ROTATOR CUFF PATHOLOGY

Anatomy, biomechanics, treatment selection
JEROME GOLDBERG

Examination & Non operative treatment
MEL CUSI

Operative management
IVAN POPOFF
Use of biologics
JEROME GOLDBERG
What do we know

- Many older people have RC tears
- Many people with RC tears have no pain and full or near full function
- Non operative management gives good outcome in many
- Risk of developing arthritis small
- Surgery fails to repair the RC in up to 40% of cases yet many of those have no pain and good function
- Larger tears will get bigger with time
INCIDENCE OF RC TEARS

- 10% to 40% of 60 year olds have R.C. tears
- 50% to 75% of 70 year olds have RC tears

MOST ARE ASYMPTOMATIC.
RESULTS OF NON OP TREATMENT

• ITOI (clin orthop 275;165, 1992)
  83% good or excellent
• BROWN (JBJS 31B; 423,1949)
  87% good
• TAKAGISHI (J. jpn orth assn 52; 1978)
  44% good
• HAWKINS (clin orthop 321;178,1995)
  58% satisfactory

Conclusion – the smaller the tear the better the outcome
RESULTS OF OPERATIVE TREATMENT

- SONNABEND (jse 3;201, 2002) 710 open cases only, 88% patients satisfied
- BOILEAU (arth 23;4, 2007) 597 arthroscopic cases only, 94% excellent results, but only 75% of cuffs repaired on arthrogram

Operative treatment fails because of failure of RC healing capacity – POOR BIOLOGY

Conclusion – 80% to 90% patients happy but RC repair is intact in only 60% to 80% of cases with the smaller tears having good technical repairs and the larger tears more likely to fail

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Shoulder Surgery
SEVERAL STUDIES HAVE BEEN UNABLE TO DETERMINE WHO WILL BENEFIT FROM NONOP TREATMENT BASED ON

• Rotator Cuff strength
• Symptom duration
• Functional impairment
PATHOANATOMY
PATHOANATOMY
An intact subscapularis and infraspinatus can hold the humeral head inferiorly against the glenoid even if supraspinatus is torn, and allow the deltoid to elevate the arm.
BIOMECHANICAL RATIONALE FOR TREATMENT OF ROTATOR CUFF TEARS

• S. Burkhart Arthroscopy 10 (1) 4, 1994
“FUNCTIONAL” ROTATOR CUFF TEAR

- Anatomically deficient
- Biomechanically intact

Patient has a RC tear but has no pain and good function
TEAR IS NOT THE CAUSE OF PAIN !!!!

PAIN CAUSED BY
- Impingement
- Edge of tear instability
- Synovitis
- Capsulitis
- Biceps / s.l.a.p.

LOSS OF FUNCTION CAUSED BY
- Tear location and to a lesser extent tear size
- Loss of force couples where humeral head cannot be kept centered in glenoid

Important to note that tears can get bigger with time especially if they are large and there is a high demand on the shoulder

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Shoulder Surgery
FORCE COUPLES KEEP HUMERAL HEAD CENTRED IN GLENOID

CORONAL PLANE
• Deltoid (D)
• Inferior part of Rotator Cuff (C)
  - subscap and infraspinatus

TRANSVERSE PLANE (most important)
• Subscapularis (S)
• Infraspinatus & T. Minor (I)

Force couples keep humeral head against glenoid or maintain a STABLE FULCRUM
ROTATOR CUFF CABLE

- Cable area 3 x as thick as rotator cuff
- Thickening acts as suspension bridge and reduces risk of tear extending

Providing the RC tear remains inside the cable the supraspinatus can function to keep the humeral head adjacent to the glenoid

These tears however can increase in size especially if there is a high demand on the shoulder

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Shoulder Surgery
A STABLE FULCRUM KINEMATIC PATTERN MUST EXIST

• Location of tear is more important than size
• Tears involving supraspinatus plus a portion of infraspinatus fit this pattern providing the tear is within the RC cable
• Rest of infraspinatus balances subscapularis and pulls the humeral head inferiorly and into the glenoid

Providing subscapularis and most of infraspinatus is intact, and the tear of supraspinatus is within the cable, the humeral head remains in position adjacent to the glenoid and the deltoid can elevate the arm – A STABLE FULCRUM
CLINICAL IMPLICATIONS

Normal function will occur with unrepaired R.C. tears when:

• Force couples intact (humeral head can be kept adjacent to glenoid)
• Rotator cable intact

if pain relief can be achieved
ABSOLUTE SURGICAL INDICATIONS

- Young patient (less than 50 years) - tear is likely to get bigger
- Patient involved with heavy or overhead occupation – tear likely to get larger
- Following dislocation in older patient (usually large tears)
- Acute & very large tears – NO ER POWER

NEEDS SURGERY WITHIN 1 MONTH
RELATIVE SURGICAL INDICATIONS

• Older patient (50 yrs plus) based on loss of e.r. power & function, plus MRI – force couples disrupted

• Chronic and large tear in older patient with disability and good quality RC on MRI and failure of conservative treatment

• Failed non operative management
NONOP INDICATIONS

- Patients over 50 years with small tears and low demand on the shoulder and with force couples intact
- Patients older than 65 years with RC tear and good function even if force couples not intact
- Large tears with poor quality RC

Providing force couples are intact and patient not too young non-op treatment is likely to be successful
BIOLOGICAL ENHANCEMENT OF TENDON TO BONE HEALING

- Ultrasound
- Growth factors

Control

LIPUS
Background: Tendon–Bone Healing

• Healthy tendon-bone insertion site – 4 gradually transitional zones (direct-type insertion)

• These zone are not recreated following surgery resulting in mechanically weaker interface

Direct-type ACL insertion in a sheep (Alcian Blue stain, polarized light, x100 original magnification) ¹

Background

• Rotator cuff surgery has seen vast improvements with advances in surgical technique, new instrumentation, surgical hardware and understanding of mechanical issues related to fixation

• Biological improvements in tendon bone healing represent a new focus to help augment outcomes in shoulder rotator cuff surgery

• Delivery of biologically active material to site of healing and keeping it there is a significant problem
WATER LAWN OR FEED THE SOIL
LIPUS daily for 20 minutes until sacrifice at 4 weeks
Results: Histology

Control Group

- Highly disorganised collagen fibres
- Very small areas of clustered chondrocytes

DBM Group

- Well organised collagen fibre orientation
- Rounded chondrocytes orientated in the direction of insertional collagen fibres
- DBM particles resorbed with loose trabecular bone within DBM holes
A. Control

B. LIPUS

Sharpey’s like fibres
CONCLUSIONS

DBM & LIPUS have a positive biological effect on initial tendon-bone healing

• increased presence of fibrocartilage at T-B interface
• increased collagen fibre orientation (tendon midsubstance)
THANK YOU