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

▪ FROZEN SHOULDER

PATHOGENENESIS

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

- 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!
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
- Cardiac disease

- Ipercholesterolemy
- Hypoadrenalism
- Carpal Tunnel (9.5%)
ETIOPATHOGENESIS

Unknown!

Theories:
- **INFLAMMATORY** Post-infective arthritis (viral, bacteria or micotic)

- **IMMUNE DISORDER**

- **DYSMETHABOLIC**

- **ENDOCRINE**
Pathology of Adhesive Capsulitis

- Increase in cytokines and growth factors PDGF, TGFβ (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

Lubiecki and Carr, 2007
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 moths average
Symptoms

ROM Restriction

- Passive Abd < 100°
- **Passive ER < 30°,**
  Less than 50% in comparison with the opposite shoulder

- Decrease Passive IR
- Decrease ER2, IR2

*BESS Definition*
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**: exclude 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  
  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
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

- Abduction
- Flexion
- External Rotation
- Internal Rotation
CONCLUSION

Challenge:
- Quick Diagnosis
- First phase may mimic any shoulder pathology
- Target: control pain and than 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>
<thead>
<tr>
<th>Study</th>
<th>Definition of shoulder stiffness</th>
</tr>
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<tbody>
<tr>
<td>Seo et al.</td>
<td>Restriction of active and passive motions of 100° of elevation or less, &lt;50% of external rotation when compared with the motion of the contralateral shoulder and internal rotation only to the sacrum</td>
</tr>
<tr>
<td>Parsons</td>
<td>Passive forward elevation was &lt;100° and passive external rotation was &lt;30° in the operated-on shoulder</td>
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<tr>
<td>Brislin et al.</td>
<td>Total passive external rotation with the arm at the side of &lt;10°, total passive external rotation with the arm in 90° abduction of &lt;30° or total passive forward flexion of &lt;100°. The diagnosis of stiffness was made only when these motion deficits persisted for 90 days postoperatively</td>
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<tr>
<td>Tauro</td>
<td>Total passive ROM deficit (abduction, forward flexion, external rotation and internal rotation added together): 0–20° = mild stiffness; 25–70° = moderate stiffness and &gt;70° = severe stiffness</td>
</tr>
<tr>
<td>Hsu et al.</td>
<td>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</td>
</tr>
</tbody>
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"Postoperative capsulitis"

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


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

Pathogenesis

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

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

- In literature: between 5% and 39%.


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
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 Teunisse, Maple PL, Julie E. Walton, PhD, and George A. C. Harvold, MBBP, SPPhD

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?
Prognosis and treatment

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

Arthroscopic capsular release is the gold standard in this group of patients: selective removal of the adhesion with periglenoid capsulotomy.
Does slower rehabilitation after arthroscopic rotator cuff repair lead to long-term stiffness?

Parsons BO, Gruson KJ, 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