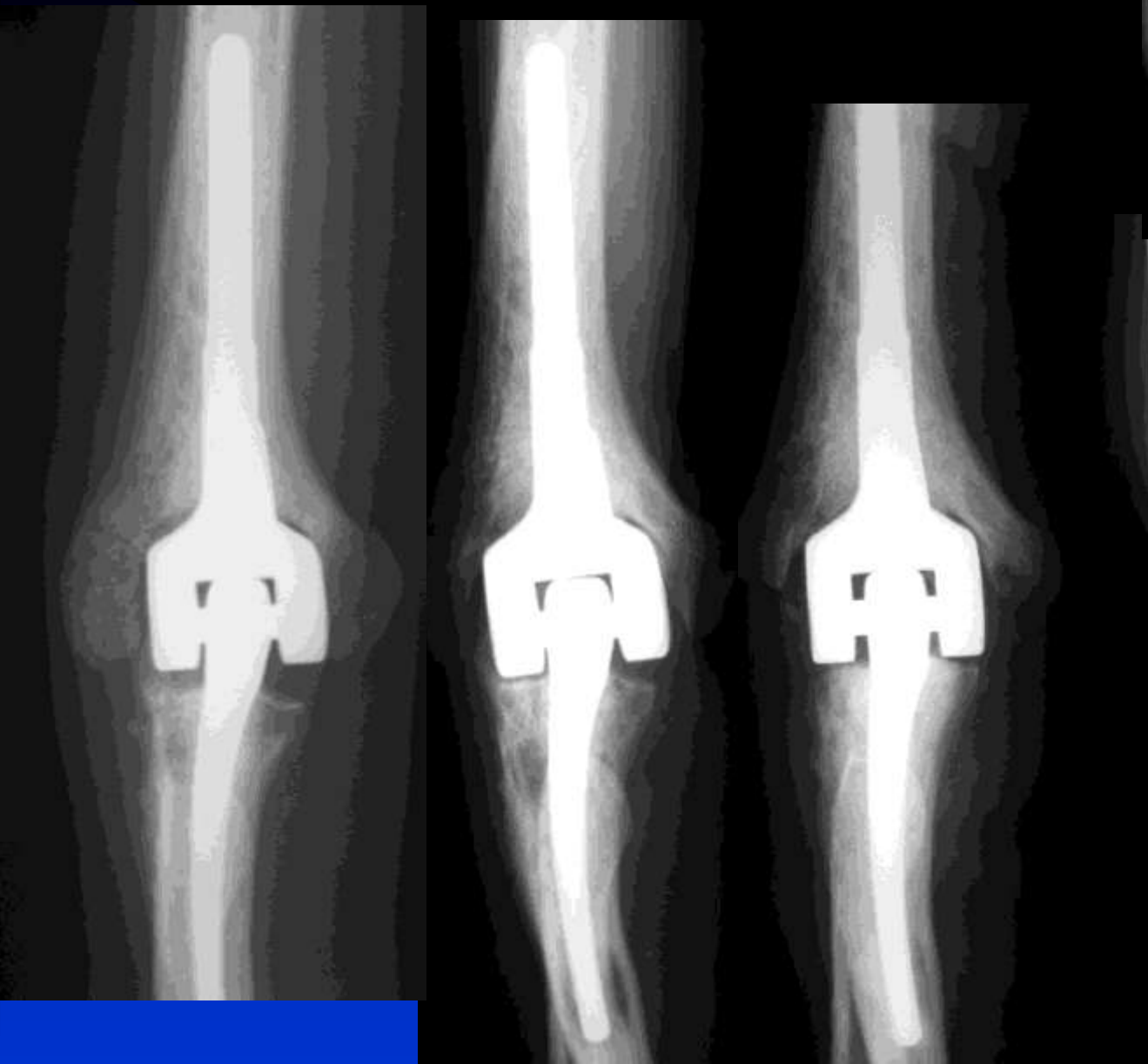


Late complications

Complication	Action taken
Heterotop ossification (6 m.)	excision
Synovial synus (2 y.)	synovectomy
6 Humeral comp. loosening of two patients(1 to 6 years)	revision +/- bone graft
Ulnar comp. loosening (2 y.)	revision
Bushing pin dissembling (4 m.)	revision

55 y.o. woman primary OA

Febr. 2001 Febr. 2003 June 2003



25 y. o. man

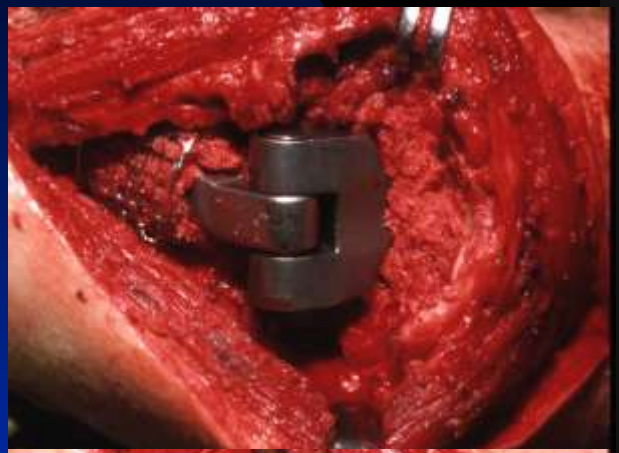
- March 1997 :
  - left elbow fix. ex. + skin transplant + fracture O.S.
  - right hand amputation

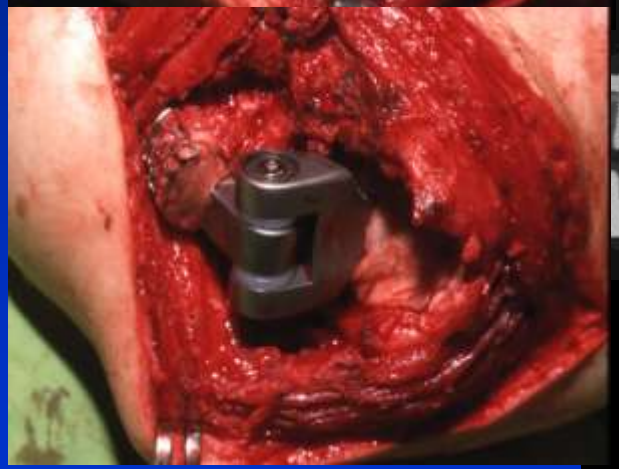
25 y. o. man

- October 1997 : hinged total elbow replacement
- December 1997: latissimus dorsi myocutaneous neurovascular island flap

25 y. o. man

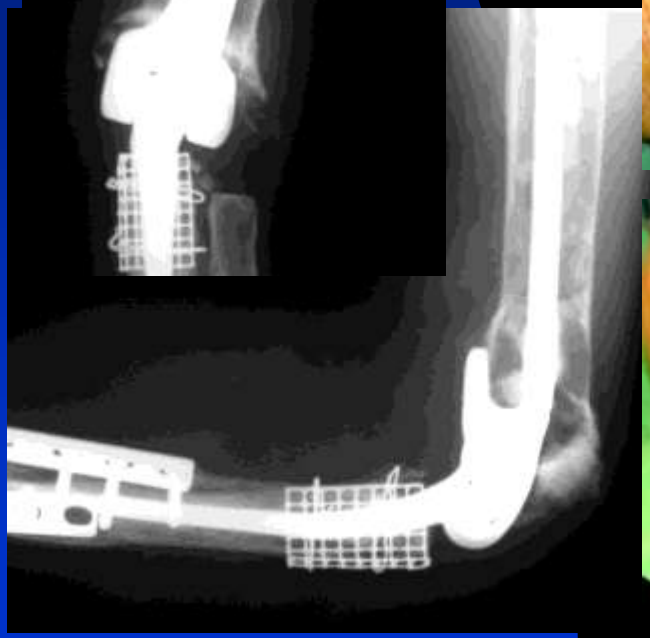
- March 1999: revision total elbow replacement + impaction bone grafting with C-M elbow





25 y. o. man

- May 2005: humeral component revision + impaction bone grafting



25 y. o. man

- Function at 6 years

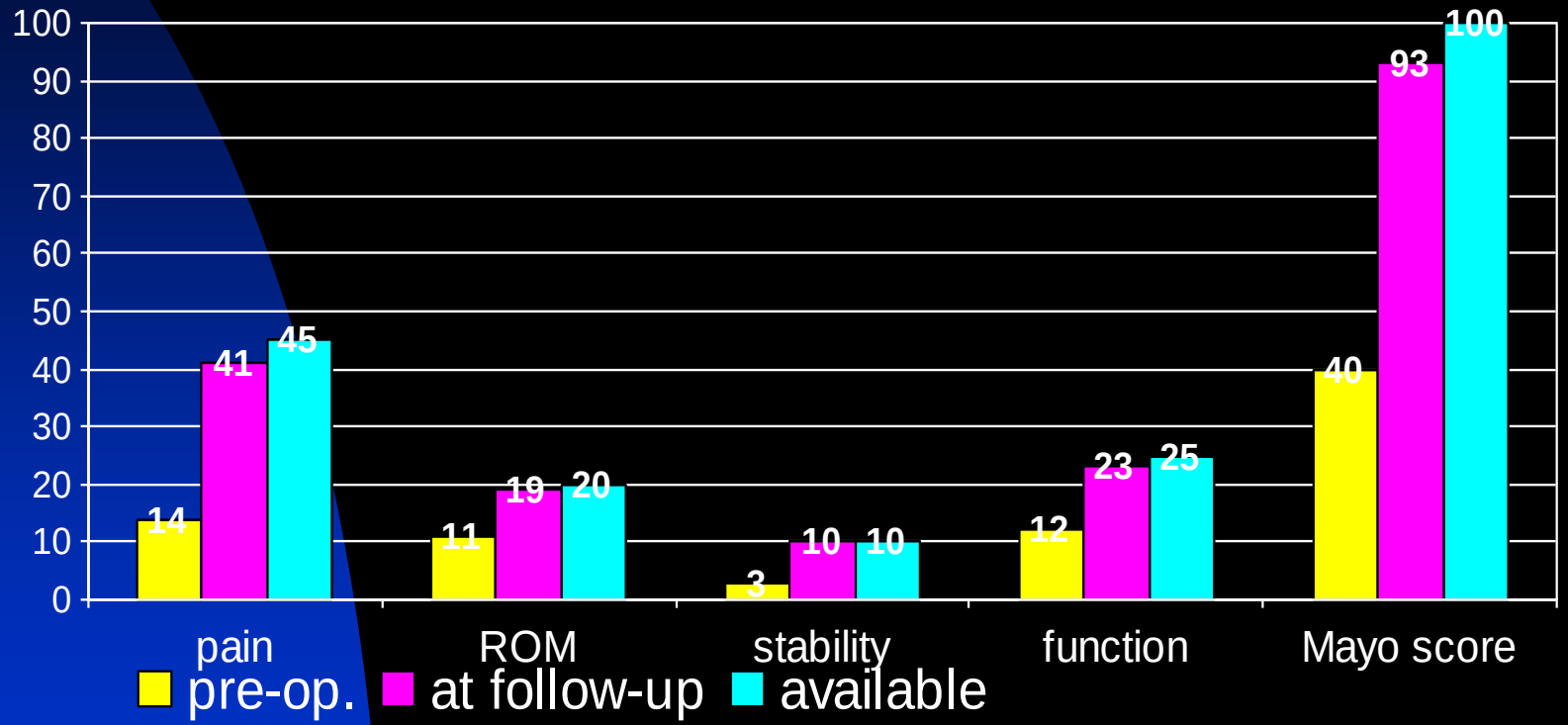
25 y. o. man

- 1 year later: looseing of humeral component and revison with long stem + impaction bone grafting

Mayo score

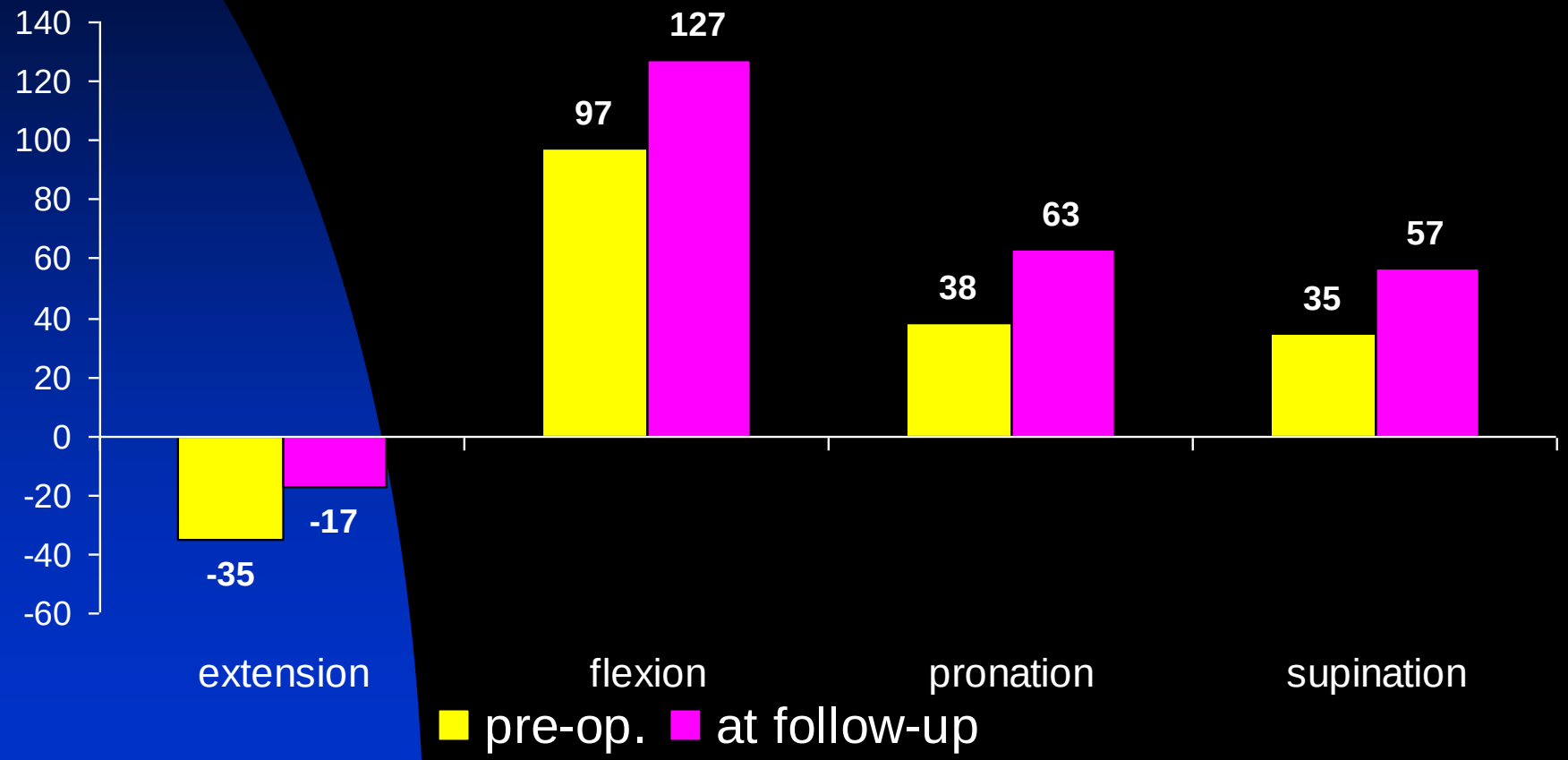
Follow-up: 5 years (1-9)

All patients but two were satisfied with the results.



Range of motion

degrees



Conclusions

- Semiconstrained elbow replacement can provide stability and function when bony and soft-tissue anatomy of the elbow is grossly altered by arthritis or by previous trauma
- But the surgery is demanding and complications are more common than following hip or knee replacement
- Most of the complications appeared in post-trauma cases and sometimes the help from plastic surgeon was necessary

Thank you for your attention!