Rotator Cuff: Debatable Issues

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Rotator Cuff: Debatable Issues

- Historical review
- Aetiology of Cuff tears
- Should we repair RCT
- Open or Arthroscopic Surgery
- With or Without Acromioplasty
- Single or Double Row Fixation
Historical Review

• JG Smith 1834 – Tendon Ruptures following shoulder Injury (London Medical Gazette)

• AW Meyer 1924 – Attrition theory of Cuff rupture (Am J. Anatomy)

• EA Codman 1909 – First Cuff repair
Historical Review

• EA Codman 1934 – Observations on Musculotendinous Cuff
  The Shoulder

• Examination of the Shoulder: The Past, the Present, and the Future; Jia et al JBJS 2009
  “……results of examination ……. may not be a substantial improvement on the original observations of Codman
Historical Review

- J Oberholtzer 1933 - Arthrography

- Lindholm & Palmer 1939 – Described Partial / full / Massive cuff tears

- HI McLaughlin 1944 JBJS – etiology of cuff tears and their management
Historical Review

• Subacromial Impingement as a possible element in Rotator Cuff disease
  – Codman; Armstrong; Hammond; McLaughlin; Moseley; Smith-Petersen; Watson-Jones

• Charles Neer 1972 – Impingement Syndrome
  – 3 stages
Historical Review

• Bigliani et al 1986 – 3 Acromion Types

• I Flat
• II Curved
• III Hooked
Shape of the Acromion: Congenital or Acquired
Shape of the Acromion

Neer’s 3 stages of Impingement Syndrome

- Stage I – Reversible oedema and Haemorrhage (<25yrs)
- Stage II – Fibrosis and Tendinitis (25 – 40)
- Stage III – Bone Spurs and Tendon Ruptures (>40 yrs)
Shape of the Acromion

• Asymptomatic College athletes
  Type I – 84-85%
  Type II – 12-14%
  Type III – 2-4% Speer et al JSES 2001
• “…Spurs associated with increasing age in asymptomatic persons.
  Bonsell et al JBJS 2000
Shape of the Acromion

- Spur formation – age related (420 scapulae)
  
  <50 yrs = <25% chance of spur  
  
  Nicholson et al JSES 1996

- Acromial shape does not vary significantly with age
  
  – 394 Scapulae – 20 –89 yrs

  I, II, and III : 22.8% (90), 68.5% (270) & 8.6% (34 )

  Type III in men (10.2% vs 6.9%)
  Type I in women (27.5% vs 18.5%)

  Spur formation : type III (59%); type II (42.6%) & type I (22%).

  Getz et al Radiology 1996
Shape of the Acromion

Histologic study – 22 cadavers

“…curved and hooked types of acromion, a common pattern of degeneration of collagen, fibrocartilage, and bone was observed, consistent with a traction phenomenon………”

Shah et al JSES 2001
Shape of the Acromion

Does it Matter?

• 91 shoulders with rotator cuff tears, 33 (36.3%) type I; 22 (24.2%) type II; and 36 (39.6%) type Hirano et al JSES 2002

• “Flat acromion was more common (60%) ........ there was no major difference between acromial shape and cuff tear.” 208 cases Oh et al CORR 2009
Aetiology of Cuff Tear: Extrinsic or Intrinsic
Aetiology of Cuff Tear: Extrinsic

Subacromial impingement
- acromial spurs
- Coraco-acromial ligament

Internal impingement - the articular side
- trapping of the tendon between the Glenoid and humerus in extreme abduction and external rotation
  - Overhead athletes Welch 1991; Jobe 1995
Aetiology of Cuff Tear: Extrinsic

Internal impingement
Aetiology of Cuff Tear: Intrinsic

Changing properties of the rotator cuff – **Degeneration**

Age related

- 54% >60 asymptomatic  
  Sher et al 1995
- <60 – 6% ; > 60 – 30% cuff tears  
  Lehman et al Bulletin Hosp Joint Dis 1995
- 50 to 59 yrs-2.1%; 60 to 69 yrs- 5.7%; 70 to 79 yrs-15% in 420 asymptomatic shoulders  
  Moosmayer at al JBJS 2009
Aetiology of Cuff Tear: Intrinsic

- **Vascularity**
  - Hypovascular critical zone (8mm from insertion)
  - Hypervascular – symptomatic
    

- Type III collagen – Increase may be adaptive, pathologic, or both

- Increased levels of smooth muscle actin (SMA) - Retraction
Aetiology of Cuff Tear: Intrinsic

- Pro-inflammatory cytokines – Increased
  Millar et al JBJS 2009

- Genetic Influences - “Full-thickness RCT in siblings are significantly more likely to progress………. This implies that genetic factors have a role, not only in the development but also in the progression ............tears of the rotator cuff.
  Gwilym et al JBJS 2009
Should We Repair Rotator Cuff Tears?
Repair the Tear?

- Exercise therapy for the conservative management of full thickness tears of the rotator cuff: a systematic review


- 10 studies. No Randomised trials
- evidence to support the use of exercise
- need for well-planned randomised controlled trials
Repair the Tear?

• “Conservative treatment of full-thickness rotator cuff tears yields satisfactory results both subjectively and objectively”
  – 19 pts for 6 months

  Baydr et al Rheum Int. 2009

• “Rotator cuff integrity is not a predictor of shoulder function at 12 months after proximal humeral fracture”

  Nanda et al J Trauma 2007
Repair the Tear?

Exercise & Supportive

- **Itoi & Tabata CORR 1992**
  - 62 Shoulders – 82% rated satisfactory
- **Bartolozzi et al CORR 1994**
  - 136 pts. – 66-75% good to excellent results
- **Hawkins & Dunlop CORR 1995**
  - 53 pts – avg. 62 yrs
  - 39/53 (74%) slight or no shoulder discomfort at 7.6yrs
Repair the Tear?

- **Yamada et al 2000**
  - Controlled trial - Conservative v Repair
  - 14 exercise & 26 surgical
  - More improvement in pain relief, muscle strength, and range of motion was obtained in operative group
Repair the Tear?

Hoe-Hansen & Palm JSES 1999

• 39 pts – All Subacromial Decompression
  – 13 No Tear
  – 13 Partial Tear
  – 13 Full Thickness

• At 3 & 6 year follow-up – No Functional Difference
Repair the Tear?

Massoud et al JBJS 2002

- Decompression only for tears
- 118 shoulders
- Satisfactory results
  - 59% of patients under the age of 60
  - 87.5% of those over the age of 60
Repair the Tear?

Ellman et al Arthroscopy 1993

- Decompression only for tears
- 40 shoulders
- Satisfactory results
  - Small tears (<2cm)
- Unsatisfactory results
  - Medium tears (2-4cm)
- Massive tears – limited goals – Satisfactory pain relief
Repair the Tear?

Subacromial Decompression - good for pain relief

- rotator cuff tears in elderly patients (>60)
- patients with low functional demand
- massive irreparable tears in patients with low functional demand
Repair the Tear?

YES

Neer et al  ASES 1988
• 233 cuff repairs : 4.6 yrs follow-up
• 77% Excellent & 14 % Satisfactory

Hawkins et al JBJS 1985
• 86 % pain relief and recovery of strength

Zandi et al JSES 2006
7 year follow-up – No deterioration in function
Repair the Tear?

YES

Samilson & Binder Orth clin N Am 1975
• <60, Full thickness, Failed conservative

Lam & Mok JSES 2004
• >65 with Massive tear – good function and pain relief

Laohteenmaoki et al JSES 2007
• 415 chronic full-thickness tears with pain & impaired shoulder function after initial conservative treatment
• Pain, function, range of active forward flexion, active abduction, strength (manual muscle testing), and patient satisfaction all improved
• Recommend Surgery for all tears regardless of age
Surgical Approach: Open vs Arthroscopic
Open vs Arthroscopic

The UKUFF Trial

• multi-centre RCT
• measure the clinical and cost effectiveness of different types of rotator cuff repairs
  – Arthroscopic Repair
  – Open Repair
  – Non-Surgical Treatment – Rest then Exercise
Mini Open vs Arthroscopic

Severud et al Arthroscopy 2003
39 scope v 29 open – 44 months avg. follow-up comparable results

Kim et al Arthroscopy 2003
42 scope v 34 open – 2 to 6 year follow-up comparable results

Mini open following Failed scopes
Mini Open vs Arthroscopic

Buess et al Arthroscopy 2005
66 scope v 30 open – 15 - 40 months follow-up
–scope better or comparable results

Youm et al JSES 2005
42 scope v 42 open – 2 year follow-up
comparable results

Bishop et al JSES 2006
Scope better for small tears ; Open for Massive
Mini Open vs Arthroscopic

Liem et al Arthroscopy 2007

• 19 scope v 19 open – Age, gender and duration of symptoms matched
• Comparable Functional results
• Equivalent tendon integrity on MRI
Mini Open vs Arthroscopic

Çağri Köse et al Ad. Therapy 2008

• 25 scope v 25 mini open
• Comparable Functional results (Constant / UCLA)
• Arthroscopic procedures – higher costs
Mini Open vs Arthroscopic


• Review and Meta Analysis
• 1996 -2006
• 5 studies
• No difference
  – Functional outcome scores
  – Complications
Rotator Cuff Repair:
with or without Acromioplasty
With or without Acromioplasty

Acromioplasty - complicated by

• Deltoid detachment,
• Compromise of the deltoid lever arm,
• Antero-superior instability, and
• Adhesions of the rotator cuff tendons under the bleeding cancellous bone of the osteotomized acromion
With or without Acromioplasty

Goldberg et al CORR 2001

- 27 full thickness tears
- No Acromioplasty
- Good results
With or without Acromioplasty

McCallister et al JBJS 2005

• 96 full thickness tears
• Mini open without Acromioplasty
• Smoothen spur but leave intact coracoacromial lig. and acromion
• 61 pts 2 year follow-up
• Significant improvement in functional scores
With or without Acromioplasty

Arthroscopic Rotator Cuff Repair With and Without Arthroscopic Acromioplasty in the Treatment of Full Thickness Rotator Cuff Tears

• A trial run by Ottawa Hospital Research Institute
• Multi-centre trial – currently recruiting
Arthroscopic Cuff Repair: Single or Double Row
Single or Double Row Suture Anchors
Single or Double Row

Meier et al JSES 2006

• Cadaveric study & 3-D digital mapping of the footprint
• Footprint area of the DRSA fixation technique was significantly larger
Single or Double Row: Meier et al

Supraspinatus footprint

Double Row Suture Anchor

Single Row Suture Anchor
Single or Double Row

Baums et al Knee surg Sports Trau 2008

• Biomechanical characteristics of single v Double row
• 32 sheep shoulders
• Ultimate tensile strength in double-row specimens was significantly higher
Single or Double Row

Lafosse et al JBJS 2008

• 105 shoulders – double row technique
• Lower rate of failure
  than has previously been reported in association with either open or arthroscopic repair methods
Single or Double Row

Hanusch et al JBJS 2009

• Massive Tears >5 cm
• 24 patients - double row technique
• 18 –53 month follow-up
• 83% repairs intact (on USG)
Single or Double Row


- 20 Fresh frozen shoulders
- Double-row - restored a larger footprint
- No difference in
  - load to failure,
  - cyclic displacement,
  - gap formation
Single or Double Row

Buess et al JBJS 2009

• Retrospective study
• 32 single row; 33 double row
• Small and medium cuff tears
• 100% patient satisfaction in Double row
• 97% patient satisfaction in Single row
• Both achieved excellent clinical results
Need for Trials!!
Thank You