

Rotator Cuff: Debatable Issues

Rajesh Nanda

SpR Northern Deanery

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

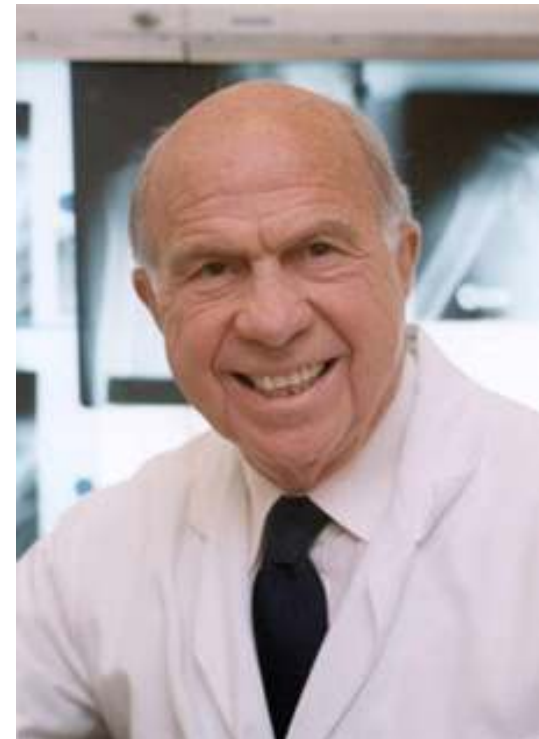


Historical Review

- 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

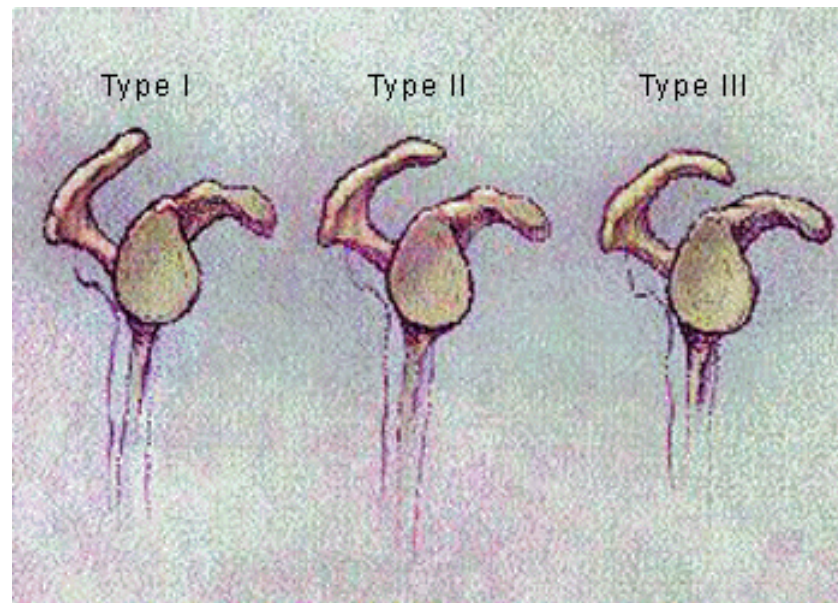
- Subacromial Impingement as a possible element in Rotator Cuff disease
 - Codman; Armstrong; Hammond; McLaughlin; Moseley; Smith-Petersen; Watson-Jones
- Charles Neer 1972 – Impingement Syndrome
 - 3 stages



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 III
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

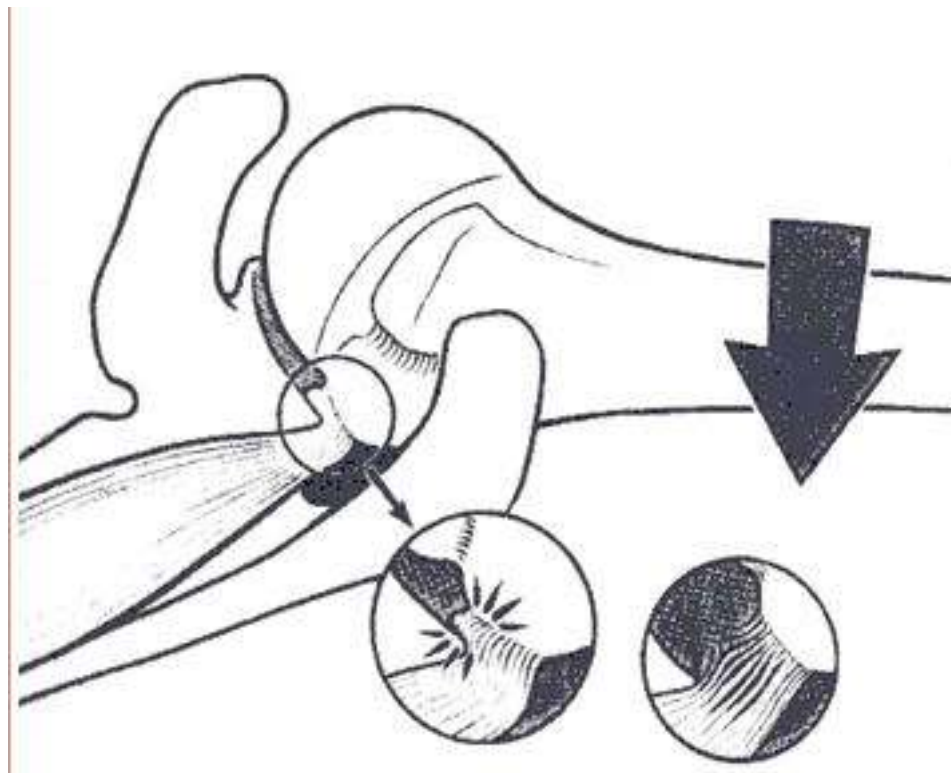
- acromial spurs
- Coraco-acromial ligament

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 et al JBJS 2009

Aetiology of Cuff Tear: Intrinsic

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

Chansky & Iannotti, Clin Sports Med. 1991
- 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 progressiontears 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**

Ainsworth & Lewis Br j Sports Med 2007

- 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

Laohteenmaaki 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

Çağrı 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

Morse et al Am. J Sports Med 2008

- 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

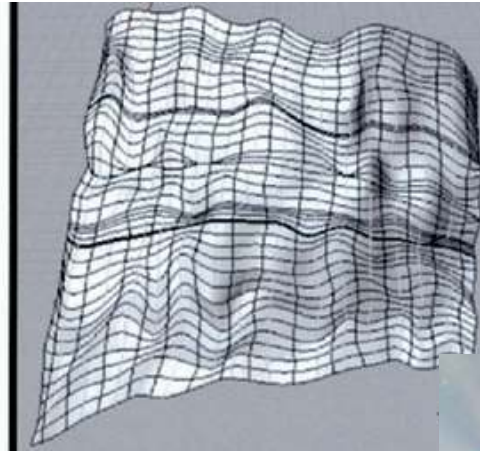
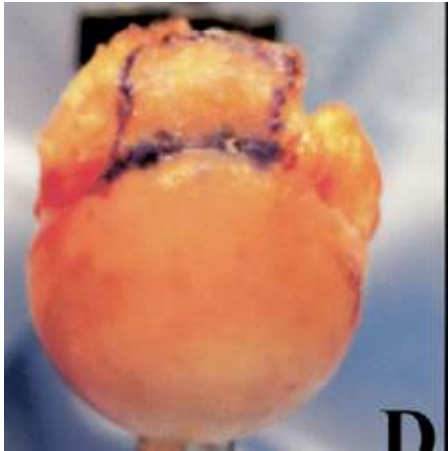


Single or Double Row

Meier et al JSES 2006

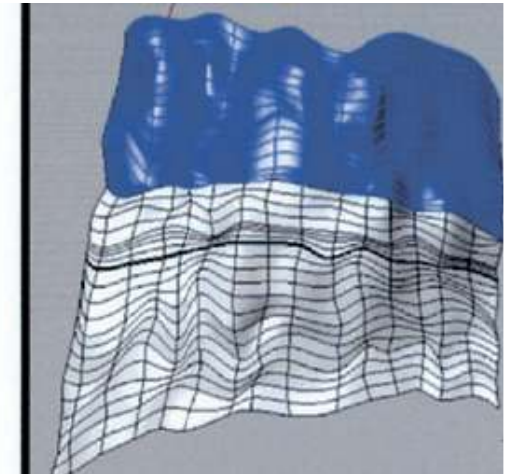
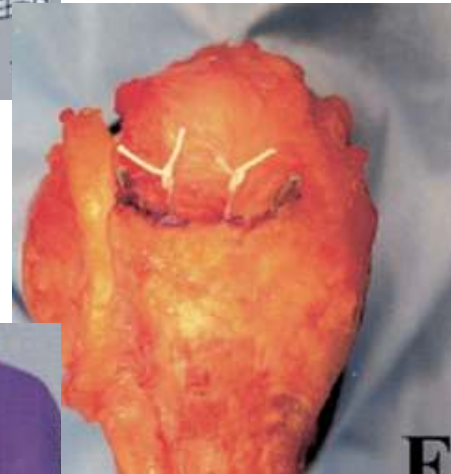
- Cadaveric study & 3-D digital mapping of the footprint
- Footprint area of the DRSA fixation technique was significantly larger

Single or Double Row: Meier et al

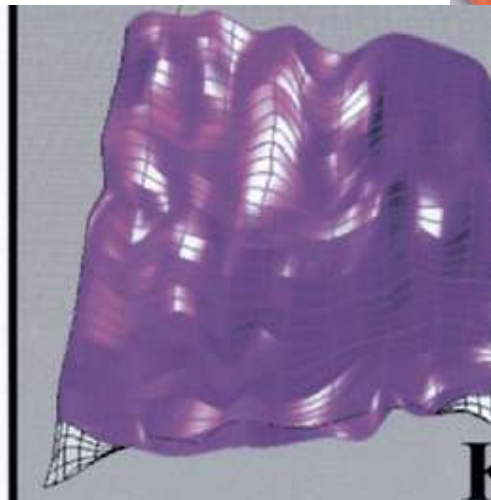


Supraspinatus footprint

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

Mazocca et al Am J Sports Med. 2005

- 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