

PROXIMAL HUMERUS FRACTURES

FIX, REPLACE OR NONOPERATIVE TREATMENT

AO TRAUMA COURSE – ADVANCED PRINCIPLES OF FRACTURE MANAGEMENT

COPENHAGEN 22-26/4-2018

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LEARNING OUTCOMES

EVALUATE INDICATIONS FOR NONOPERATIVE
TREATMENT, INTERNAL FIXATION AND ARTHROPLASTY

EPIDEMIOLOGY

↑ INCIDENTS

↑ INCIDENTS WITH AGE

WOMEN >> MEN

SURGICAL TREATMENT INCREASING

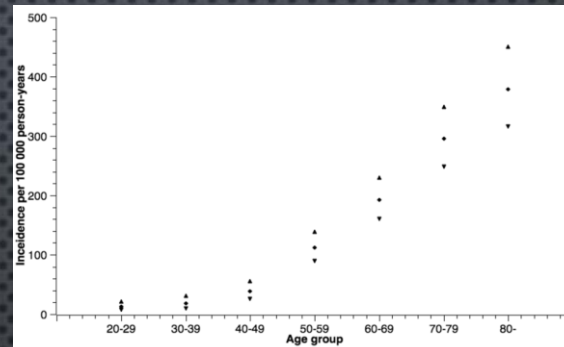
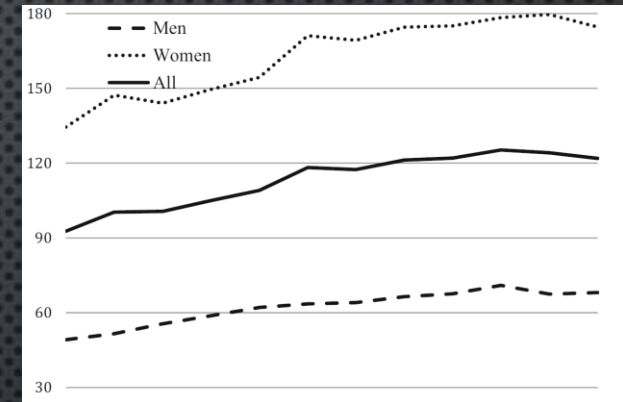
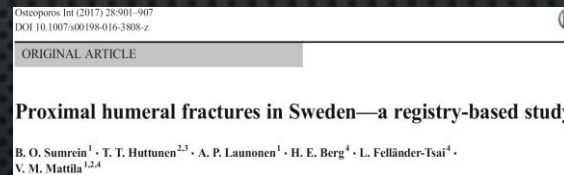


Fig. 1 Five-year mean incidences with 95 % confidence intervals in female population by age group

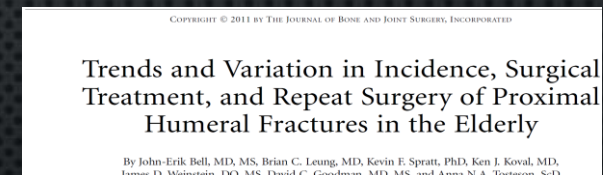
Launonen et al. Arch Osteoporos 2015



Sumrein et al. Osteoporos.Int 2017



Sumrein et al. Osteoporos. Int 2017.
Substantially increase in surgically
treatment



Bell et al. JBJS 2011.
25% relative increase in surgically
managed fractures

PROXIMAL HUMERUS FRACTURES - **DECISION MAKING**



NONOPERATIVE VS SURGICAL TREATMENT



**Cochrane
Library**

Cochrane Database of Systematic Reviews

Interventions for treating proximal humeral fractures in adults (Review)

Handoll HHG, Brorson S

SURGERY DOES NOT RESULT IN A BETTER OUTCOME THAN NONOPERATIVE TREATMENT

.... LIKELY TO RESULT IN GREATER NEED FOR SUBSEQUENT SURGERY

NONOPERATIVE TREATMENT

- **INDICATION**

- NONDISPLACED FRACTURES
- DISPLACED 2,3& 4 PART FRACTURES
 - COMORBIDITIES, LOW DEMAND, LOW COMPLIANCE

- **CONSERVATIVE TREATMENT STRATEGY**

- INITIAL SLING FOR PAIN RELIEF
- EARLY MOBILIZATION
- STRUCTURED REHABILITATION

Phase	Duration (weeks)	Rehabilitation
1	0-3	Pendulum exercises
		Gentle active assisted motion
		Avoid external rotation for 6 weeks
2	3-9	Orthopedic sling for 2-3 weeks
		If there is clinical evidence of healing and fragments move as a unit, and no displacement is visible on the x-ray, then:
		Active-assisted motion forward and side arm elevation
		Partial functional use week 3-6
		Week 6: Add active, nonassisted motion
3	> 9	Week 6: Add isometric strength
		If there is bone healing but joint stiffness, then:
		Add manual therapy passive motion by physiotherapist
		Add isotonic strength, concentric and eccentric

NONOPERATIVE TREATMENT - RESULTS

ORIGINAL ARTICLE

Functional and Quality-of-Life Results of Displaced and Nondisplaced Proximal Humeral Fractures Treated Conservatively

Carlos Torrens, MD, Monica Corrales, MD, Gemma Vilà, MD, Fernando Santana, MD, and Enrique Cáceres, MD

Good pain relief

CURRENT STATE OF THE ART

Nonoperative Treatment of Proximal Humerus Fractures: A Systematic Review

Jaicharan J. Iyengar, MD, Zlatko Devcic, BS, Robert C. Sproul, MD, and Brian T. Feeley, MD

High healing rate
Good functional outcomes
Low complication rate

Original Investigation

Surgical vs Nonsurgical Treatment of Adults With Displaced Fractures of the Proximal Humerus The PROFHER Randomized Clinical Trial

No difference in outcome

Amar Rangan, FRCS(Tr&Orth); Helen Handoll, DPhil; Stephen Brealey, PhD; Laura Jefferson, PhD; Ada Keding, MSc; Belen Corbacho Martin, MSc; Lorna Goodchild, MSc; Ling-Hsiang Chuang, PhD; Catherine Hewitt, PhD; David Torgerson, PhD; for the PROFHER Trial Collaborators

NONOPERATIVE VS SURGICAL TREATMENT



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.... THE EVIDENCE DOES NOT COVER TWO-PART TUBEROSITY FRACTURES, FRACTURES IN YOUNG PEOPLE, HEAD SPLITTING, FRACTURE DISLOCATIONS +++

FIXATION - INDICATIONS

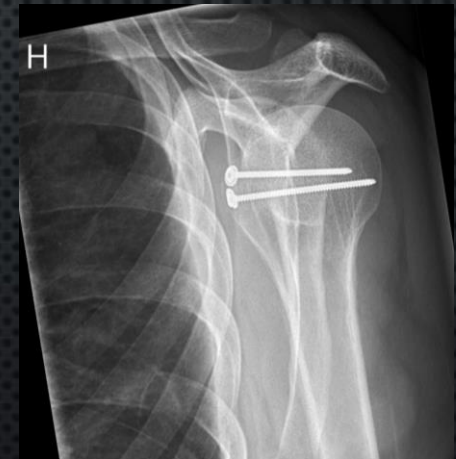
- ABSOLUTE INDICATIONS — UNCOMMON
 - OPEN FRACTURES
 - ASSOCIATED VASKULAR INJURIES
 - FRACTURE DISLOCATIONS



FIXATION - INDICATIONS

- **STRONG INDICATIONS**

- **ISOLATED TUBEROSITY FRACTURES WITH DISPLACEMENT $> 5-10$ MM**
- **100 % DISPLACED SURGICAL NECK FRACTURES**
- 3 & 4 PART FRACTURES WITH SEVERE DISPLACEMENT OF THE TUBEROSITIES?
- 3 & 4 PART FRACTURES WITH ANGULATION OF THE HEAD $> 30^{\circ}$?



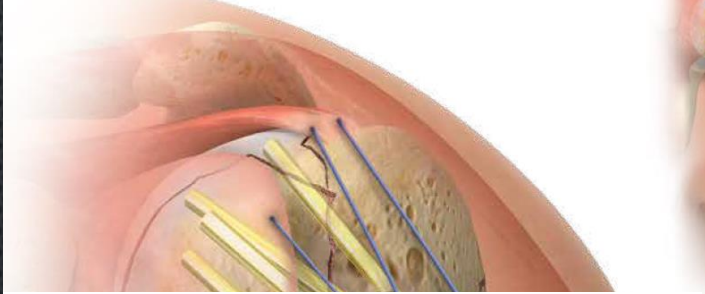
ORIF - GOAL

PRESERVE FUNCTION

- RESTORE ANATOMY
- STABLE FIXATION



CHALLENGES

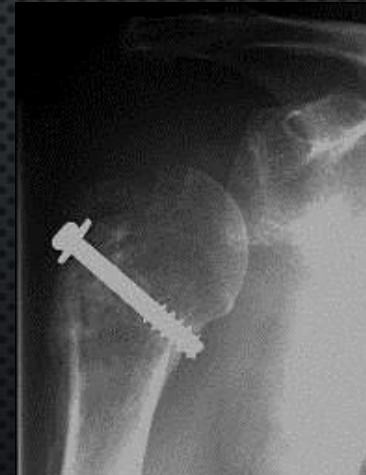


OSTEOPOROSIS
VASCULARITY
CUFF DEPENDENCY



TUBEROSITY FRACTURES

- INDICATION FOR SURGERY
 - YOUNG: 5 MM
 - OLDER: 10 MM
- FIXATION:
 - OPPOSE TENSION FORCES
 - SUTURES: SUTURE ANCHORS, BONE-TUNNELS ETC,
 - SCREW(S)



LOCKED PLATING

- **BETTER FIXATION IN OSTEOPOROTIC BONE**
- **INDICATION;** DISPLACED 2,3 AND 4 PART FRACTURES
- **GOOD FUNCTIONAL RESULTS**
- **COMPLICATIONS¹**
 - **AVN** 8% (14,5% IN C-FRACTURES)
 - **SCREW CUT-OUT** 12%
 - **REOPERATION RATE** 14%

1. THANASAS ET AL. REVIEW JSES 2009.



MANDATORY

CUFF SUTURES

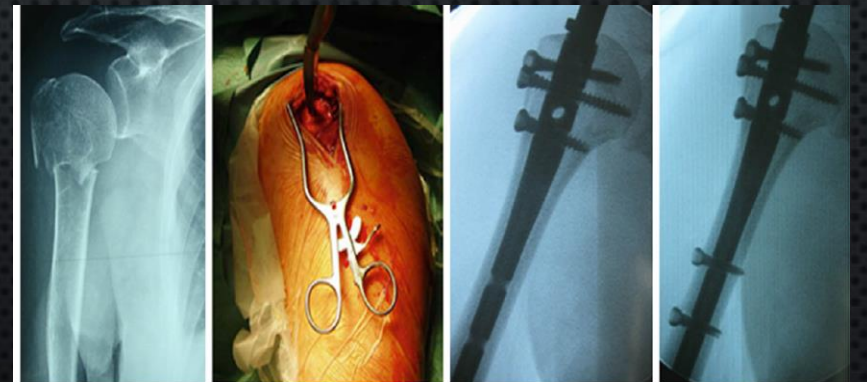
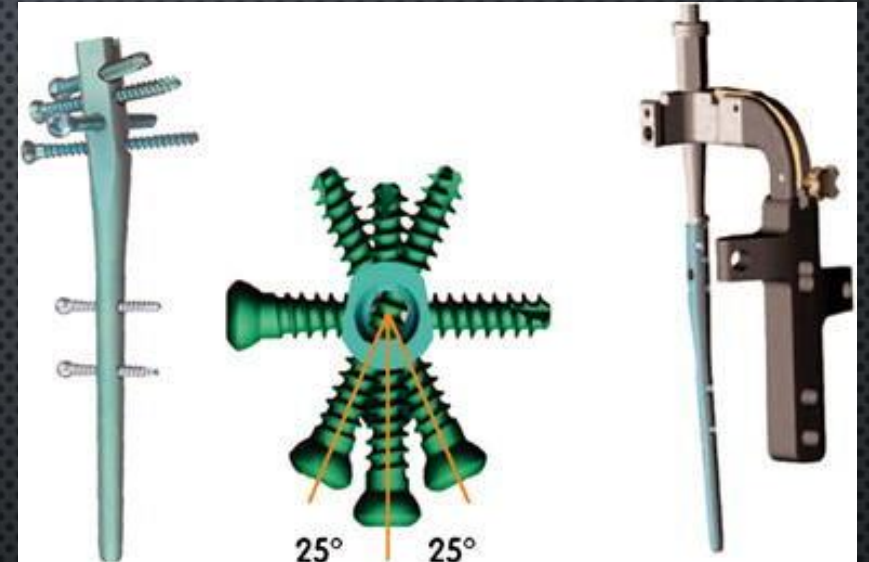
MEDIAL SUPPORT

ALLOW FOR SUBCIDENTENCE
OF CAPUT



INTRAMEDULLARY NAILING

- **MINIMALLY INVASIVE**
 - PRESERVATION OF BIOLOGY
- **MODERN IMPLANT DESIGNS**
 - STRAIGHT NAIL — MORE MEDIAL ENTRY POINT
 - MULTIPLANAR LOCKING — INCREASED STABILITY
- **INDICATION**
 - DISPLACED 2 (3&4) PART FRACTURES
 - SHAFT EXTENSION/IPSILATERAL SHAFT



INTRAMEDULLARY NAILING - COMPLICATIONS

«Historical cohorts»



Complication rate 30-40%

- Nonunion
- Malunion
- Rotator cuff injuries

Images; Boileau et al. Prox.humerus fractures

«Modern implants»



Comparable results to locked plating

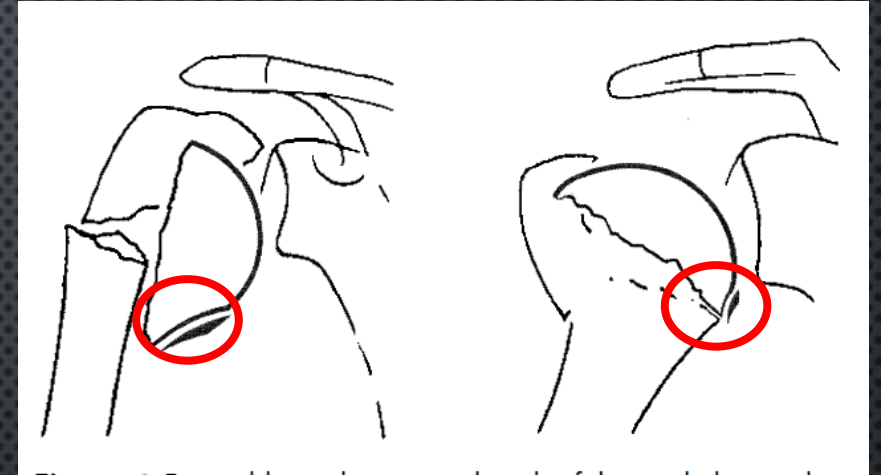
- Zhu et al – 2 part
- Gracitelli et al JSES 2016 – 2&3 part

Images; Nijs et al. Techn in Orthopaedics 2013

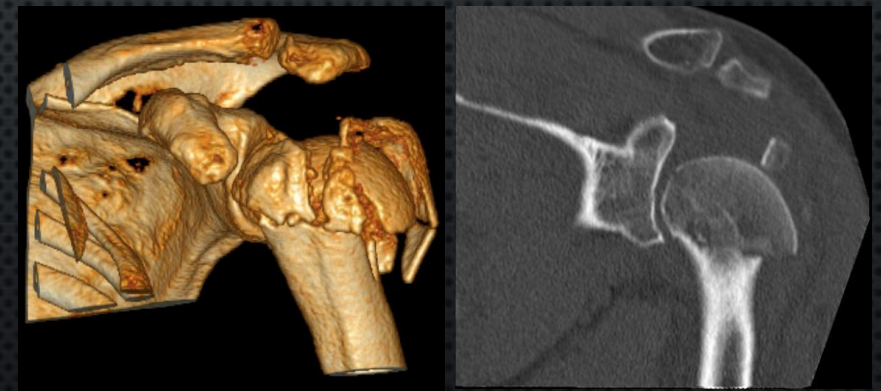
REPLACEMENT

INDICATIONS FOR ARTHROPLASTY

- **HEAD SPLITTING FRACTURES**
 - > 2 PARTS?
- **FRACTURE DISLOCATIONS?**
 - DEPENDING ON HEAD FRAGMENT AND AGE
- **4 PART DISPLACED GERIATRIC FRACTURES?**
 - AGE > 65?



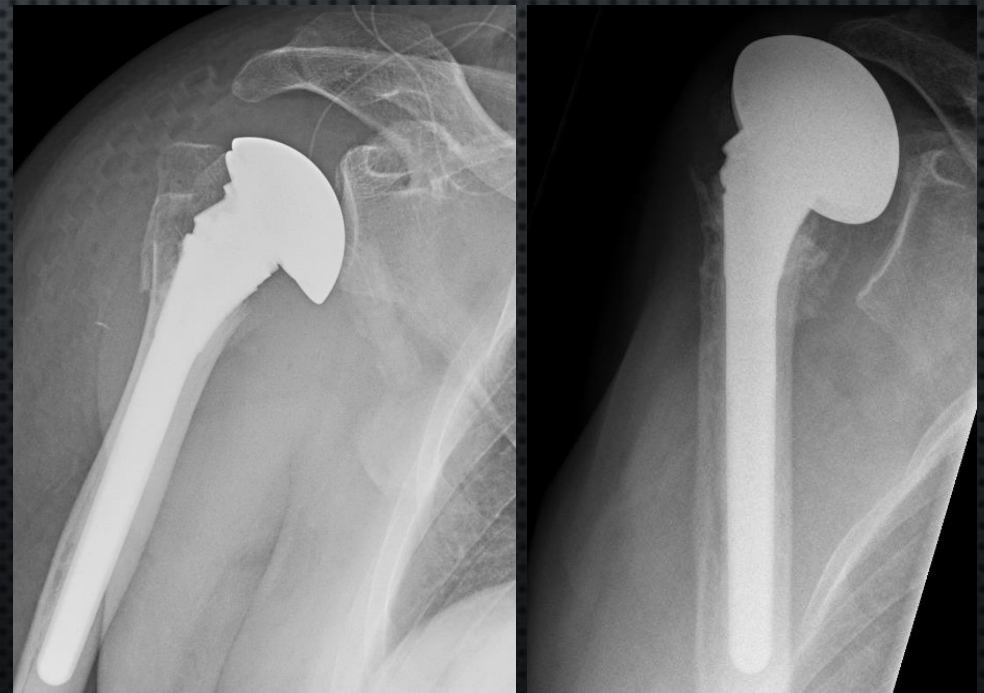
Hertel et al. JSES 2004



HEMIARTHROPLASTY

- **WELL FUNCTIONING CUFF**
- **ANATOMICAL REDUCED TUBEROSITIES**
- **CORRECT HUMERAL HEAD HEIGHT AND VERSION**
- **MIXED RESULTS** – BIMODAL DISTRIBUTION
- **INDICATION**
 - NON SALVAGEBLE HUMERAL HEAD IN YOUNG PATIENTS (<60 Y?)

Prerequisite for a favorable outcome



REVERSE SHOULDER ARTHROPLASTY

INCREASING POPULARITY

NOT DEPENDING ON TUBEROSITY HEALING

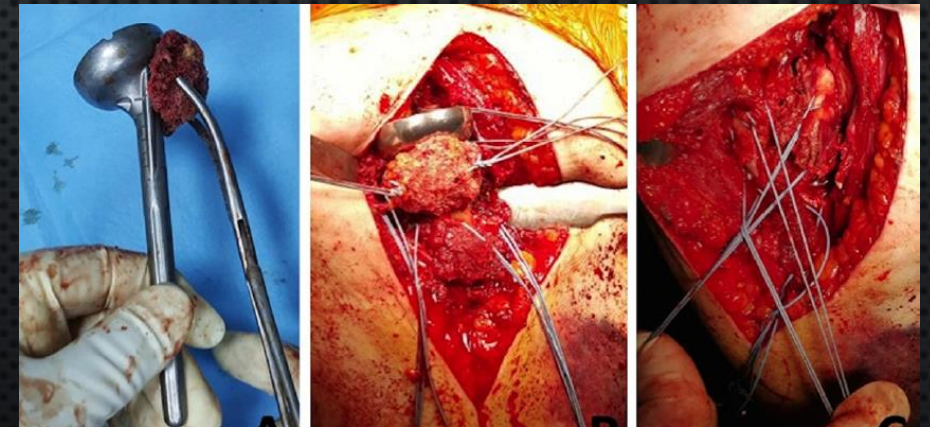
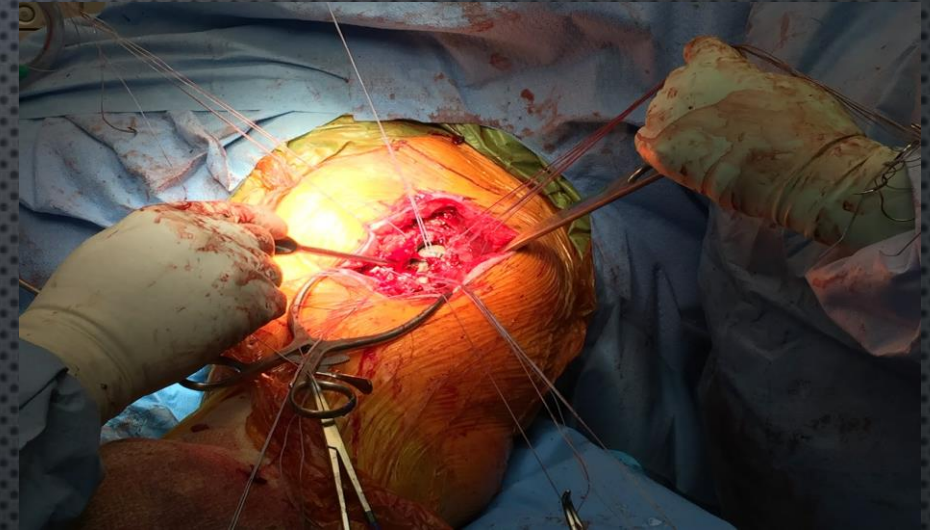
MORE PREDICTABLE RESULTS THAN WITH HA

«UNIQUE» COMPLICATIONS



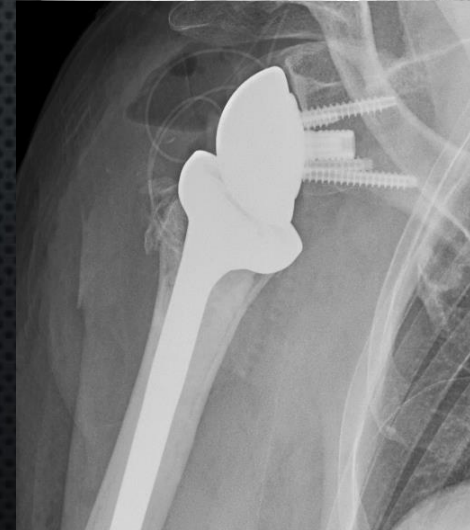
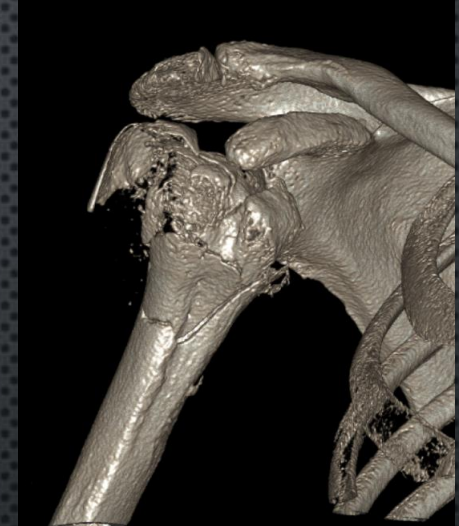
RSA – HOW TO IMPROVE YOUR RESULTS

- **CT PREOP.**
 - EVALUATE GLENOID BONE STOCK, VERSION ETC
- **CUFF SUTURES** TO THE HUMERAL SHAFT AND HUMERAL COMPONENT
- **USE HEAD FRAGMENT AS GRAFT**
 - IMPROVES HEALING OF THE TUBEROSITIES
- **LARGE HEAD DIAMETER**



RSA FOR FRACTURES - RESULTS

- **RSA VS HA** CUFF ET AL JBJS 2013
 - BETTER FUNCTIONAL OUTCOME
 - HIGHER PATIENT SATISFACTION
 - SIMILAR COMPLICATION RATE
- **RSA VS ORIF** GIRADELLA ET AL 2017 (COMPARATIVE STUDY)
 - BETTER ROM WITH RSA
 - HIGHER QUALITY OF LIFE-SCORES



DECISION MAKING

Patient age, comorbidities and compliance



Fracture pattern
Head viability

Age > 65, low demand, non-compliance



NON OPERATIVE

ORIF – 2 or 3 part fractures
RSA – 4 part fractures

Age < 65, «high demand»



NON OPERATIVE

ORIF
HA

TAKE HOME MESSAGES

- **DON`T OPERATE ON RADIOGRAPHIC INDICATION ALONE!**
- **MOST PHF SHOULD BE TREATED NONOPERATIVELY**
- WITH FIXATION THE KEY TO A GOOD RESULT IS PROPER REDUCTION AND STABILIZATION OF BOTH THE SOFT TISSUES AND THE FRACTURE.
- HEMIARTHROPLASTY ONLY FOR YOUNG PATIENTS WHERE THE HUMERAL HEAD IS NON-SALVAGEBLE
- RSA IS A VIABLE ALTERNATIVE FOR PATIENTS > 65Y

