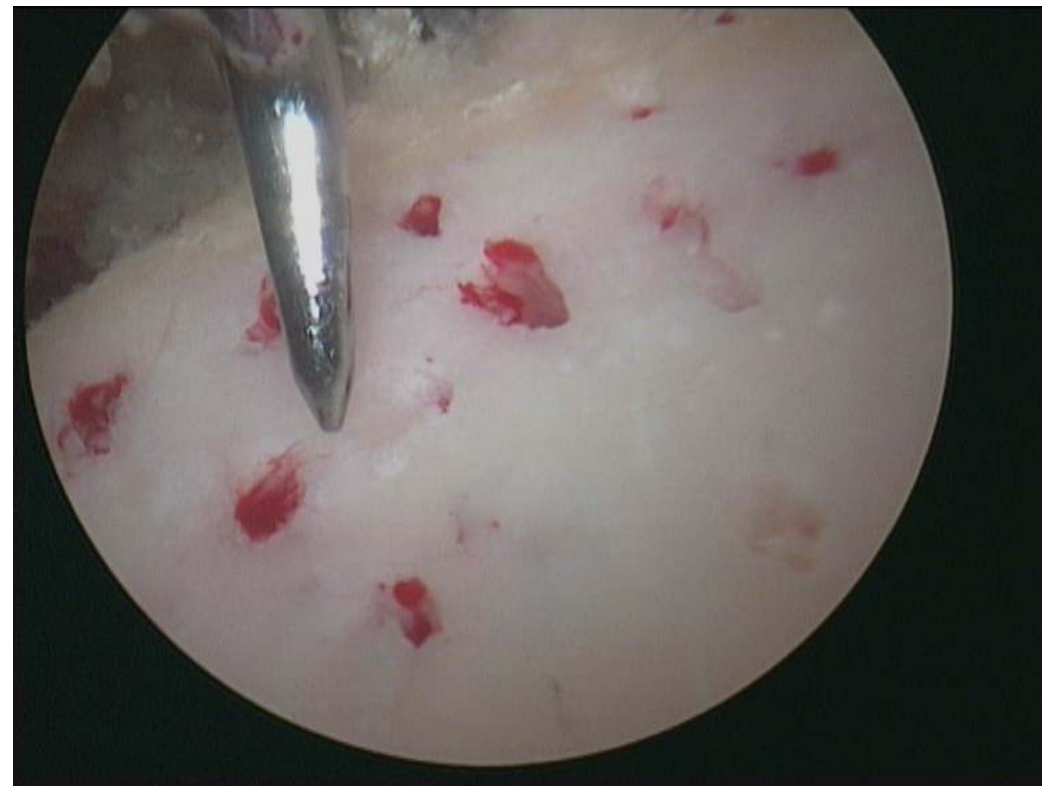
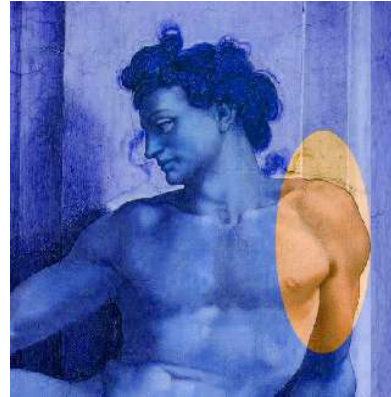


Arthroscopic treatment of osteoarthritis – Comprehensive Arthroscopic Management - CAM procedure



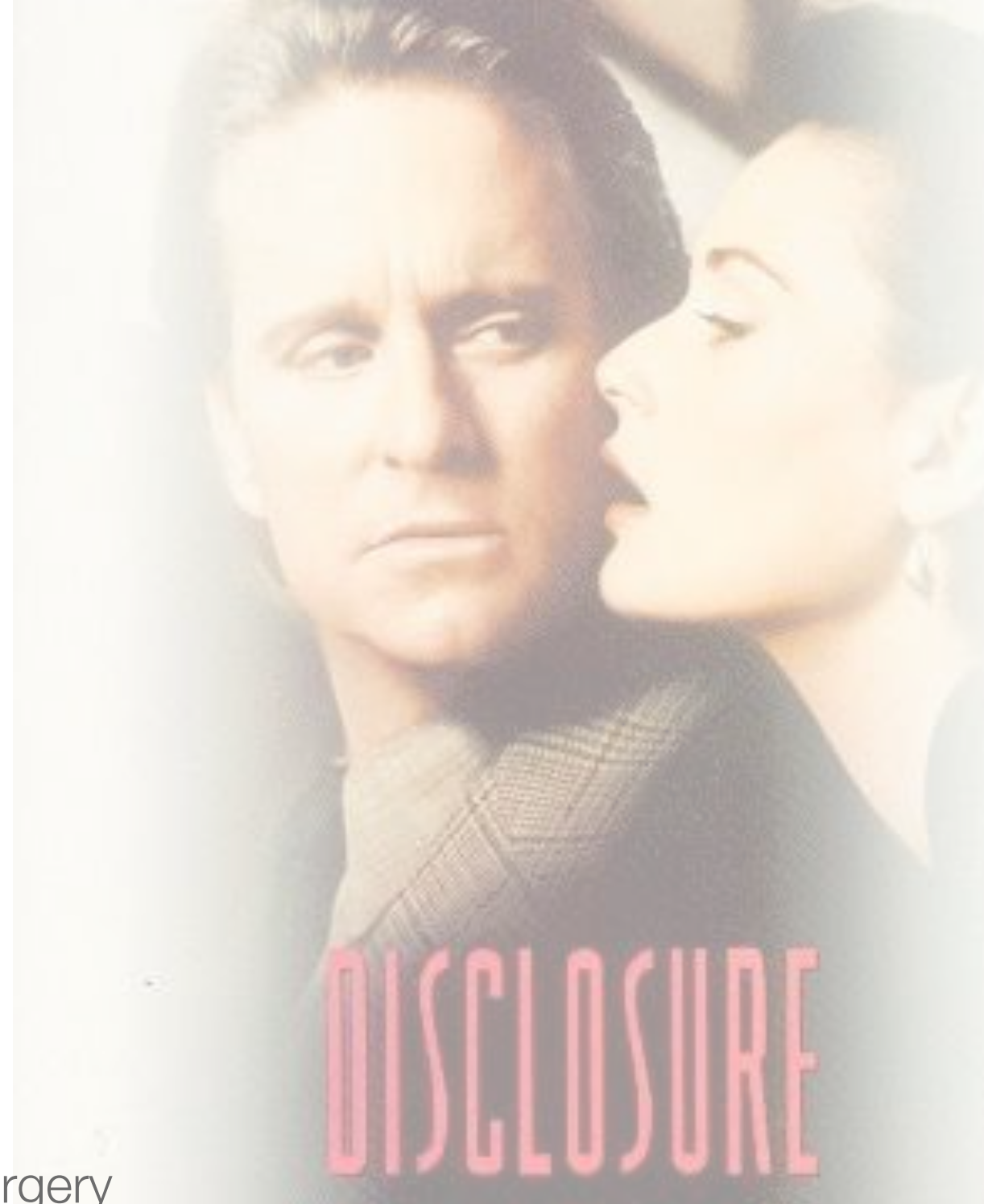
Ofer Levy, MD MCh(Orth) FRCS
Reading Shoulder Unit,
Royal Berkshire & Berkshire Independent Hospitals
Reading, United Kingdom

www.readingshoulderunit.com



Disclosure

- Innovative Design Orthopaedics (IDO) - Designing surgeon - Stocks, Royalties
- Collplant - Advisory Board - Stocks
- Minivasive - Advisory Board - Stocks
- Estar Medical - Advisory Board - Royalties
- Assistant Editor - J of Shoulder and Elbow Surgery
- Associate editor - J of Shoulder and Elbow Arthroplasty



Shoulder Arthroplasty in Young Patients

- Challenging
- Worse and less predictable results
- ~ 50% of young patients w **anatomic TSA** are **unsatisfied**
- Sperling, Cofield, Rowland , JBJS April 1999
- Higher functional demand
Would like to resume all their activities including all sporting activities
- Increasing use
- Concerns re risks of failure and need for revision



J Shoulder Elbow Surg (2011) 20, 123-130



JOURNAL OF
SHOULDER AND
ELBOW
SURGERY

www.elsevier.com/locate/ymse

Shoulder arthroplasty in patients aged fifty-five years or younger with osteoarthritis

Robert Bartelt, MD, John W. Sperling, MD, Cathy D. Schleck, BS,
Robert H. Cofield, MD*

- High revision rate

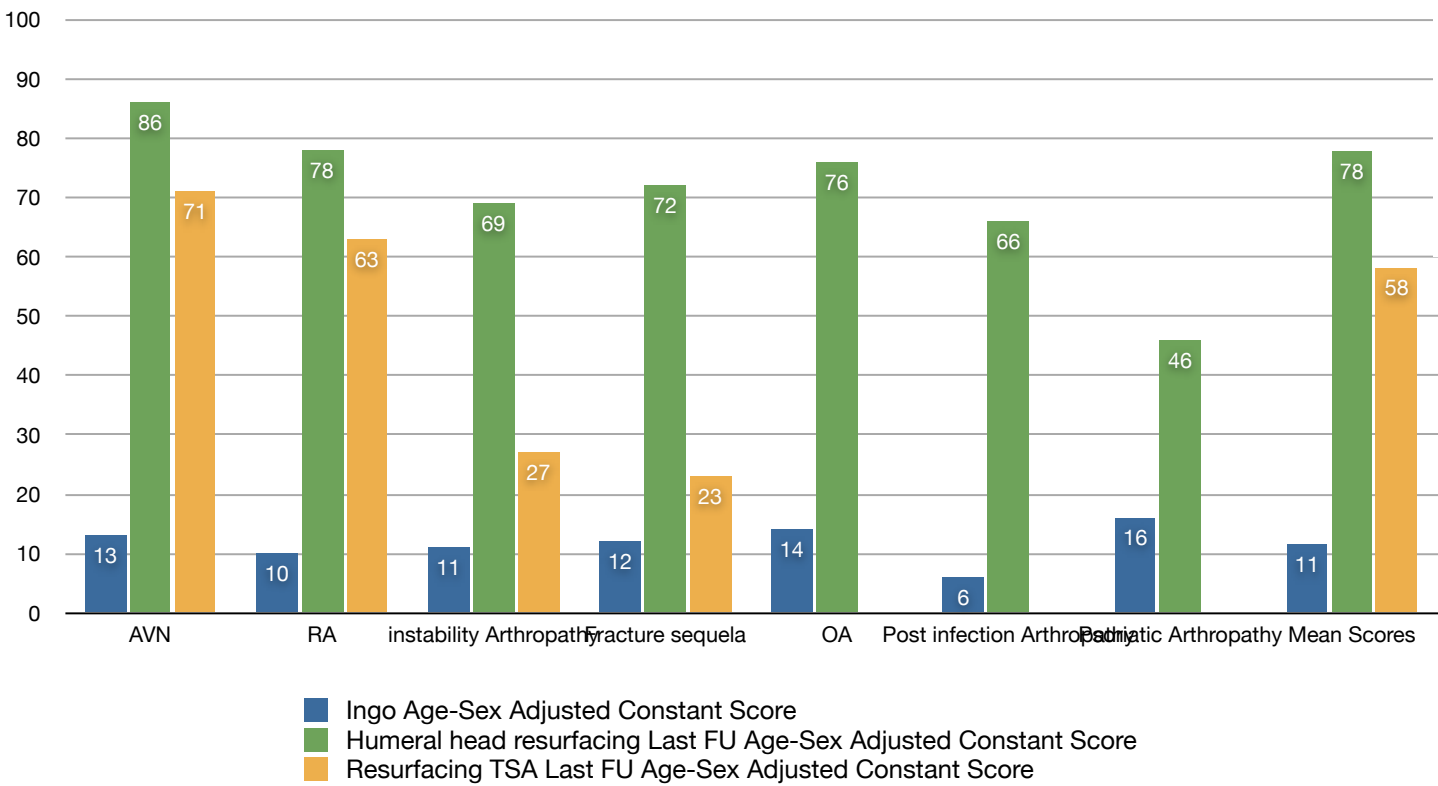


Between 1988 and 2003

54 CSRAs in 49 patients <age of 50 years (5 Bilateral)

Mean follow up of 14.5 years (range 10- 25 years)

Age-Sex Adjusted Constant score HSA vs TSA - per diagnosis



■ Ingo Age-Sex Adjusted Constant Score
■ Humeral head resurfacing Last FU Age-Sex Adjusted Constant Score
■ Resurfacing TSA Last FU Age-Sex Adjusted Constant Score

% Free Of Revision

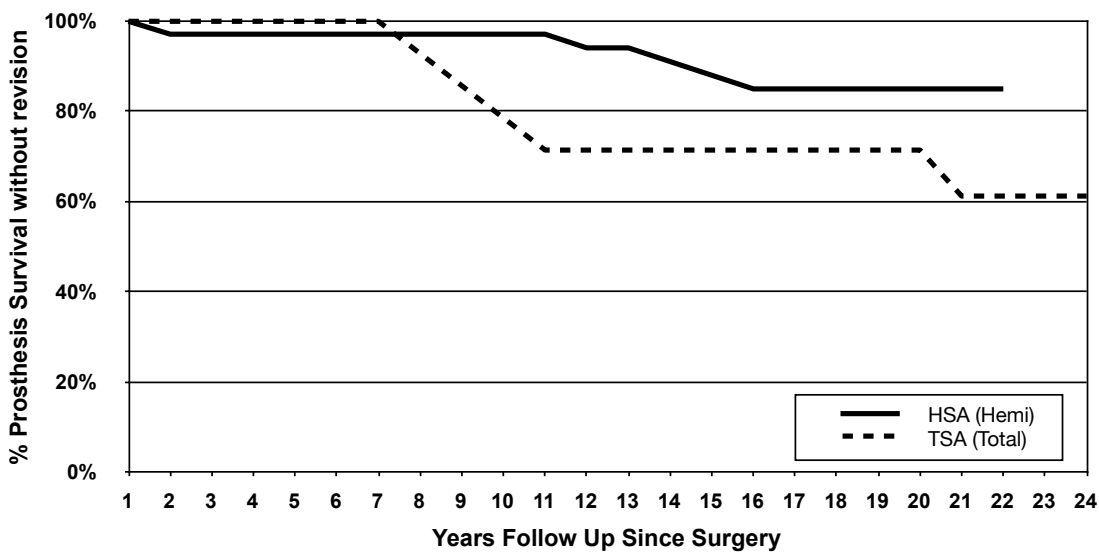


Figure 8 - Kaplan-Meier survival curve for all patients aged 50 years or younger receiving shoulder resurfacing arthroplasty for glenohumeral arthritis. The estimated revision-free survival rate for Humeral head resurfacing (hemi) was 97% (95% CI, 1.02 - 0.92) at 5 years, 97% (95% CI, 1.02 - 0.92) at 11 years, 91% (95% CI, 0.96 - 0.87) at 14 years and 85% (95% CI, 0.89 - 0.81) at 22 years. The estimated revision-free survival rate for total shoulder arthroplasty (TSA) was 100% (95% CI, 1.05 - 0.95) at 5 years, 71% (95% CI, 0.75 - 0.68) at 11 years, 71% (95% CI, 0.75 - 0.68) at 14 years and 61% (95% CI, 0.64 - 0.58) at 22 years.



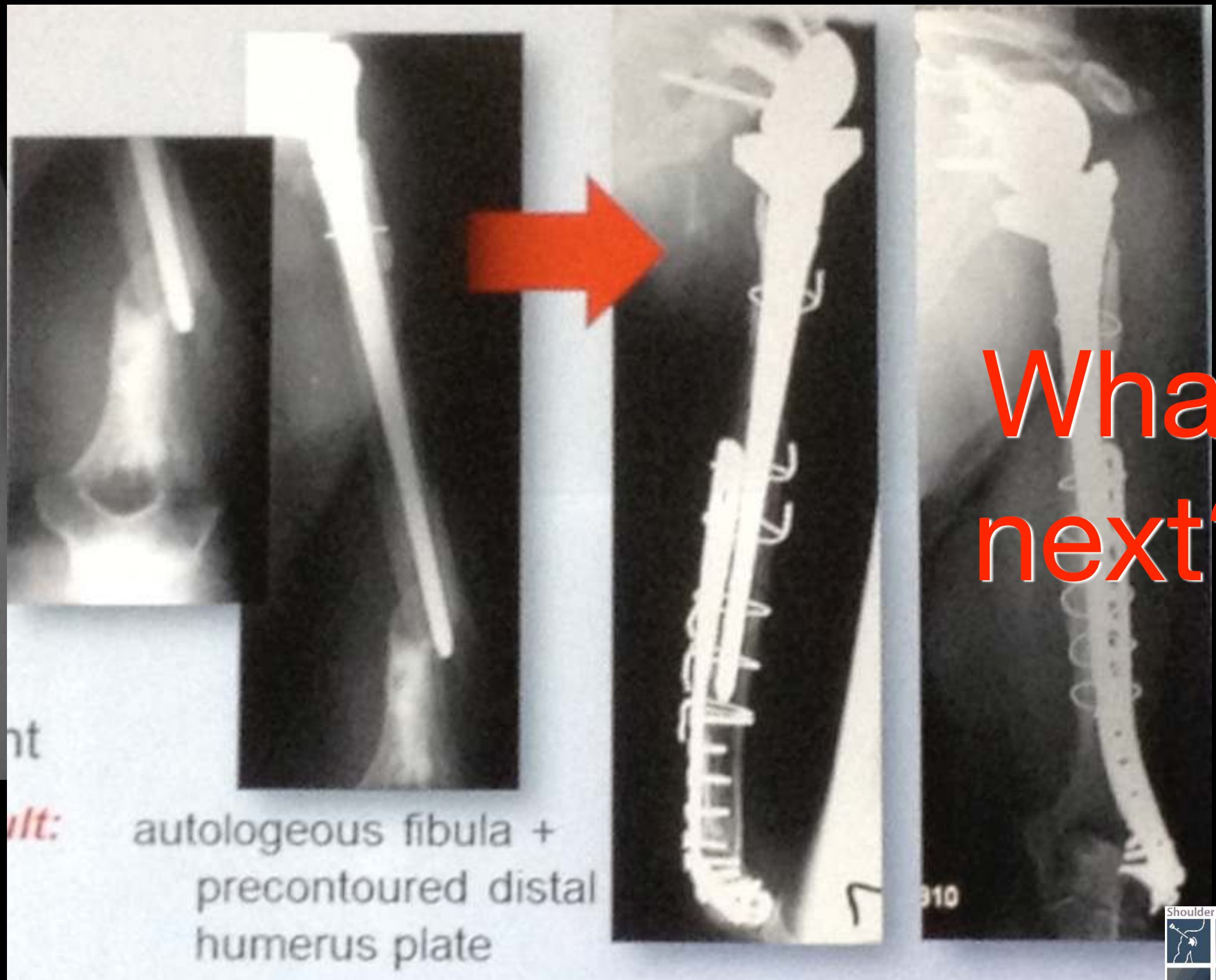
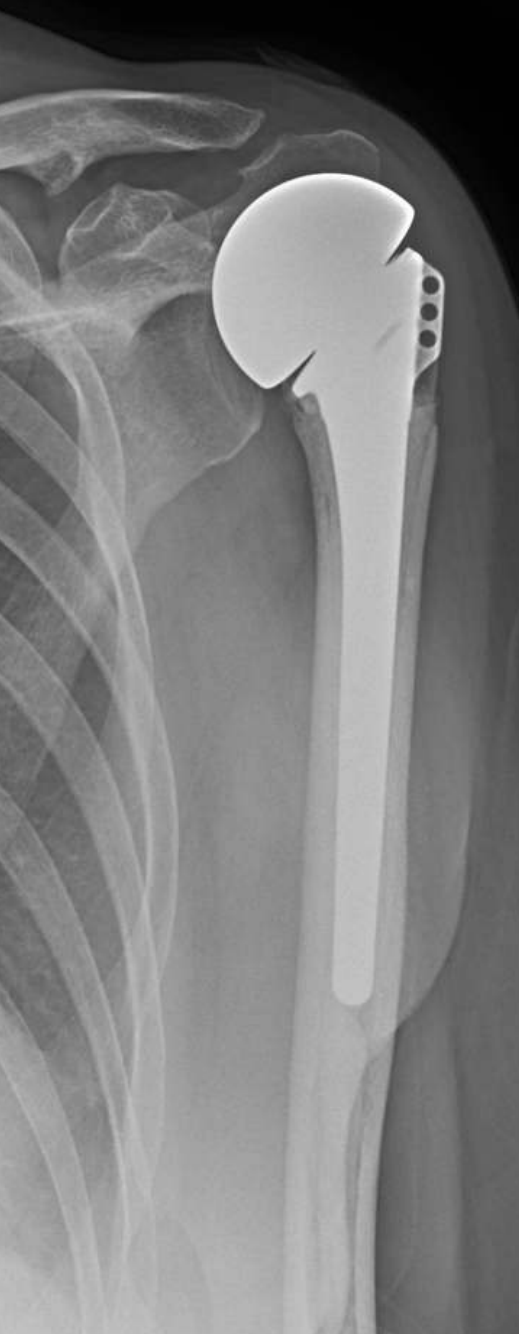
Surface replacement arthroplasty for glenohumeral arthropathy in patients aged younger than fifty years: results after a minimum ten-year follow-up

Ofer Levy, MD, MCh(Orth), FRCS*, Oren Tsvieli, MD, Julia Merchant, MRCS, Lora Young, FRCS (Tr&Orth), Alberto Trimarchi, MD, Rupen Dattani, MD, FRCS (Tr&Orth), Ruben Abraham, FRCA, Stephen A. Copeland, FRCS†, Ali Narvani, FRCS (Tr&Orth), Ehud Atoun, MD

19 years po Lt CSRA
(Hemi* w Micro#)

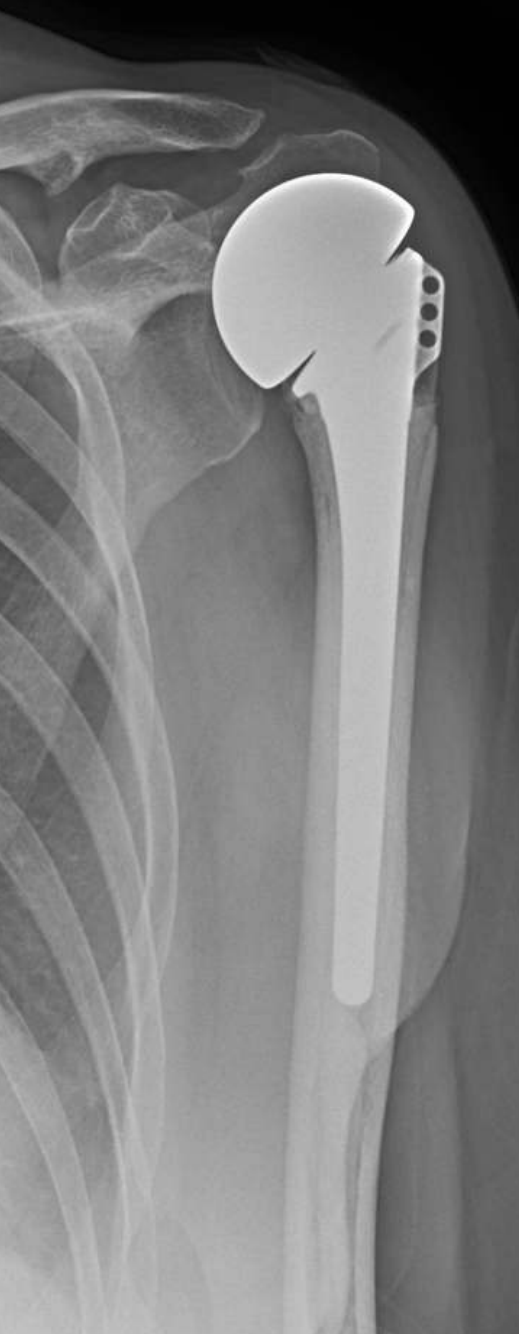


Revisions with longer and longer stems...
Less and less bone stock...



Courtesy of Prof. Frank Gohlke, Paris Course 2013

Revisions with longer and longer stems...
Less and less bone stock...



Courtesy of Prof. Frank Gohlke, Paris Course 2013

The patient's (shoulder) life journey



Plan the patient's life journey

Preserve all options for future revisions

Management of OA in the Young

- Controversial

- Conservative treatment -
Physio, NSAIDs, Injections, Nerve blocks/ablations
- Arthroscopic treatment of osteoarthritis –
CAM procedure + PRP (Tropocells, (Estar-Medical))
- Arthroplasty -
Resurfacing, Hemi, TSA, reverse TSA...

Management of OA in the Young

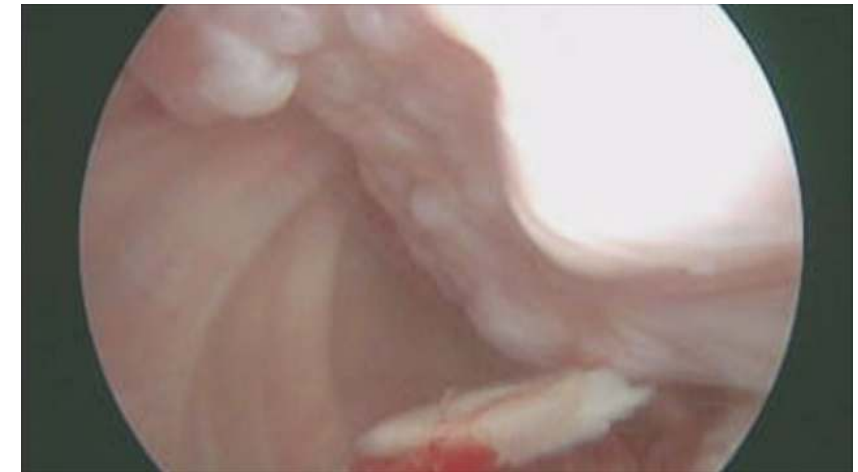
- Controversial

- Conservative treatment -
Physio, NSAIDs, Injections, Nerve blocks/ablations
- Arthroscopic treatment of osteoarthritis –
CAM procedure + PRP (Tropocells, (Estar-Medical))
- Arthroplasty -
Resurfacing, Hemi, TSA, reverse TSA...

Comprehensive Arthroscopic Management

- CAM procedure

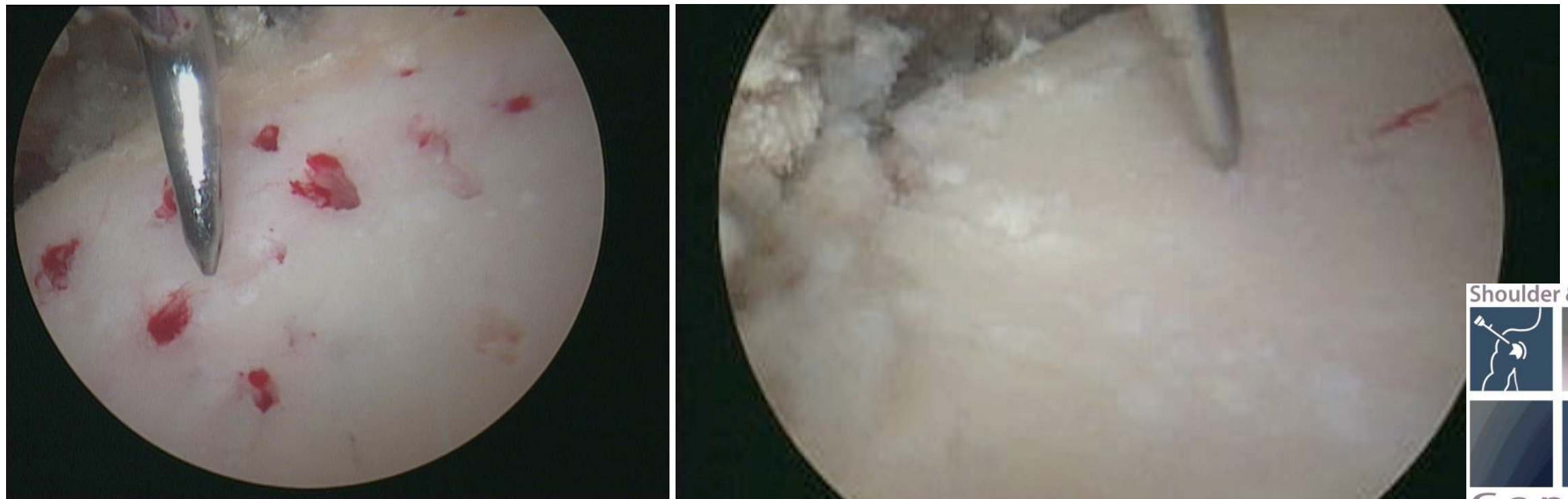
- Under GA & IS block
- EUA - Passive ROM, Limitations, Directions
- Diagnostic arthroscopy -
Assessment: Chondropathy, Contracture
- Loose cartilage debrided to a stable border
- Loose bodies removed
- Debridement of the GH joint
- Synovectomy (shaver & RF ablation)
- Biceps tenotomy (Brazilian Tech)
- Arthroscopic capsular release
- Release of the SSC
- Resection of large osteophytes
- Microfracture + PRP (Tropocells, (Estar-Medical))



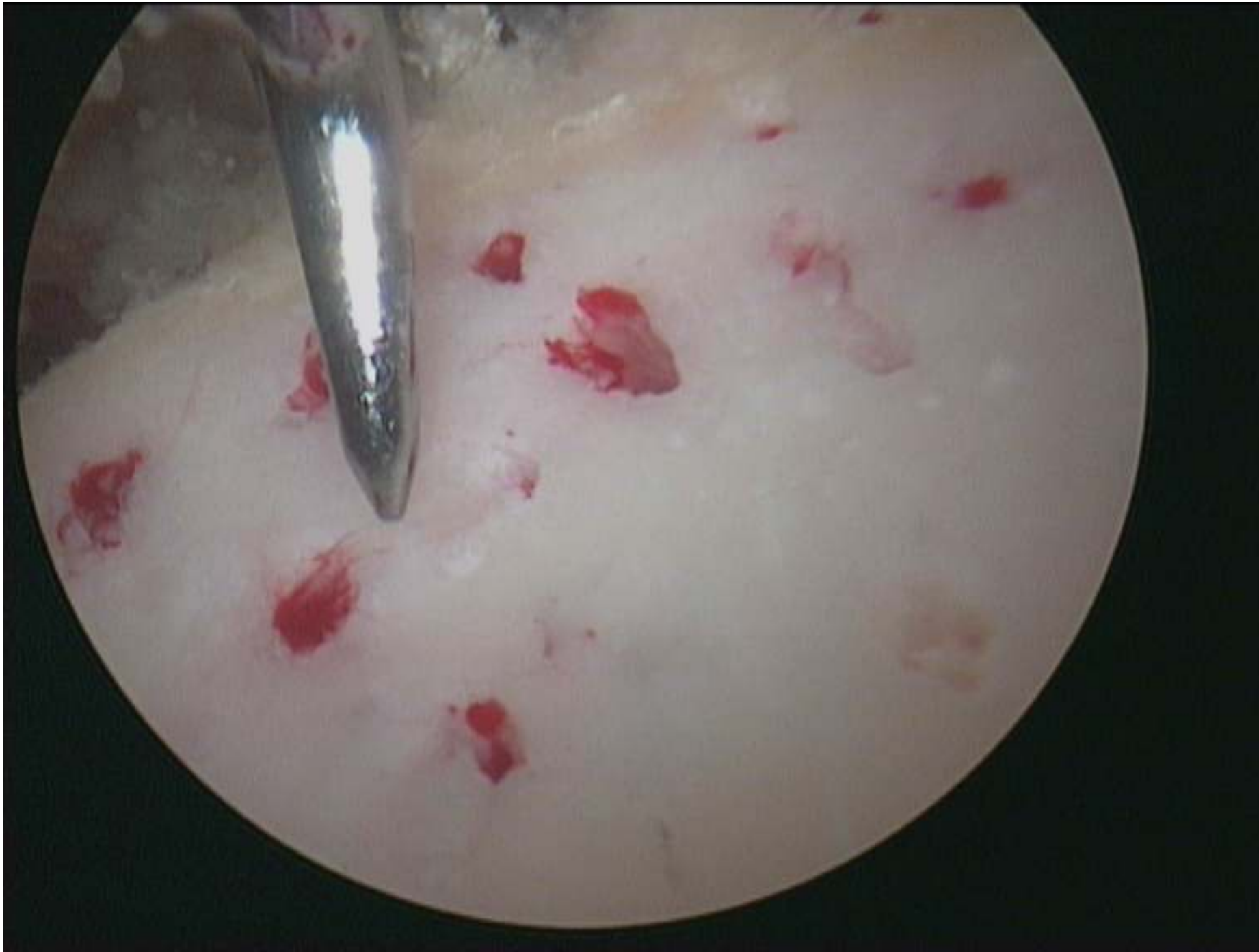
Technically demanding

Comprehensive Arthroscopic Management - CAM procedure

- Thorough 360° capsular release of the capsule & contracted CHLs
- Thorough release of the SSC
- To stop the posterior subluxation of the humeral head
- Creating excessive glenoid pressure and erosion
- Resection of large osteophytes - helps to 'lengthen' the soft tissues
- Microfracture - to penetrate the subchondral bone to release stem cells to fibrocartilage
- PRP - (Tropocells, (Estar-Medical)) growth factors

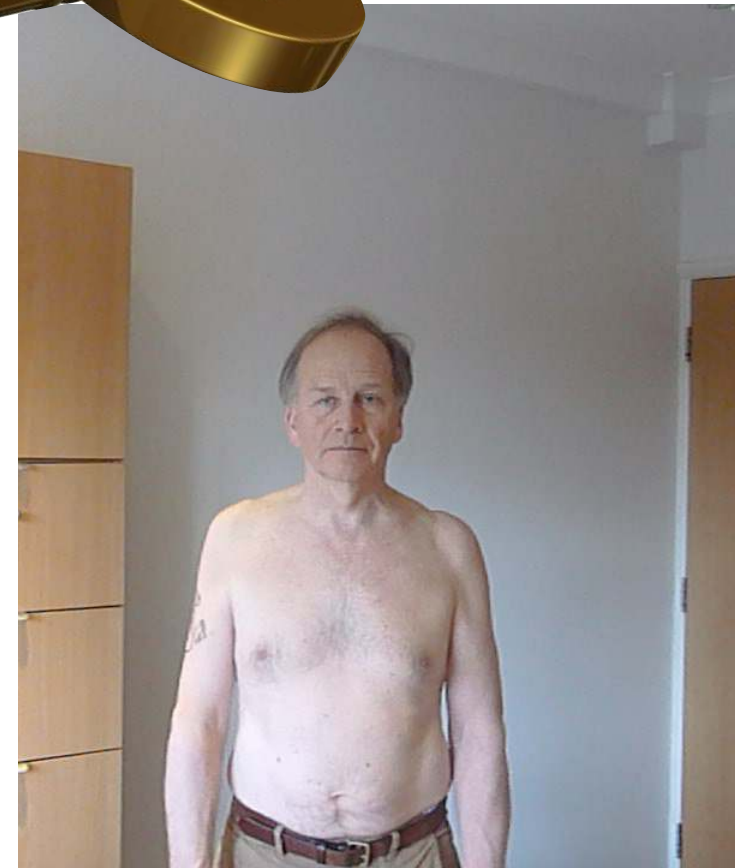


Tropocells™ PRP



Patient selection

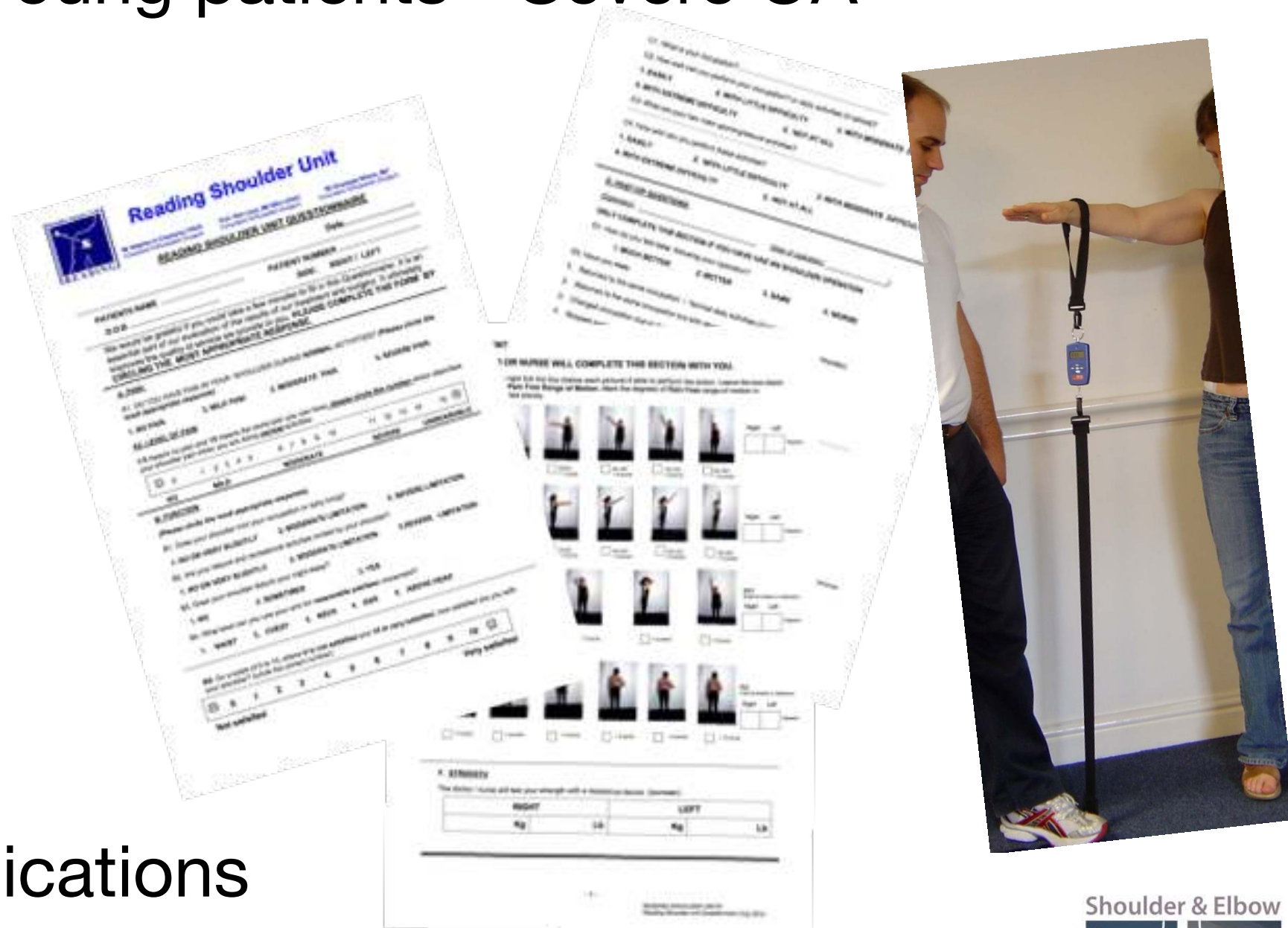
- Advanced Osteoarthritis
- Preserved (good) ROM
- Some residual GH joint space left...
- Good rotator cuff function



- **Remember:**
We treat the patient - NOT the X-rays!

Our results

- 2005 - 2016
- 27 consecutive young patients - Severe OA
- Demographics
- Constant score
- Pain
- SSV
- Satisfaction
- ROM
- Strength
- Operative complications
- Return to Work, Sports, Hobbies



Severe OA

Bipolar lesions - Outerbridge stage 3 or 4

Table I The Samilson and Prieto classification

Grade	Description
1	Inferior humeral or glenoid exostosis, or both, measuring less than 3 mm in height.
2	Inferior humeral or glenoid exostosis, or both, between 3 and 7 mm in height, with slight glenohumeral joint irregularity.
3	Inferior humeral or glenoid exostosis, or both, more than 7 mm in height, with narrowing of the glenohumeral joint and sclerosis.

Table IV The Weinstein classification

Stage	Description
I	Normal radiographs. Diagnosis was made at the time of arthroscopy.
II	Minimal joint space narrowing with a concentric head and glenoid.
III	Moderate joint space narrowing with early inferior osteophyte formation.
IV	Severe loss of joint space with osteophyte formation and loss of concentricity between the humeral head and glenoid.

Table II Modified Samilson and Prieto classification according to Allain

Grade	Description
1	Inferior humeral exostosis between 1 and 3 mm in height.
2	Inferior humeral exostosis between 4 and 7 mm in height.
3	Inferior humeral exostosis more than 7 mm in height.
4	Narrowing of the glenohumeral joint and sclerosis.

Table V The Guyette classification

Stage	Description
0	No appreciable signs of arthritis.
1	Mild sclerosis and/or a small osteophyte less than 2 mm on only one side of the joint.
2	Large marginal osteophytes or osteophytes on more than one side or surface of the joint, joint space narrowing, and/or the presence of cysts.
3	Joint surface destruction, bone on bone joint space narrowing, and/or loose bodies.

Table III Modified Samilson and Prieto classification according to Gerber

Grade	Description
1	Inferior humeral head or glenoid osteophyte of less than 3 mm.
2	Inferior humeral head or glenoid osteophyte between 3 and 5 mm, associated with mild joint line irregularity and subchondral sclerosis.
3	Degenerative changes in the joint greater than above mentioned.

Table VI The Kellgren and Lawrence classification

Stage	Description
0	Marginal osteophytes of doubtful importance
1	Definite osteophytes
2	Moderate joint space narrowing, subchondral sclerosis
3	Severe joint space narrowing, cyst formation

Severe OA

Severe destruction of the joint with 'bone to bone' contact
bone collapse and severe deformity...
it is beyond this procedure

Normal radiographs. Diagnosis was made at the



in height.

- 3 Inferior humeral exostosis more than
- 4 Narrowing of the glenohumeral joint a

Table III Modified Samilson and Priet according to Gerber

Grade	Description
1	Inferior humeral head or glenoid oste than 3 mm.
2	Inferior humeral head or glenoid oste 3 and 5 mm, associated with mild irregularity and subchondral sclerosis
3	Degenerative changes in the joint gre above mentioned.



small osteophyte less than
e of the joint.
es or osteophytes on more
ce of the joint, joint space
presence of cysts.
, bone on bone joint space
se bodies.

ence classification

ubtful importance

wing, subchondral sclerosis
ng, cyst formation

Shoulder & Elbow



Centre

14 F & 13 M

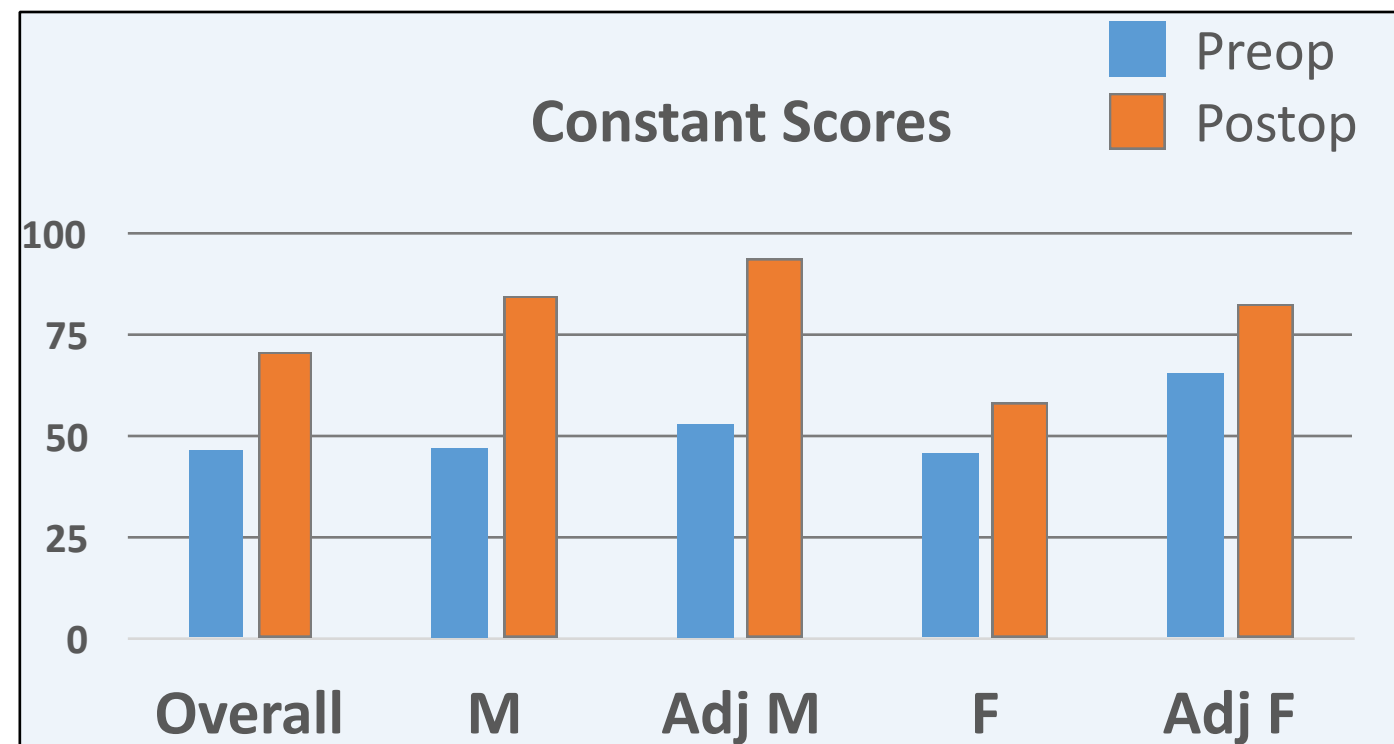
Mean age 56y (22 - 75y)

Mean follow-up 41 months (24m - 12y)

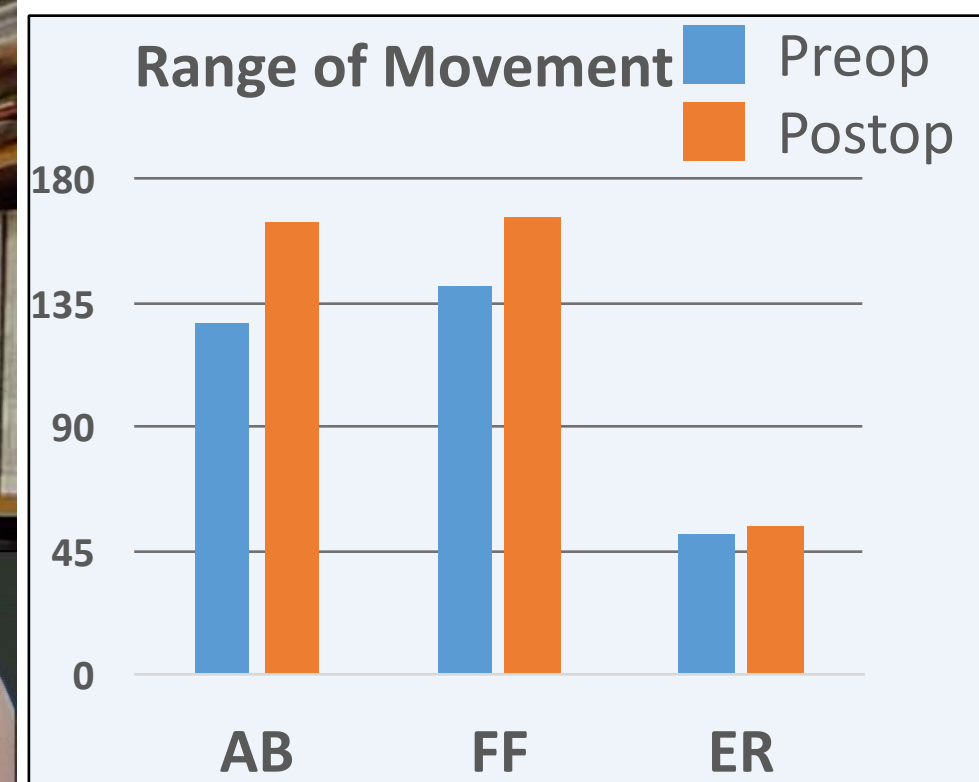
Results:

Mean CS 47 → 71 (Adj. 88) $p < 0.0001$

Significantly improved ROM



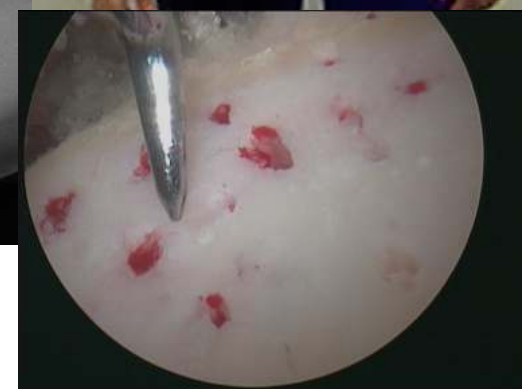
1y po Rt shoulder CAM Micro# + RCR



55yo OA Rt shoulder - Ingo



1 year po CAM - Microfracture



Results:

- Reduced pain $p < 0.0001$
- Improved strength $p = 0.010$
- 25/27 patients satisfied & resumed all activities including sport
- No surgical complications.
- 3 to rTSA (**11%**) at mean of 5y3m (range: 2y3m - 12y) after CAM

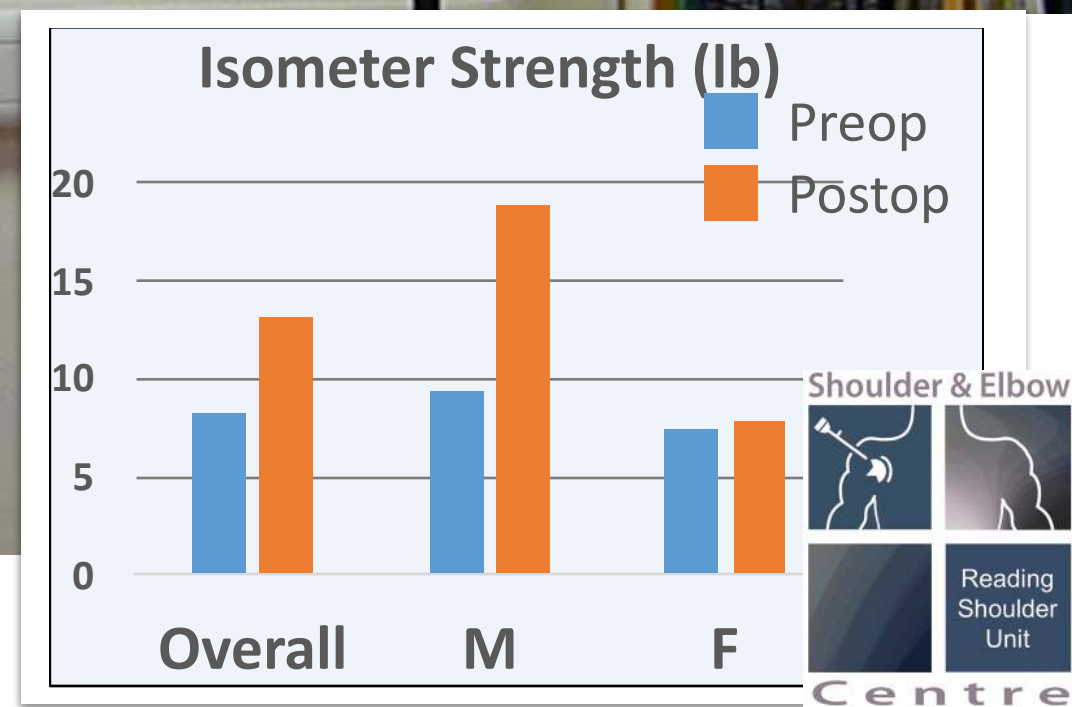


Table 1. Summary of Outcomes After Arthroscopic Management of Glenohumeral Osteoarthritis

Authors	Year	Shoulders, n	Age, yr	Technique	Revisions and Complications	Change in Status
Millett et al. ⁶	2013	30	Mean, 52	Debridement with or without capsular releases, humeral osteoplasty, axillary neurolysis, and acromioplasty	Arthroplasty (n = 6) at mean of 1.9 yr	ASES score, 25 SF-12 PCS score, 6.6 FE, 54.7° ER, 48.8° ER at 90°, 48.1° IR, 37°
Van Thiel et al. ⁹	2010	81	Mean, 47	Debridement with or without capsular releases, tenotomy, microfracture, and acromioplasty	Arthroplasty (n = 16) at mean of 10.1 mo	ASES score, 20.9 SST score, 2.9 VAS score, 2.1
De Beer et al. ⁴	2010	31	Median, 57.5	Debridement, glenoid resurfacing, and tenotomy	Axillary paresis (n = 1) Material failure (n = 2) Synovitis (n = 1) Contusion from MUA (n = 1)	Median Constant-Murley score, 24.5
Kerr and McCarty ⁵	2008	20	Mean, 38	Debridement with or without tenotomy and microfracture	NR	ASES score,* 75.3 SANE score,* 63%
Richards and Burkhart ⁸	2007	8	Mean, 55	Debridement with or without capsular releases	NR	FE, 21.4° IR, 31.1° ER, 16.7°
Cameron et al. ³	2002	70	Mean, 50	Debridement with or without capsular releases	NR	Functional score (0-60), 14.7 FE, 38°
Weinstein et al. ¹⁰	2000	25	Mean, 46	Debridement	None	Pain improved

ASES, American Shoulder and Elbow Surgeons; ER, external rotation; FE, forward elevation; IR, internal rotation; MUA, manipulation under anesthesia; NR, not reported; SANE, Single Assessment Numeric Evaluation; SF-12 PCS, Short Form 12 Physical Component Summary; SST, Simple Shoulder Test; VAS, visual analog scale.

*Postoperative scores only.

Table 1. Summary of Outcomes After Arthroscopic Management of Glenohumeral Osteoarthritis

Authors	Year	Shoulders, n	Age, yr	Technique	Revisions and Complications	Change in Status
Millett et al. ⁶	2013	30	Mean, 52	Debridement with or without capsular releases, humeral osteoplasty, axillary neurolysis, and acromioplasty	Arthroplasty (n = 6) at mean of 1.9 yr 20%	ASES score, 25 SF-12 PCS score, 6.6 FE, 54.7° ER, 48.8° ER at 90°, 48.1° IR, 37°
Van Thiel et al. ⁹	2010	81	Mean, 47	Debridement with or without capsular releases, tenotomy, microfracture, and acromioplasty	Arthroplasty (n = 16) at mean of 10.1 mo 20%	ASES score, 20.9 SST score, 2.9 VAS score, 2.1
De Beer et al. ⁴	2010	31	Median, 57.5	Debridement, glenoid resurfacing, and tenotomy	Axillary paresis (n = 1) Material failure (n = 2) Synovitis (n = 1) Contusion from MUA (n = 1)	Median Constant-Murley score, 24.5
Kerr and McCarty ⁵	2008	20	Mean, 38	Debridement with or without tenotomy and microfracture	NR	ASES score,* 75.3 SANE score,* 63%
Richards and Burkhart ⁸	2007	8	Mean, 55	Debridement with or without capsular releases	NR	FE, 21.4° IR, 31.1° ER, 16.7°
Cameron et al. ³	2002	70	Mean, 50	Debridement with or without capsular releases	NR	Functional score (0-60), 14.7 FE, 38°
Weinstein et al. ¹⁰	2000	25	Mean, 46	Debridement	None	Pain improved

ASES, American Shoulder and Elbow Surgeons; ER, external rotation; FE, forward elevation; IR, internal rotation; MUA, manipulation under anesthesia; NR, not reported; SANE, Single Assessment Numeric Evaluation; SF-12 PCS, Short Form 12 Physical Component Summary; SST, Simple Shoulder Test; VAS, visual analog scale.

*Postoperative scores only.

Significant risk factor for progressing to arthroplasty:

- Joint space < 2 mm (7.8 times higher risk)
- Grade IV bipolar arthritis

Comprehensive Arthroscopic Management (CAM) Procedure: Clinical Results of a Joint-Preserving Arthroscopic Treatment for Young, Active Patients With Advanced Shoulder Osteoarthritis

Peter J. Millett, M.D., M.Sc., Marilee P. Horan, M.P.H., Andrew T. Pennock, M.D.,
and Daniel Rios, M.D.

Arthroscopy: The Journal of Arthroscopic and Related Surgery, Vol 29, No 3 (March), 2013: pp 440-448



GH joint space <2mm - Failure CAM

Survivorship and Patient-Reported Outcomes After Comprehensive Arthroscopic Management of Glenohumeral Osteoarthritis

Minimum 5-Year Follow-up The American Journal of Sports Medicine 2016

Justin J. Mitchell,* MD, Marilee P. Horan,* MPH, Joshua A. Greenspoon,* BSc,
Travis J. Menge,* MD, Dimitri S. Tahal,* MSc, and Peter J. Millett,*^{†‡} MD, MSc

Investigation performed at the Steadman Philippon Research Institute, Vail, Colorado, USA

46 patients (49 shoulders)

15 F / 29 M

Mean age 52 years (27-68 years)

12 shoulders (26%) progressed to TSA
at a mean of 2.6 years (0.5-8.2 years)

Survivorship:

95.6% at 1 year

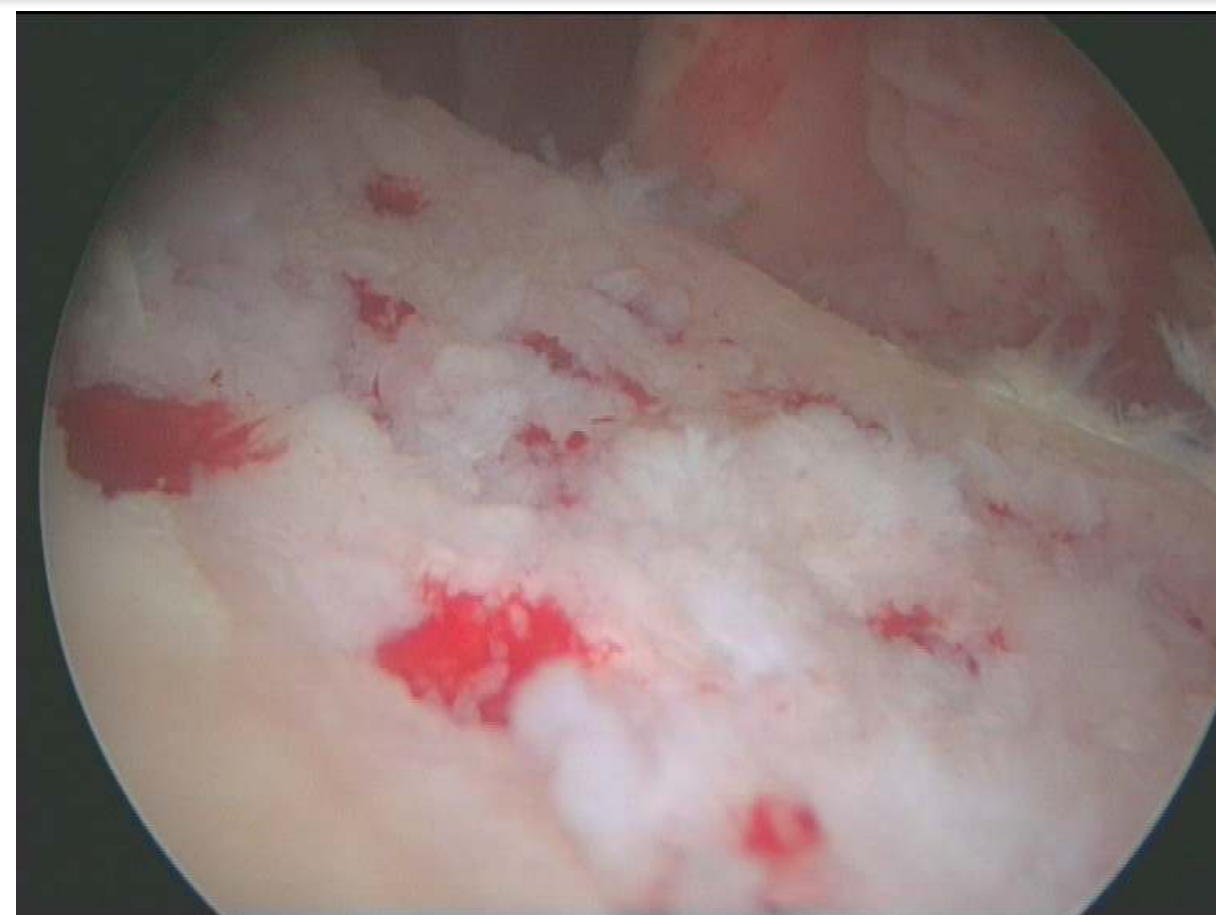
86.7% at 3 years

76.9% at 5 years

ASES score was 84.5 ± 17

SANE score was 82 ± 18

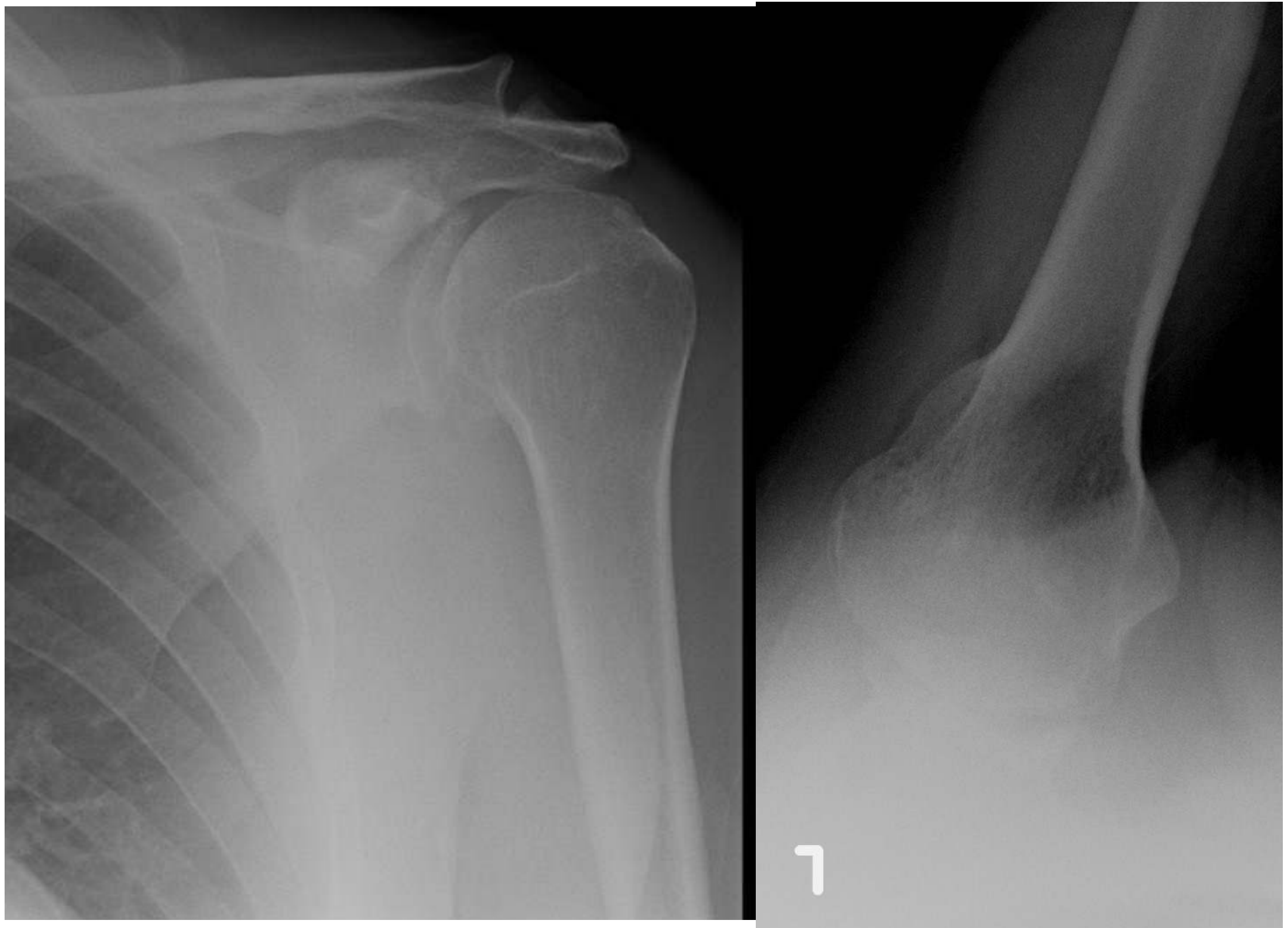
Median patient satisfaction was 9 /10



51yo - 2004 CAM procedure

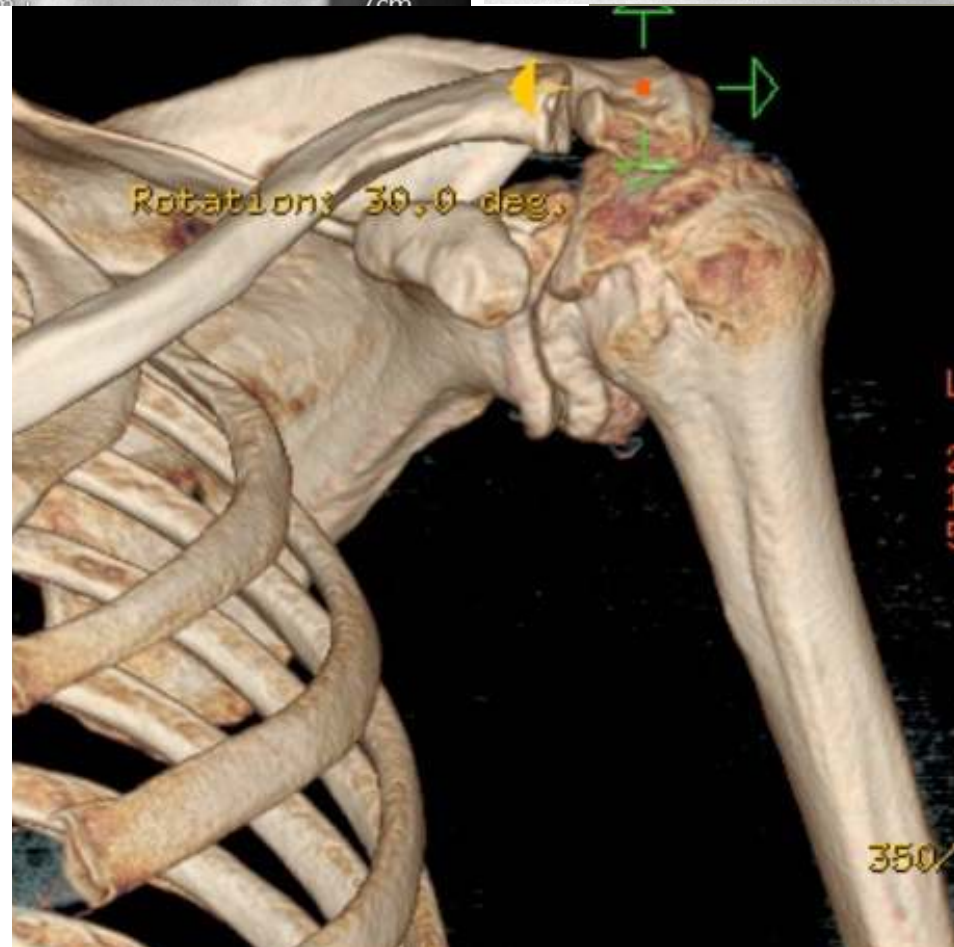


52yo - 2005 1y po CAM procedure



SM

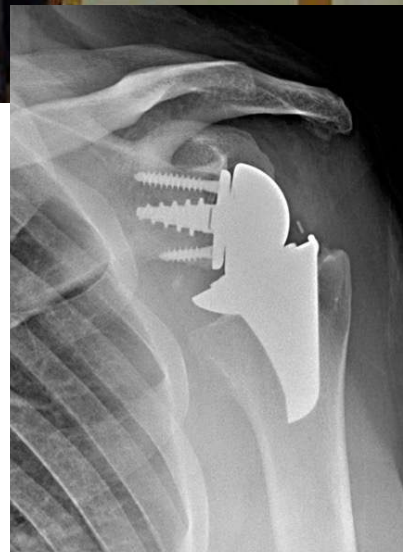
63yo - 2016 12y po CAM procedure



SM

Centre

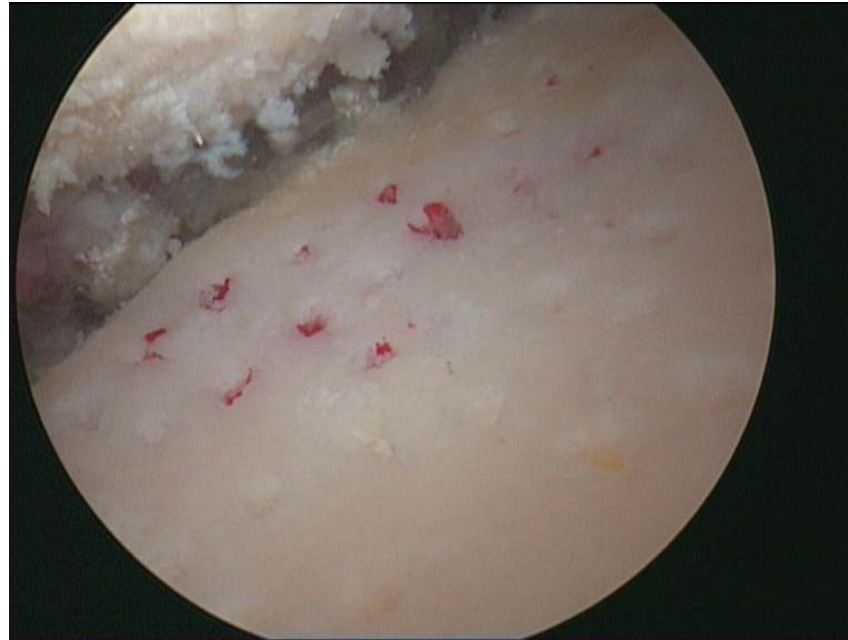
1y po Verso rTSA



No 53

SM

70yo ♀ semi-pro swimmer



3m po CAM procedure - good ROM but pain



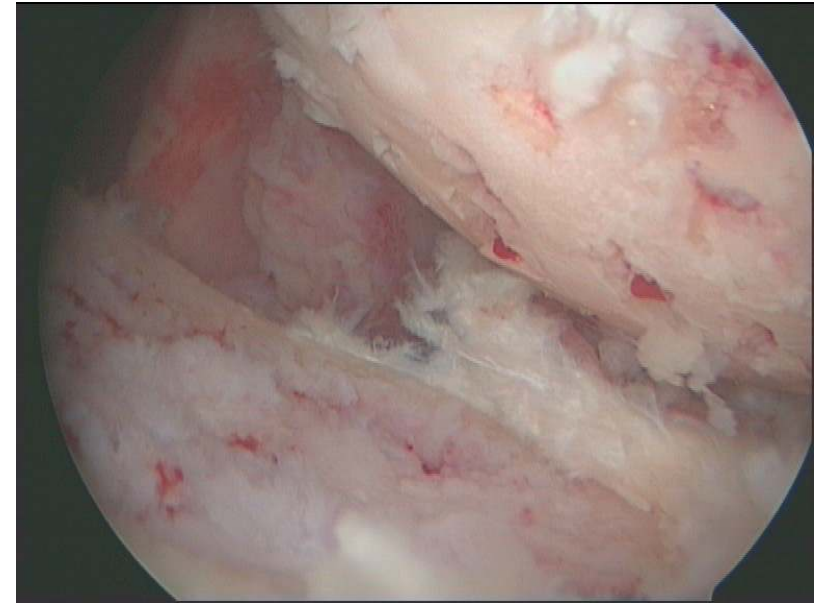
6m po CAM procedure - good ROM but pain



for Resurfacing

Conclusions:

- Arthroscopic CAM procedure with microfracture + PRP is safe and effective
- Technically demanding - skilled surgeon
- Patient selection is crucial
- GH joint space $< 2\text{mm}$, 'Bone to Bone' apposition or severe deformities have high risk of failure
- It can delay arthroplasty - beneficial for younger patients
- No Bridges are burnt....
- Successful arthroplasty can be performed when it fails





INTERNATIONAL SHOULDER SAFARI

November 11-18, 2018 • Israel



www.shouldersafari.com