

Frozen Shoulder

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Shoulder conditions....there was only one!

- Impingement
- AC joint pain / arthritis
- Calcific tendonitis
- Rotator cuff tear
- Frozen shoulder
- LHB tendonopathy / SLAP
- Instability
- AVN
- Degenerative joint disease –OA/RA
- Fractures



DEFINITION

EPIDEMIOLOGY

Duplay 1872 describes a shoulder disease with **pain** and **global ROM restriction**

SYMPTOMS

ETIOLOGY

▪ **ADHESIVE CAPSULITIS**

Or

PATHOGENESIS

▪ **FROZEN SHOULDER**

DIAGNOSIS

Codman 1934: Stiff shoulder

“difficult to define and describe”



Simple definition

(Painful) global restriction in range of movement of shoulder (passive and active) in presence of **normal plain radiographs**



STIFF SHOULDER IS NOT A FROZEN SHOULDER!

**STIFFNESS =
SYMPTOM**

IDIOPATHIC

Adhesive Capsulitis

Unknown cause:

Benign!

SECONDARY

- Surgery
- Inflammatory arthritis
- Calcific tendinitis
- Hemiplegic pt
- Cuff tear
- Metabolic, etc



Epidemiology

EPIDEMIOLOGY

- **3-5%** white caucasian population
- Female more frequent between **50 and 60 Y, male 55-65**
- **Non** dominant arm more frequent
- **20-37%** pt **bilateral, not simultaneously**
- **No recurrence** on the same shoulder!

SYMPTOMS

ETIOLOGY

PATHOGENESIS

DIAGNOSIS



Diabetic Frozen Shoulder

42% Bilateral

Increased risk of lasting >2 years

Resistant to treatment

Residual limitation ROM



Idiopathic CO-MORBIDITY

- **Diabetes mellitus (10-30%)**
- **M. Dupuytren (8.8%)**
- **Distyroidism**
- **M Parkinson**
- **Neurosurgery Op.**
- **Cardiac disease**
- **Ipercholesterolemia**
- **Hypoadrenalism**
- **Carpal Tunnel (9.5%)**



ETIOPATHOGENESIS

Unknown!

Theories:

- INFLAMMATORY **Post-infective arthritis** (viral, bacteria or micotic)
- IMMUNE DISORDER
- DYSMETABOLIC
- ENDOCRINE



Pathology of Adhesive Capsulitis

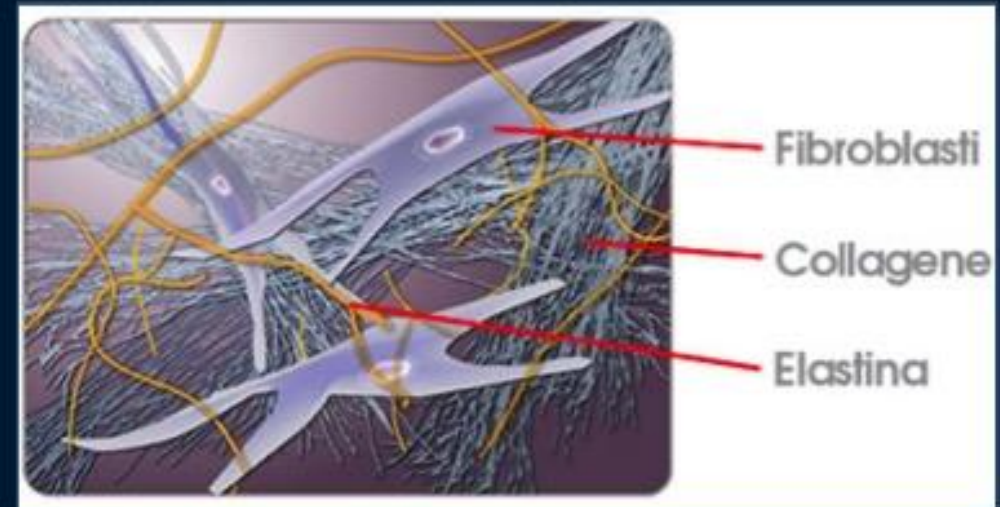
- Increase in cytokines and growth factors PDGF, TGF β (VEGF **Diabetes**) and inhibition of matrix metalloproteinases
- Angiogenesis
- Nerve cells/Termination increase in number
- Mast cells – T and B ? **Immune modulated condition**
- Fibrosis, **Miofibroblast late stage Shrinking** capsular thickening
- Joint volume 3-4 ml (10-15 ml)
- Genetic cause



HISTOLOGY

- 18% Frozen Shoulder associated with Dupuytren
- Capsule: modification of **fibroblasts similar to the Dupuytren**

(Meulengracht e Schwartz 1952)



- Similar hystology, **Genetic component, non dominant** with variable **penetrance**
(Bunker 2000)



Pain in frozen shoulder

- The pain is ‘very trying’, but the patient is able to continue with daily habits and routines.
- Increased expression of **nerve growth factor** receptor and new nerve fibers were found in the shoulder capsular tissue of patients with frozen shoulder compared with those without
- Neoinnervation and neoangiogenesis in the shoulder capsule are important events in the pathogenesis of frozen shoulder and **may explain the severity of pain.**
 - (Murrell et al JSES 2013)



3 Phases

1. “Freezing”

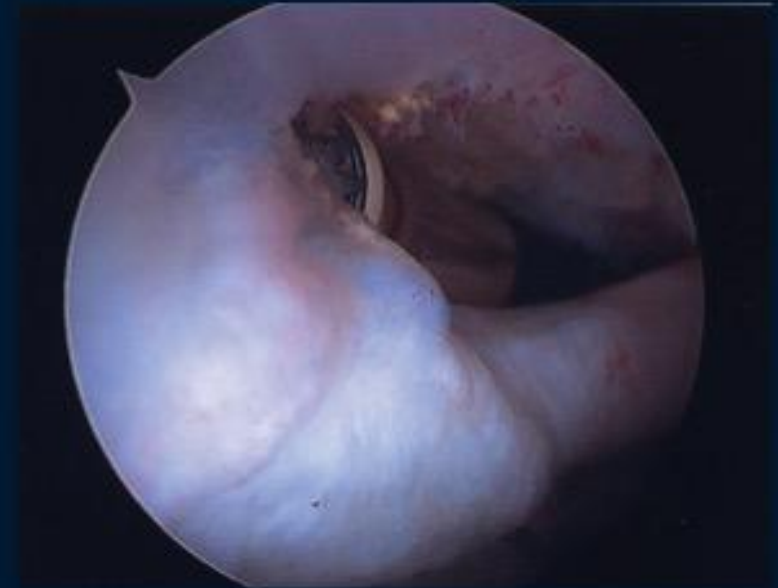
- 2 -9 months
- Insidious onset
- Main characteristic: Pain, sleep discomfort, increase with movement
- Arm in IR and Adduction (isometric position)
- Tx: NSAID, Steroid oral/injection, gentle stretching, Hydrotherapy



3 Phases

2. "Frozen"

- 3 - 12 months
- ROM deficit in all planes **Active and Passive**
- Tx: gentle stretching, **MUA/ Surgery accelerate the healing process**



3 Phases

3. “Thawing”

- 5 - 18 months
- Gradual recover of ROM
- Might persist a functional deficit
10%, diabetic up to 40%
- Tx gradual stretching,
arthroscopic release



Frozen Shoulder

"This entity is difficult to define, difficult to treat, and difficult to explain" Codman 1934,

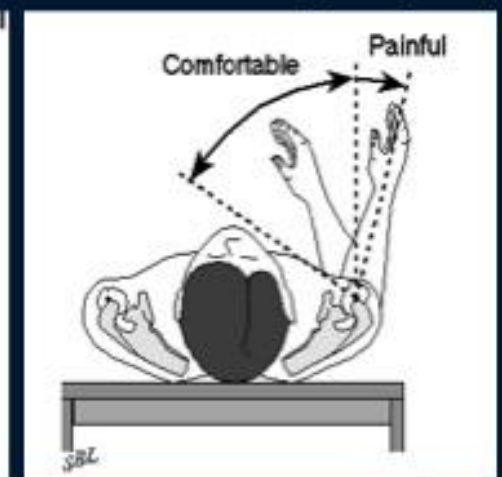
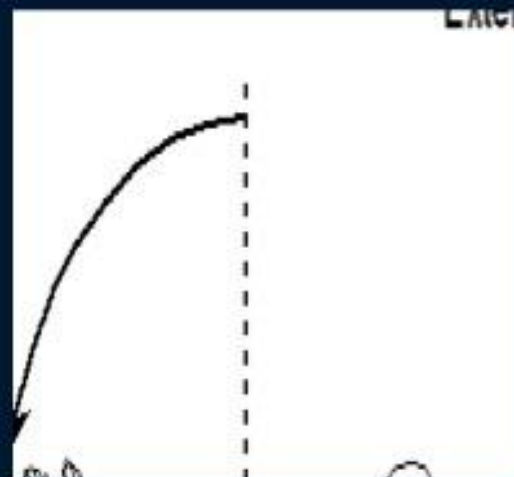
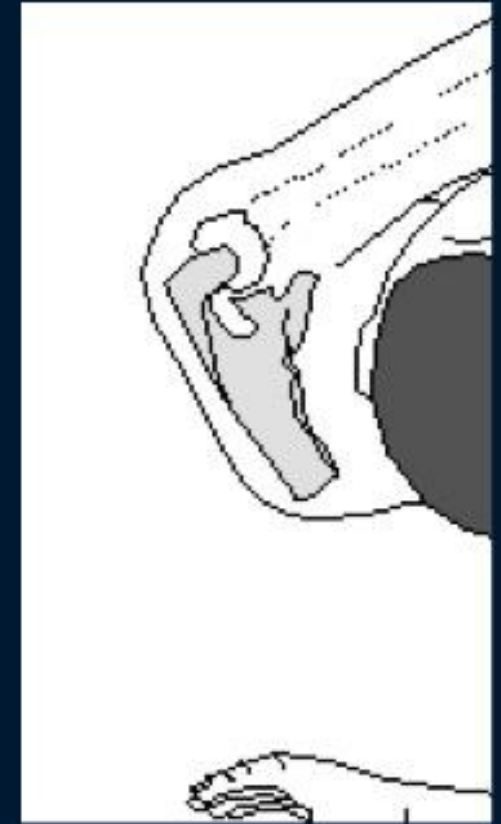
- Symptoms =
 - pain
 - progressive
 - mostly at night
 - end of the range of motion (ROM).
 - restricted ROM
 - Duration 30 months average



Symptoms

ROM Restriction

- Passive Abd $< 100^\circ$
- Passive ER $< 30^\circ$,
Less than 50% in comparison with the
opposite shoulder
- Decrease Passive IR
- Decrease ER2, IR2



Exclusions for Diagnosis

- Causes of Secondary Stiff shoulder
- Locked posterior dislocation
- Osteoarthritis
- Tumours:
 - Primary
 - Metastases
- Subdiaphragmatic Pathology
- Cervical spine Pathology
- Pancoast Tumour



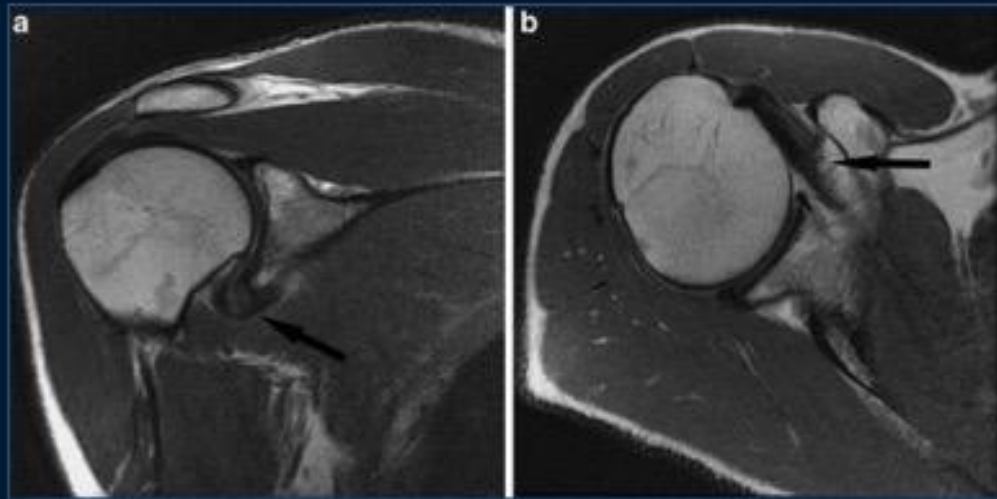
Lab and Imaging

- **XRays:** normal (Dd: Arthritis, Posterior dislocation)
- **Lab:** normal (ESR, CPR, ...)
- **USS:** esclude tendon lesions



Imaging

- **MRI:** Thickening and abnormal signal in the axillary folder and on rotator interval



DIAGNOSTIC ARTHROSCOPY

- **Arthroscopy:**
Neviaser 4 degrees



- 1: fatty tissue with local edema** above the **synovia**,
- 2: Inflamed** synovia, beginning of the **capsular retraction**,
decreased ROM
- 3: transition from inflamed synovia to chronic fibrosis**, severe
decrease glenohumeral space
- 4: no synovitis**, Thickened capsule and retraction



ANATOMY

- **Coraco-acromial ligament and anterior capsule retraction** in the rotator interval area followed by shrinking of the posterior capsule



Principles of Management

- Pain control
- Pain control
- Pain control
- Pain Control

-
- Improve ROM



Treatment

"the role of the Physician is to entertain the Patient whilst his disease runs its usual course."

Molière 17th century



Management

- Long term prognosis

Carr 2008

After an average of 3 years:

- 50% good shoulder
 - 35% mild symptoms
 - 6% moderate/severe symptoms
-
- Diabetic FS
 - Up to 40% mild to severe symptoms
 - Final outcome may depend on initial degree of disability



Management of Adhesive Capsulitis

- 1) Watch and wait (or “supervised neglect”)**
- 2) NSAIDs and Prednisolone**
- 3) Physiotherapy**
- 4) Intra-articular steroid injections**
- 5) Arthrographic Distension**
- 6) MUA**
- 7) Arthroscopic Capsular Release**



Management

- Analgesia:
Paracetamol, NSIADs, Opiates, Calcitonin, Acupuncture
- **NSAID less effective than steroid short term**

Cochrane 2009

- **Steroid:**
- Injections: Better short term result higher dose
- Better results if associated with distension
- More effective than physio
- MUA +Inj versus MUA: No difference
- **Oral versus Injections less effective short term**



Physiotherapy

- Variety of techniques including mobilisations, home exercises, electrotherapy, thermotherapy and massage
- Diercks 2004 demonstrated **worse outcome than no treatment**
- Recent review concluded that corticosteroid injections are more effective than physiotherapy for pain in the shorter term



Self-Stretching



Suprascapular nerve block

- More effective than Injection short term
- Often used for 3 days in diabetic patients and recurrence
- Different report on efficacy



Arthrographic Distension

- 20ml fluid (+ contrast) injected into glenohumeral joint and allowed to flow back syringe, repeated until capsular rupture
- Performed under radiological imaging and local anaesthetic
- Distension of the glenohumeral joint with fluid is thought to disrupt adhesions (scar tissue)



Arthrographic Distension

Small Tight Capsule

Volume Increase

Capsule Rupture



Images from Musculoskeletal Imaging Companion, Berquist



Reading Shoulder
Unit

Arthrographic Distension – Cochrane Review

- Distension with saline and steroid better than placebo for pain, ROM and disability at 3 weeks
- Benefit maintained at 6 and 12 weeks
- Distension with saline and steroid may not have any benefit in pain reduction vs corticosteroid injection



Clinical Course

Codman (1934) -

“Even the most protracted cases recover with or without treatment in about 2 years”

Is it always true?

Reeves (1975) -

Patients still symptomatic up to 10 years later 25/41 had detectable decrease in ROM 3 had functional deficit

Shaffer et al (1992) -

50% - 60% of patients treated non-operatively still having some pain or stiffness or both at mean follow-up of 7 years seven years.

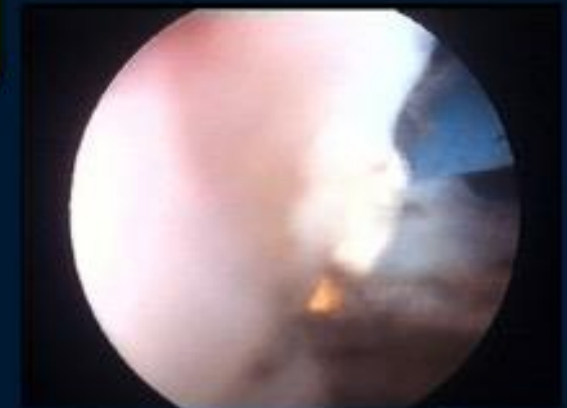


Frozen Shoulder Management



- MUA + Injection
or
- Arthroscopic release
+++Diabetics

as day case
under GA + ISB



- Immediate **PHYSIO**
- Shoulder function improves
about 70% within 3 weeks



Manipulation

Of value in second phase of disease when ROM has not responded to exercise programme

Causes tear in capsule around the glenoid and the Coracohumeral ligament / Rotator Interval

Risks / Complications 4%

Fracture

Dislocation

Nerve injury



Surgery

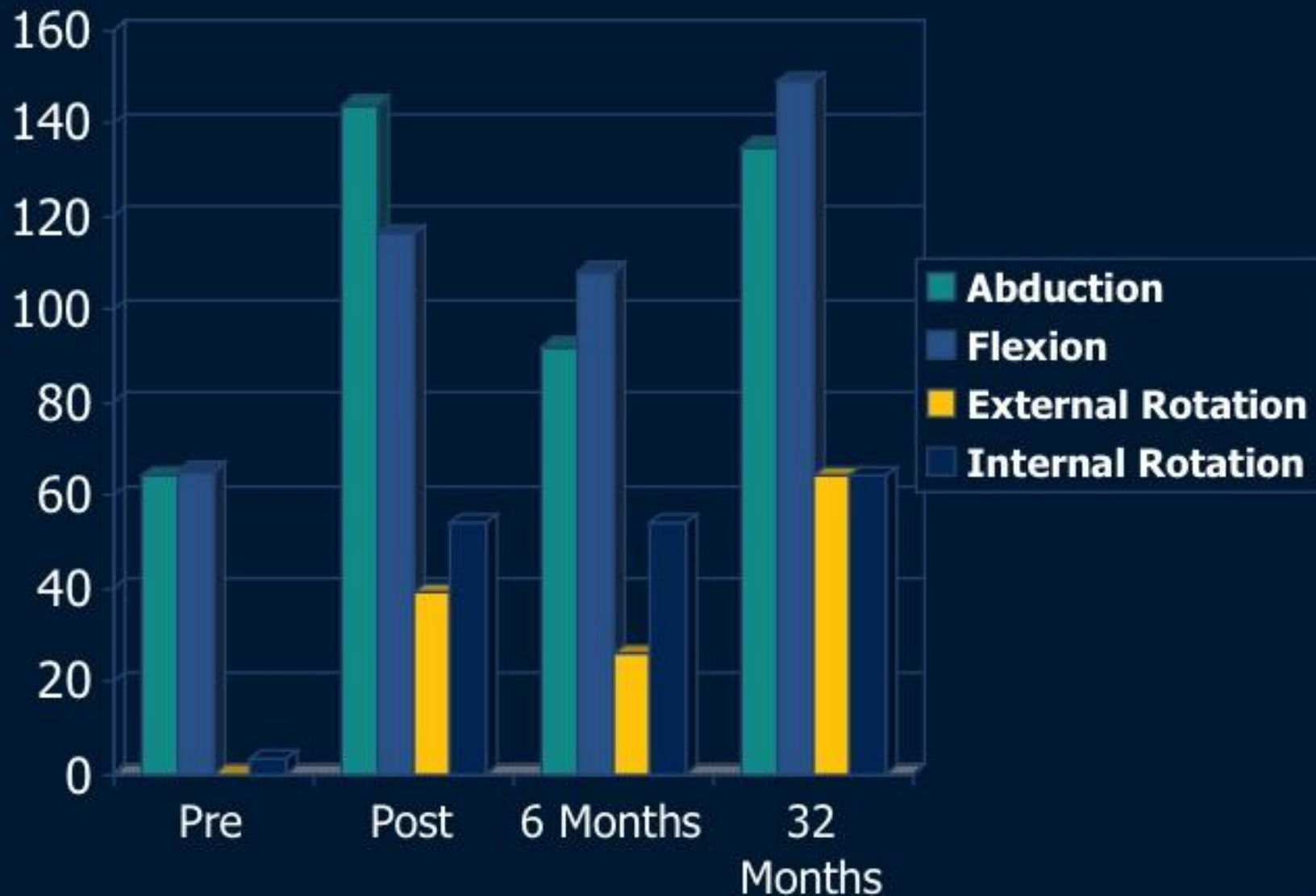
- Arthroscopic release less risk of intraoperative complication (0,5%)
- 270 degree release effective in ROM restoration

Indication:

- Longer period before installing treatment
- Diabetes
- Severe limitation ROM
- Younger refractory patients



Motion in relation to time



CONCLUSION

Challenge:

- **Quick Diagnosis**
- **First phase may mimic any shoulder pathology**
- **Target: control pain and then regain full ROM**
- **Appropriate Treatment** avoiding wrong medical, physio and surgical intervention for **timing, intensity and invasivity**



“Postoperative stiff shoulder”

Active and Passive ROM Limitation in well-aligned normal joint surfaces

Table 1 Definition of stiff shoulder from different authors

Study	Definition of shoulder stiffness
Seo <i>et al.</i> ³	Restriction of active and passive motions of 100° of elevation or less, < 50% of external rotation when compared with the motion of the contralateral shoulder and internal rotation only to the sacrum
Parsons <i>et al.</i> ¹⁹	Passive forward elevation was < 100° and passive external rotation was < 30° in the operated-on shoulder
Brislin <i>et al.</i> ²	Total passive external rotation with the arm at the side of < 10°, total passive external rotation with the arm in 90° abduction of < 30° or total passive forward flexion of < 100°. The diagnosis of stiffness was made only when these motion deficits persisted for 90 days postoperatively
Tauro ²⁰	Total passive ROM deficit (abduction, forward flexion, external rotation and internal rotation added together): 0–20° = mild stiffness; 25–70° = moderate stiffness and > 70° = severe stiffness
Hsu <i>et al.</i> ¹⁴	Active and passive limitation of motion of equal to or more than half the normal range for at least 3 months. The ranges of motion were flexion = 90°, abduction = 90°, external rotation = 25° and internal rotation = sacral level

³Holloway GB, Schenk T, Iannotti JP *et al* *Arthroscopic capsular release for the treatment of refractory postoperative or post-fracture shoulder stiffness.* J Bone Joint Surg Am 2001

“Postoperative capsulitis”

The most common postsurgical stiff shoulder is due to an **intense inflammatory response similar to the adhesive capsulitis disease**, unresponsive to physiotherapy

¹Mansat P, Cofield R, Kerssten T et al : *Complications of rotator cuff repair*. Orthop Clin North Am 1997;28:205–213.

- Cytokine cascade, Local inflammatory mediators, growth factors are involved
- Fibrosis, capsular thickening and contracture
- Joint volume 3-4 ml (10-15 ml)

²Franceschi F, Papalia R, Palumbo A et al: *Management of postoperative shoulder stiffness*. Sports Med Arthrosc Rev 2011;19:420–427



Pathogenesis

- Surgery is one of the most common cause of shoulder stiffness

Vezeridis PS,Goel DP,Warner JJP et al: *Postarthroscopic arthrofibrosis of the shoulder*. Sports Med Arthrosc Rev 2010;18:198–206

- Postsurgical Stiffness is one of the most common complication of RCR

Brislin KJ, Field LD, Savoie FH III.: *Complications after arthroscopic rotator cuff repair*. Arthroscopy 2007;23:124–128.

- In literature: between 5% and 39%.

Franceschi F, Papalia R,Palumbo A et al: *Management of postoperative shoulder stiffness*. Sports Med Arthrosc Rev 2011;19:420–427

Is this True?



Clinical – Postsurgical Stiff Shoulder

- Characterised by immediate or late (>3-4 weeks) spontaneous onset of pain with progressive, increasing stiffness of the glenohumeral joint
- Classically interferes with sleep
- Restricts daily living, work and leisure (Neviaser 1987)
- External and Internal Rotation most affected in abduction, then elevation
- Both passive and active movement affected



Different conditions:



- **Post ASD**
- **Post Capsular release:**
 - Posteroinferior capsular stiffness
- **Post Calcific deposit excision**
- **LHB Hourglass effect**
- **Post Instability Surgery**
 - Overtightening (Temporary?)
 - HAGL Lesion
 - Mobilized anchors and chondropathy
- **Post Rotator Cuff Repair**
- **Post Arthroplasty/ Fracture fixation**



Management of Postsurgical Stiffness

- 1) Wait and See (or "supervised neglect")
- 2) Oral Prednisolone
- 3) **Intrarticular Steroid Injection (>4/52 RCR)**
- 4) Hydrokinesis, Selfstretching in closed chain, Physio (late stages)
- 5) MUA
- 6) Arthroscopic Capsular Release



Watch and Wait (Supervised Neglect)

Can be more effective than physiotherapy (Diercks 2004)

- 89% v 64% pts showed near normal function <1yr

NSAIDs and Prednisolone

- NSAIDs, acetaminophen and a short course of prednisolone can reduce pain and inflammation (Tasto 2007)
- Do not improve ROM, and may only be short term benefit (Lee 1974, Buchbinder 2004)



Postsurgical Stiffness **after RCR**

- Predisposing Factors
- Preop Stiffness
- Postop Stiffness management
- Rehabilitation after RCR

Published Online February 14, 2012

Shoulder stiffness and rotator cuff repair

Rocco Papalia¹, Francesco Franceschi¹, Sebastiano Vasta¹, Andrea Gallo¹,
Nicola Maffulli^{2*}, and Vincenzo Denaro¹

¹Department of Orthopaedic and Trauma Surgery, Campus Biomedico University of Rome, Via Álvaro del Portillo 200, Rome, Italy, and ²Centre for Sports and Exercise Medicine, Barts and The London School of Medicine and Dentistry, Mile End Hospital, 275 Bancroft Road, London E1 4DG, UK



Incidence and treatment of postoperative stiffness following arthroscopic rotator cuff repair.

Huberty DP¹, Schoolfield JD, Brady PC, Vadala AP, Arrigoni P, Burkhart SS.

489 arthroscopic RCR

4,9% postop stiffness (29 cases)

95,8% spontaneous resolution (24 cases)

100% of cases full resolution after release

Predisposing Factors:

Calcific tendonitis

Preop stiffness,

Single tendon repair

PASTA lesion repair,

Patients below 50Y

Working/Insurance related issues



SECTION II
ORIGINAL ARTICLES

Prevention of Shoulder Stiffness after Rotator Cuff Repair

Kim Treisman, MAgile PT; Julie R. Watson, PhD; and George A. C. Sterner, MREBS, DPMd

• Predisposing Factors:

Retrospective study, **209 patients after RCR**

Best preop predictive factor for stiffness:

Level of the hand behind the back.

After 24 months similar ROM progression

Average duration to recover shoulder stiffness: 76 weeks

By 1 year similar ROM

Are we overestimating post RCR Stiffness?



Scand J Surg. 2014 Apr 2. [Epub ahead of print]

Postoperative stiff shoulder after open rotator cuff repair: A 3- to 20-year follow-up study.

Vastamäki H. Vastamäki M.

- Spontaneous resolution in 6-12 months without intervention
- Good long term prognosis.
- Rarely a capsular release is needed



Surgical Procedure

Prognosis & Treatment

Sports Med Arthrosc. 2010 Sep;18(3):198-206. doi: 10.1097/JSA.0b013e3181ec84e5.

Postarthroscopic arthrofibrosis of the shoulder.

Vezeridis PS¹, Goel DP, Shah AA, Sung SY, Warner JJ.

MUA is less successful in Postsurgical Stiffness if compared to the adhesive capsulitis

Sports Med Arthrosc. 2011 Dec;19(4):420-7. doi: 10.1097/JSA.0b013e3182393e06.

Management of postoperative shoulder stiffness.

Franceschi F¹, Papalia R, Palumbo A, Vasta S, Maffulli N, Denaro V.

Arthroscopic capsular release is the **gold standard** in this group of patients: selective removal of the adhesion with periglenoid capsulotomy



J Shoulder Elbow Surg. 2010 Oct;19(7):1034-9. doi: 10.1016/j.jse.2010.04.006. Epub 2010 Jul 24.

Does slower rehabilitation after arthroscopic rotator cuff repair lead to long-term stiffness?

Parsons BO¹, Gruson KI, Chen DD, Harrison AK, Gladstone J, Flatow EL.

6 weeks immobilization does not increase post RCR
stiffness instead improve % of tendon healing
Stiffness=Healing Process!



Mechanic of Repair

- **Avoid overzealous physiotherapy**
- **Taylor to the patient the correct postop protocol**



Thank You

