

# Shoulder Injuries in Climbing



Volker Schöffl,  
2018

# The shoulder is an important body part in climbing



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# Shoulder Injuries in Climbers 2009-12 and 2017-18



TOKYO 2020



Body area	2017-2018 (n = 633)	2009-2012 (n = 911)	1998-2001 (n=604)
<b>Finger</b>	261 (41.2)	474 (52)	247 (41)
<b>Shoulder</b>	<b>128 (20.2)</b>	<b>157 (17.2)</b>	<b>30 (5)</b>
<b>Hand</b>	49 (7.7)	119 (13.1)	47 (7.8)
<b>Forearm and elbow</b>	49 (7.7)	83 (9.1)	81 (13.4)
<b>Lower leg/foot</b>	67 (10.6)	35 (3.8)	55 (9.1)
<b>Knee</b>	45 (7.1)	19 (2.1)	22 (3.6)
<b>Trunk, spine, pelvis</b>	34 (5.4)	21 (2.3)	43 (7.1)
<b>Other</b>	-	3 (0.3)	-



Wilderness Environ Med. 2015 Mar;26(1):62-7. doi: 10.1016/j.wem.2014.08.013.

## Injury trends in rock climbers: evaluation of a case series of 911 injuries between 2009

Schöffl V<sup>1</sup>, Popp D<sup>2</sup>, Küpper T<sup>3</sup>, Schöffl I<sup>4</sup>.



# The shoulder is an important body part in climbing



TOKYO 2020



## Sport climbing: medical considerations for this new Olympic discipline

C Lutter,<sup>1,2,3</sup> Y El-Sheikh,<sup>4</sup> I Schöffl,<sup>5</sup> V Schöffl<sup>2,3,6</sup>

# Distribution of diagnoses in shoulder injuries

Shoulder Injuries 2017-2018 (n = 154)	n	%	Shoulder Injuries 2009-2012 (n = 157)	n	%
<b>SLAP</b>	37	29.8	<b>SLAP</b>	51	32.5
<b>Impingement</b>	34	27.4	<b>Impingement</b>	40	25.5
<b>Dislocation. bankart lesion</b>	22	17.7	<b>Shoulder sprain</b>	17	10.8
<b>Shoulder sprain</b>	16	12.9	<b>Dislocation. bankart lesion</b>	16	10.2
<b>Rotator cuff tear</b>	12	9.7	<b>Supraspinatus tendonitis</b>	7	4.5
<b>Acromioclavicular joint injury</b>	12	9.7	<b>Instability (non-bankart)</b>	7	4.5
<b>Tendinosis of long biceps tendon</b>	6	4.8	<b>Tendinosis of long biceps tendon</b>	5	3.2
<b>Instability (non-bankart)</b>	5	4.0	<b>Rupture of long biceps tendon</b>	5	3.2
<b>Pulley injury</b>	5	4.0	<b>Rotator cuff tear</b>	5	3.2
<b>Rupture of long biceps tendon</b>	2	1.6	<b>Acromioclavicular joint injury</b>	3	1.9
<b>Other</b>	2	1.6	<b>Pulley injury</b>	1	0.6
<b>Supraspinatus tendonitis</b>	1	0.8			

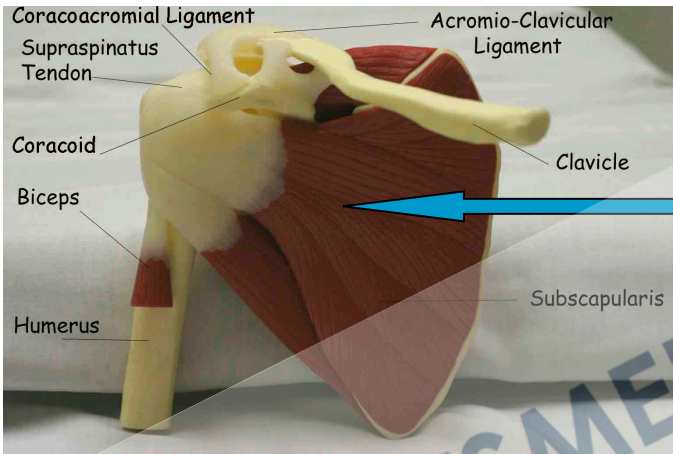


Wilderness Environ Med. 2015 Mar;26(1):62-7. doi: 10.1016/j.wem.2014.08.013.

**Injury trends in rock climbers: evaluation of a case series of 911 injuries between 2009 and 2012.**

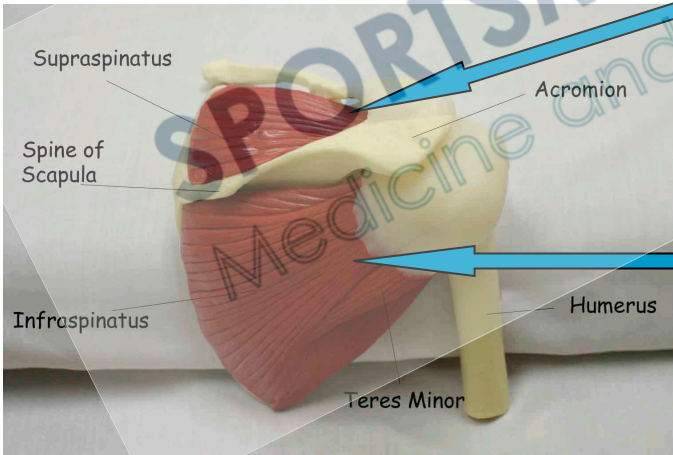
Schöffl V<sup>1</sup>, Popp D<sup>2</sup>, Küpper T<sup>3</sup>, Schöffl I<sup>4</sup>.

# Anatomy: Rotator Cuff



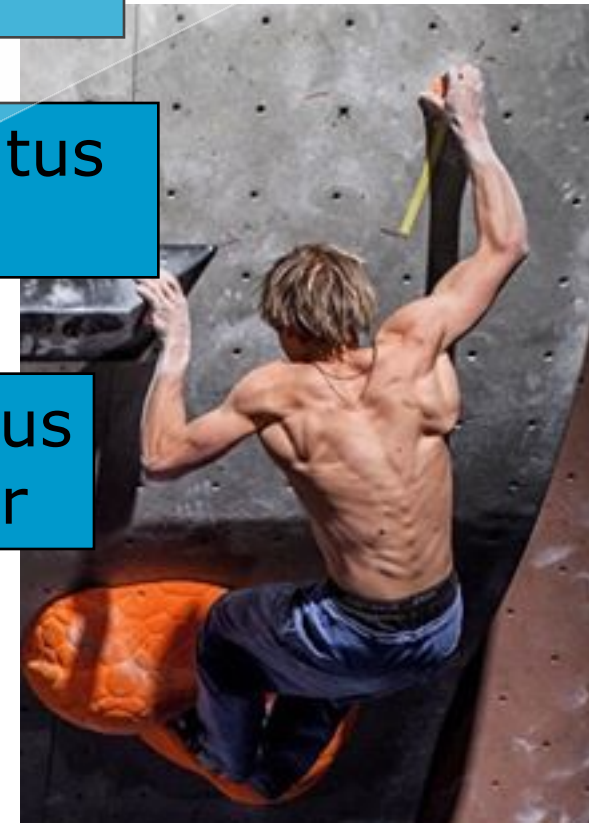
## *rotator cuff muscles*

Subscapularis



Supraspinatus

Infraspinatus  
Teres minor



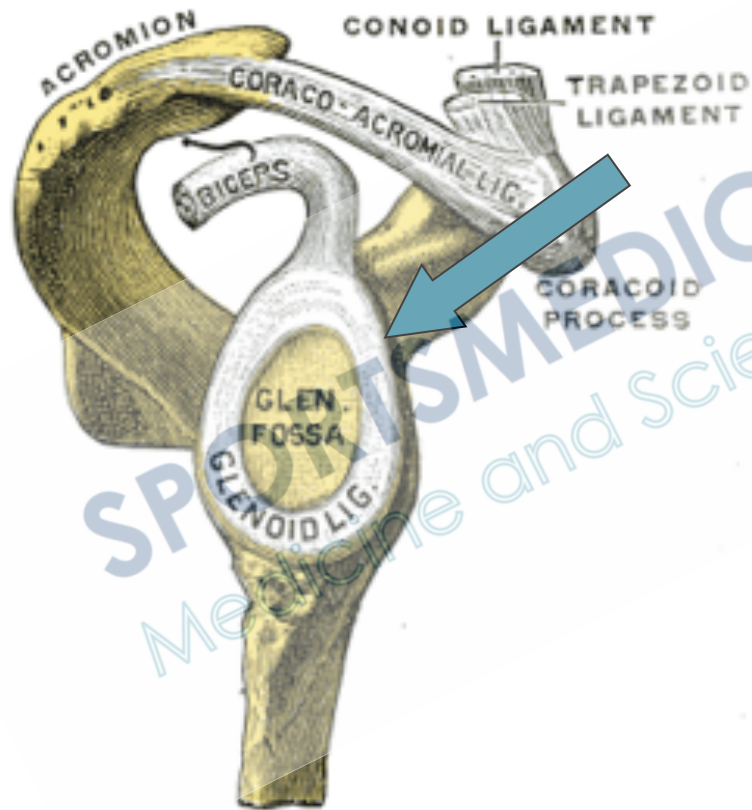
# Muscular stability



# Anatomy: Labrum glenoidale



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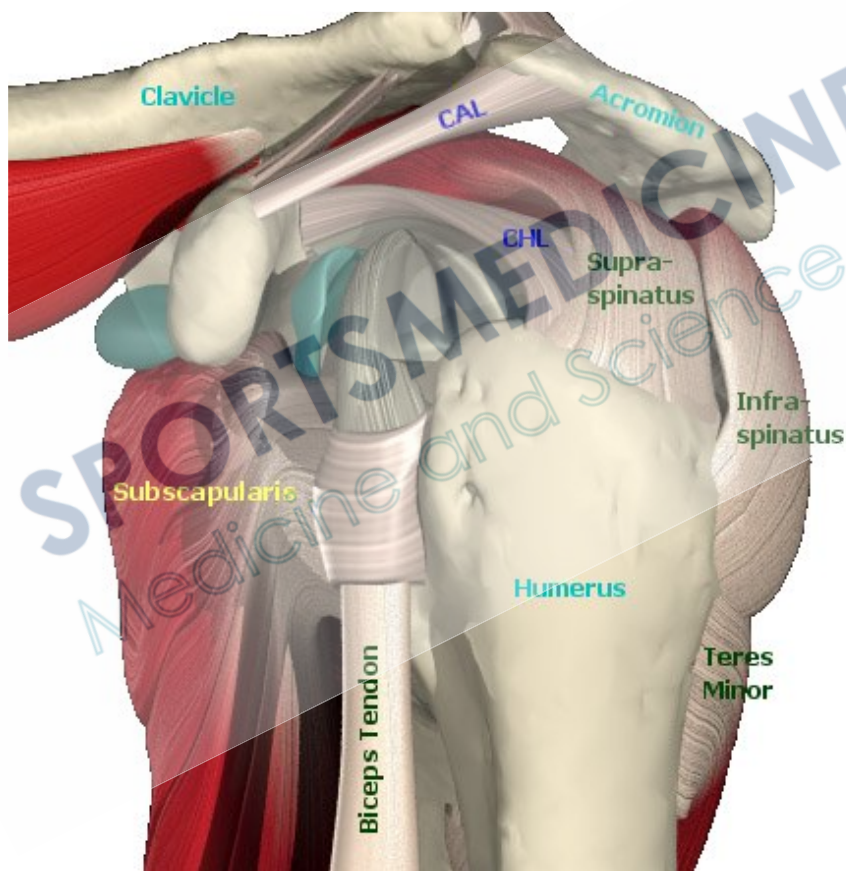
Labrum glenoidale



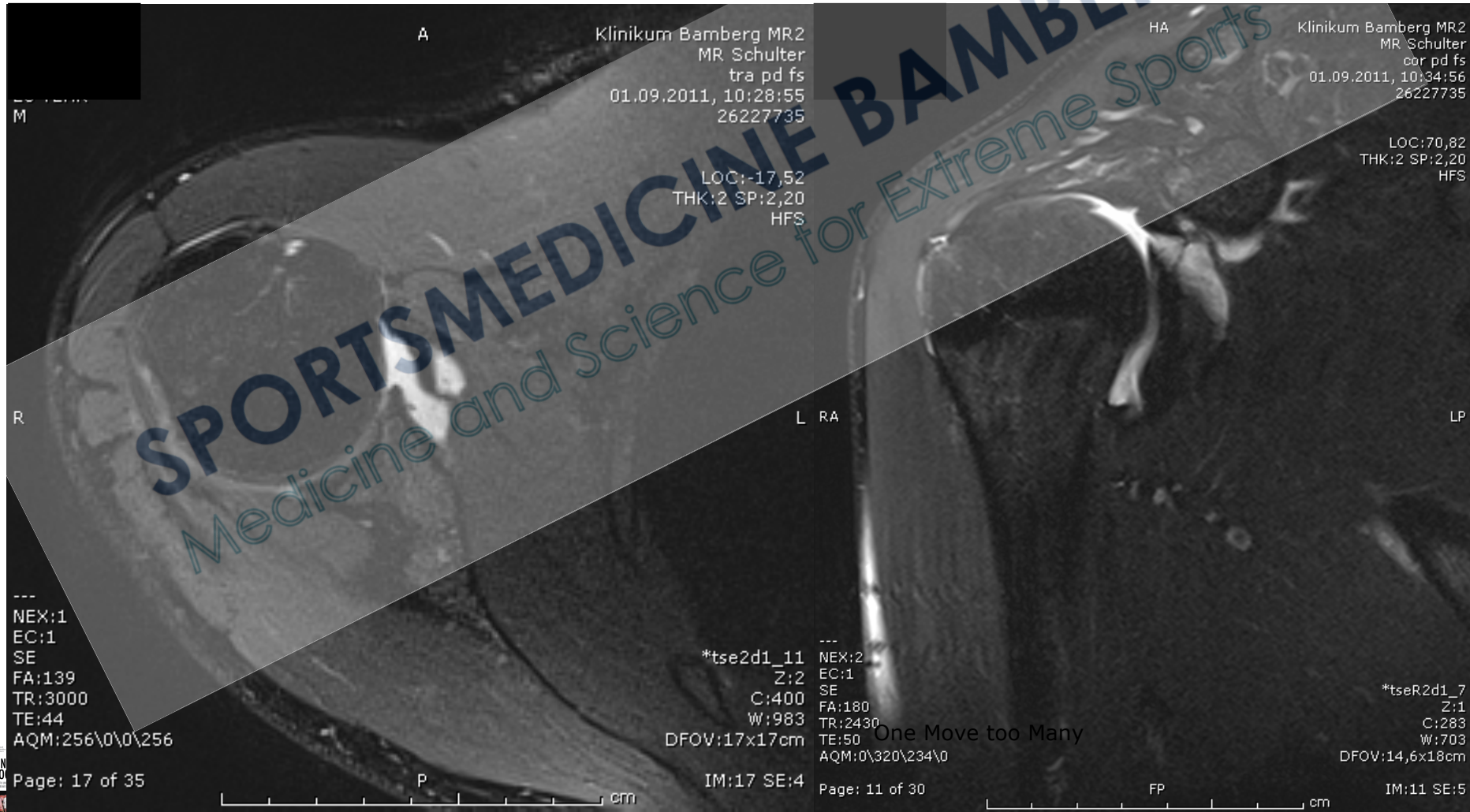
# Anatomy: Ligaments



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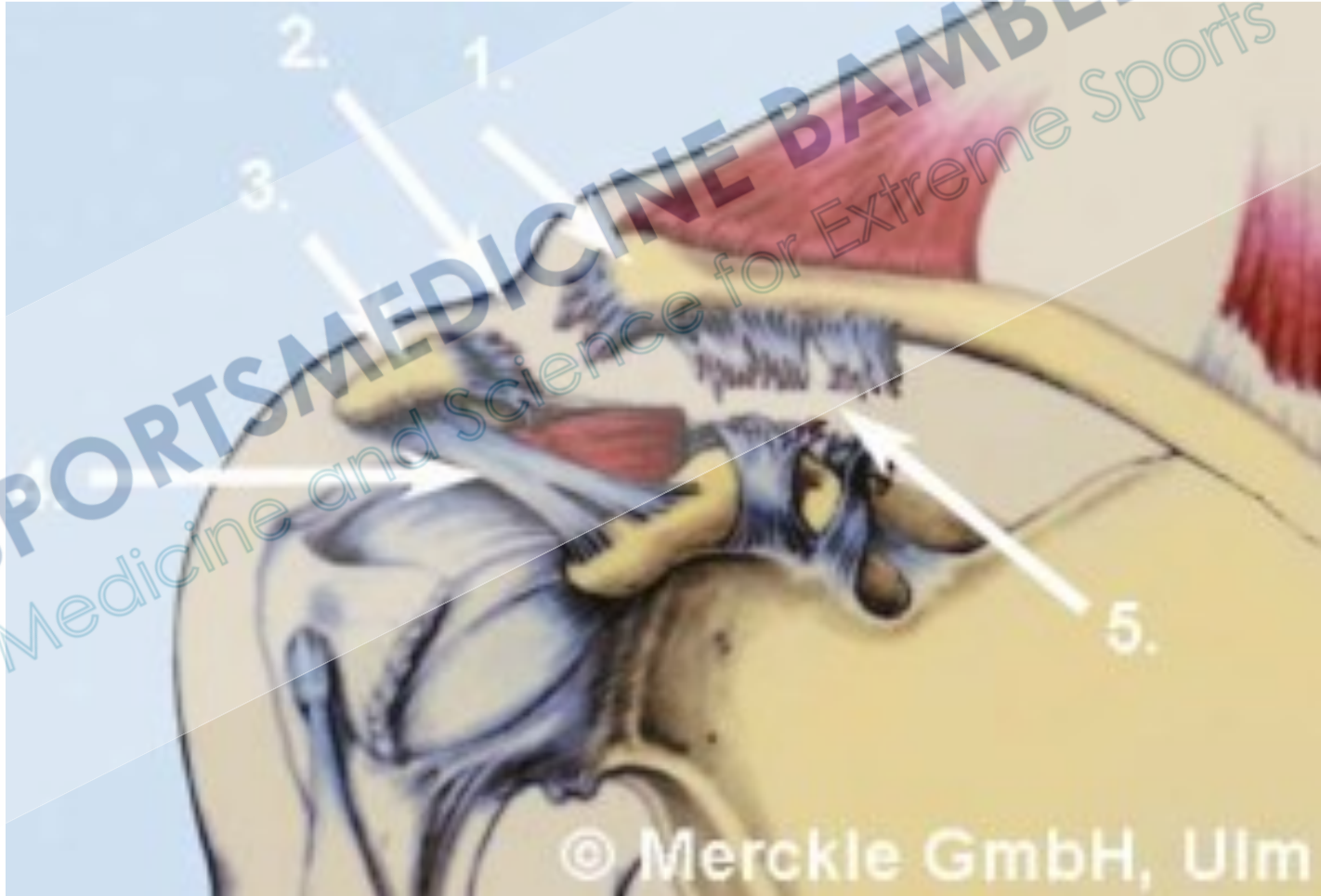
# Diagnostics: Clinical evaluation, ultrasound and MRI





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# AC-Gelenksverletzungen





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- Körperkontaktbetonte Sportarten
- Reitsport, Radfahren, Skilaufen und Ringen
- Meist **Sturz auf die Schulter bei adduziertem Arm**
- Seltener indirekt durch **Sturz auf die ausgestreckte Hand**



**SOZIALSTIFTUNG BAMBERG**  
HEILEN. WOHLFÜHLEN. BETREUEN.



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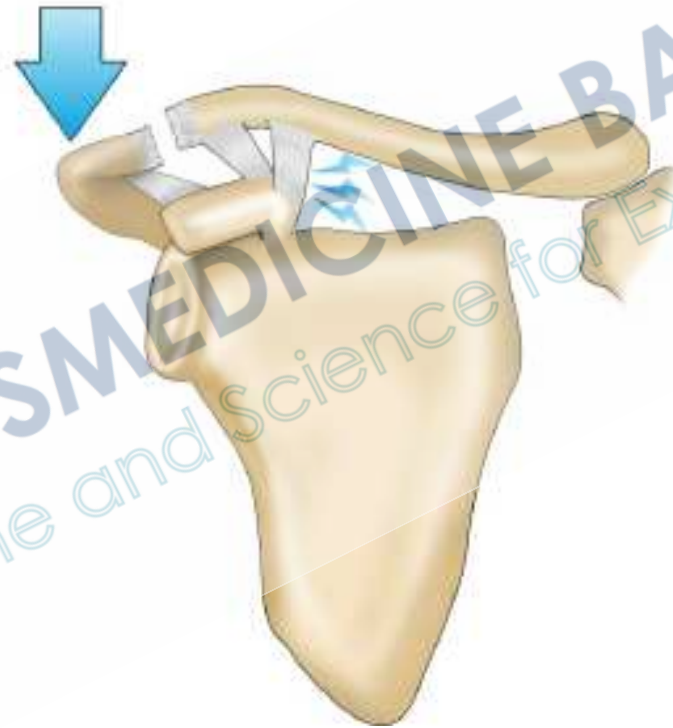
# AC-Gelenksverletzung: Rockwood I



Überdehnung oder Zerrung der Ligg. Acromioclavicularis et coracoclavicularis

Sportorthopädie - Sporttraumatologie

# AC-Gelenksverletzung: Rockwood II



Ruptur des Lig. acromioclavivularis und  
Überdehnung des Lig. coracoclavicularis

Sportorthopädie - Sporttraumatologie



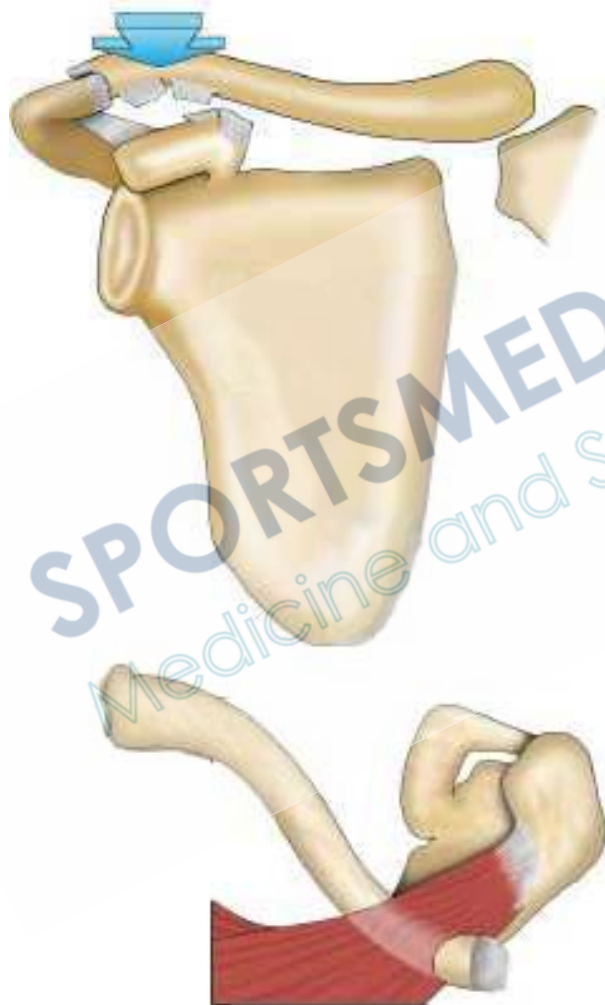
# AC-Gelenksverletzung: Rockwood III



Ruptur der Ligg. acromioclavicularis und coracoclavicularis

Sportorthopädie - Sporttraumatologie

# AC-Gelenksverletzung: Rockwood IV



dorsale Dislokation der  
Klavikula (Aufsicht)

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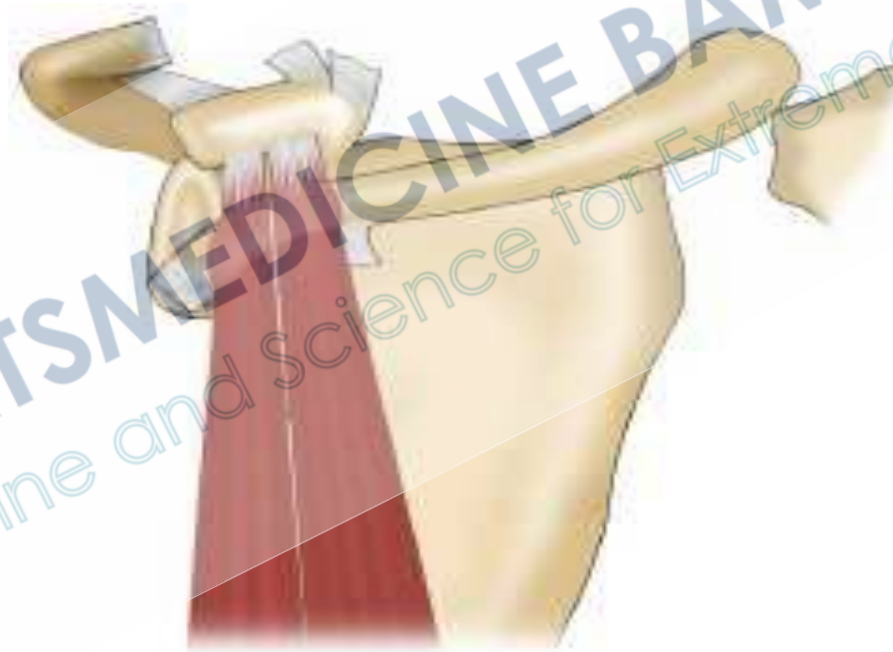
# AC-Gelenksverletzung: Rockwood V



Sporttraumatologie



# AC-Gelenksverletzung: Rockwood VI



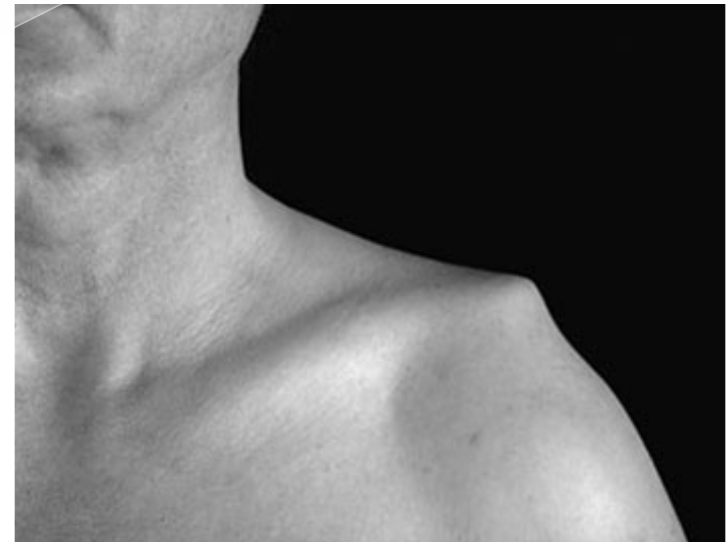
Orthotraumatologie



# AC-Gelenksverletzung: Symptomatik

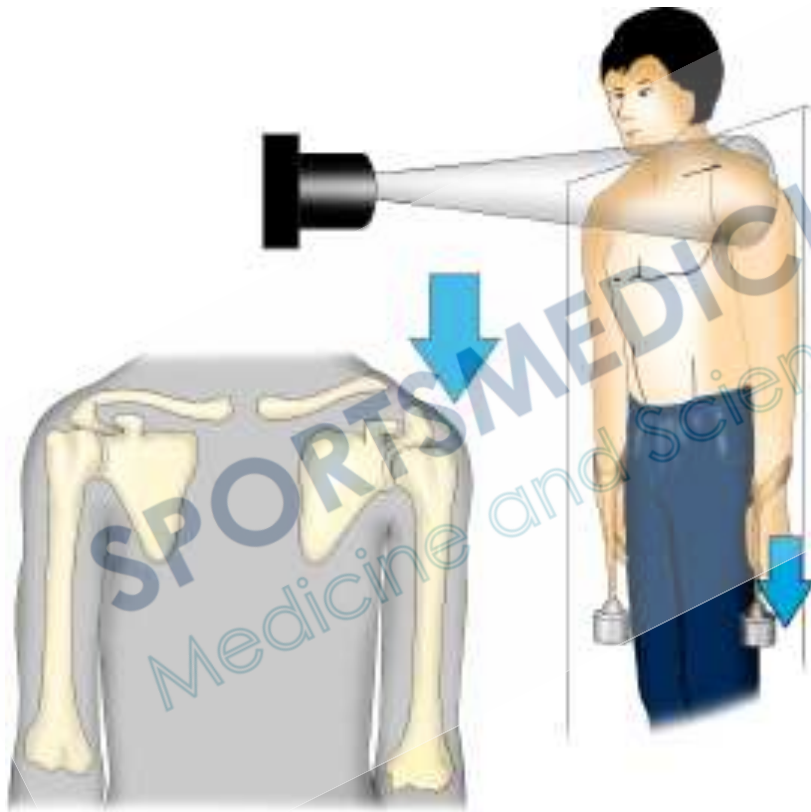


- Schmerzen bei der Palpation
- bei Bewegung noch verstärkt
- Bei der Luxation steht die Clavicula typischerweise über dem Acromion.
- sicht- und tastbare Stufe
- Klaviertastenphänomen



# AC-Gelenksverletzung: Bildgebende

## Untersuchung



- Zum Ausschluß einer Fraktur Röntgenaufnahmen im a.p. und im seitlichen Strahlengang
- Aufnahme mit Belastung (Panoramaaufnahme)
- Ultraschall, CT, und MRI nicht als Routinediagnostik

Sportorthopädie - Sporttraumatologie

# Röntgenaufnahme



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R  
mit Belastung

ap

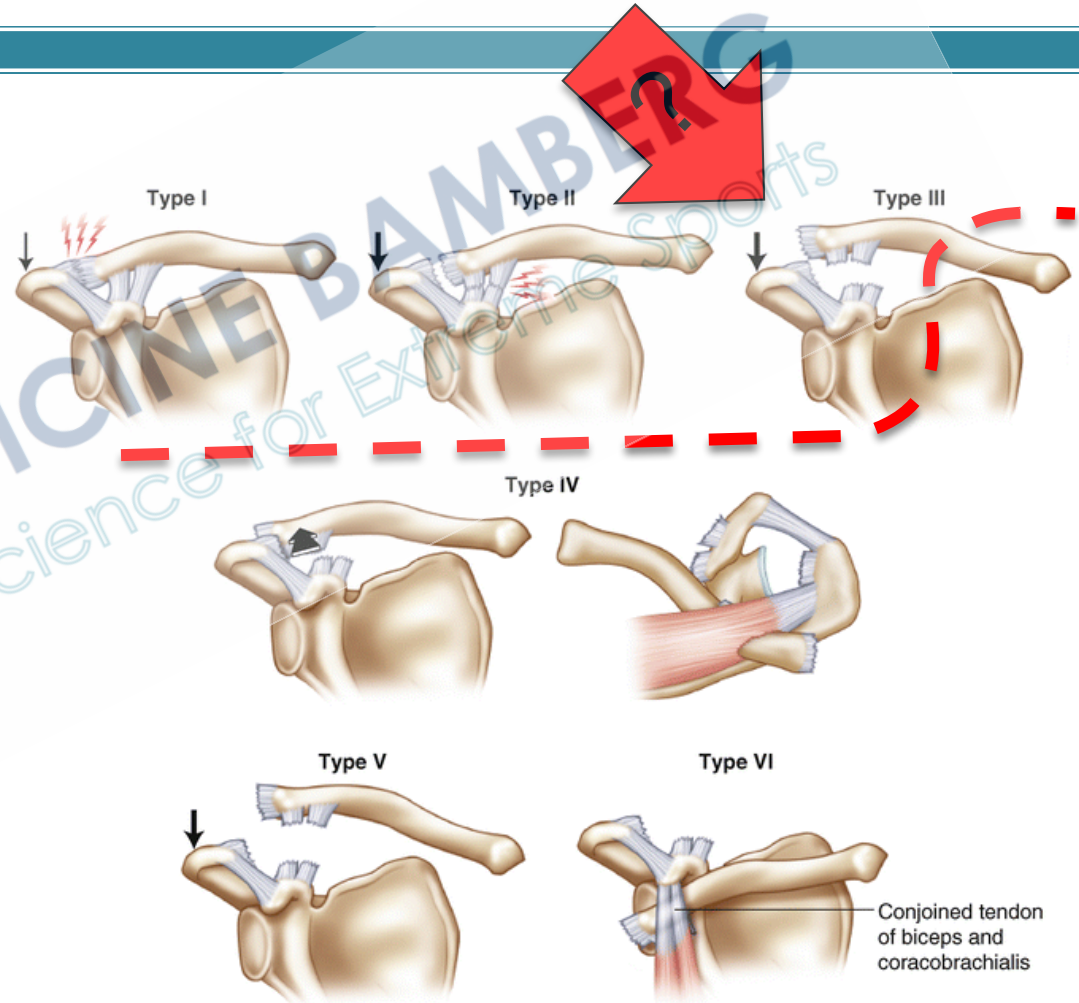
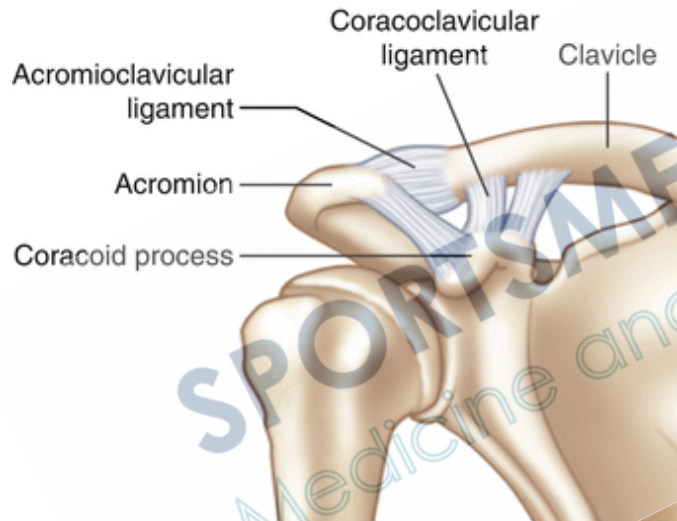
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# Rockwood Klassifikation (General Treatment Recommendation)



Frazer-Moodie et al., JBJSbr, 2008  
Balke et al., Unfallchirurg, 2014  
Beitzel et al., Arthroscopy, 2013

# Operatives Vorgehen „Mini-Open Double Tightrope“



# Operatives Vorgehen





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# Impingementsyndrome



ONE MOVE TOO MANY...

# Subacromiale Space: Anatomy

- periost subacromial
- **bursa** subacromialis
- **rotator Cuff** (SSP)
- synovialis
- **LB tendon**
- cartilage

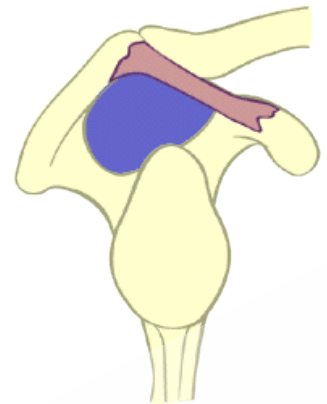


# Impingementsyndrome

- Extrinsic impingement
  - subacromial (primary, secondary)
  - subcoracoidal
  
- Internal impingement
  - posterosuperior
  - anterosuperior



# Impingementsyndrome: Primary subacromial stenosis through mechanical narrowing of the supraspinatus outlet



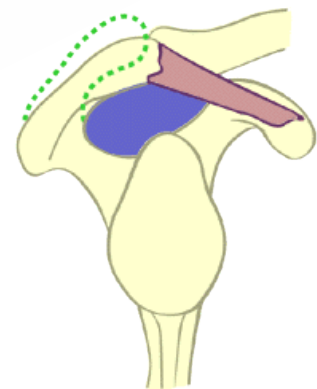
normal outlet



AC joint osteoarthritis with bone spurs



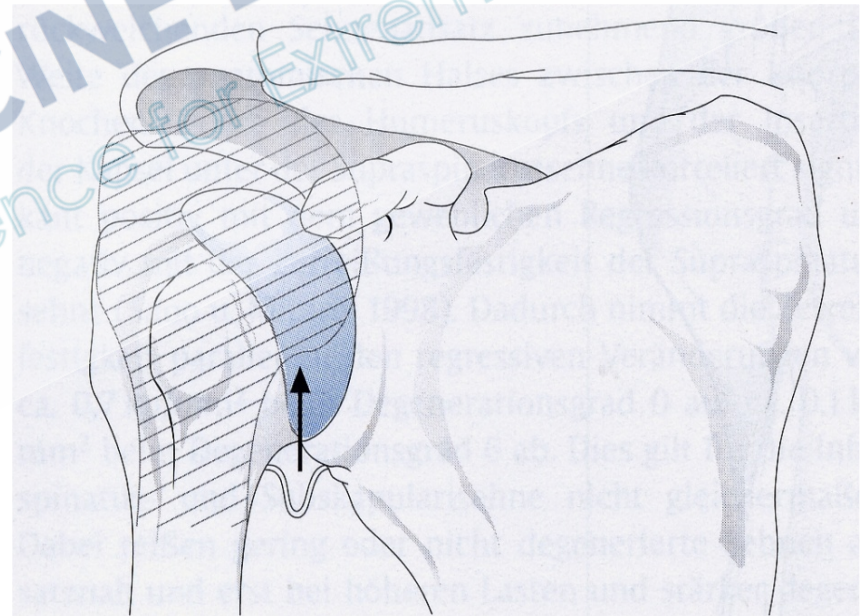
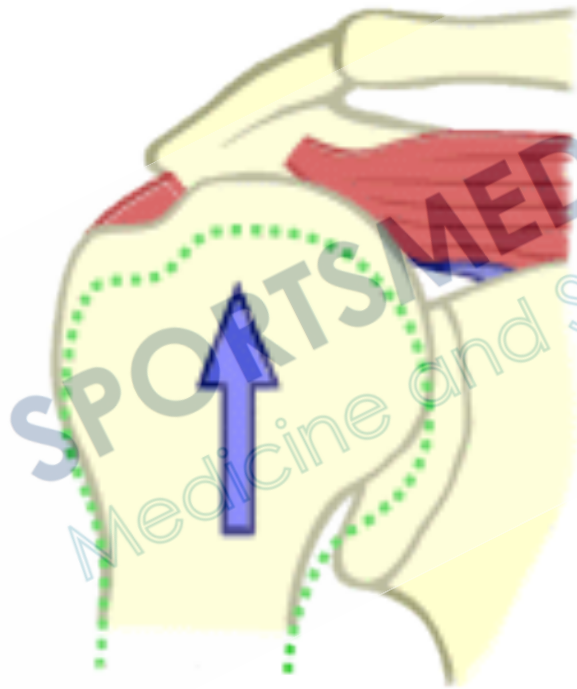
bone spur of the coracoacromial ligament



narrowing through mechanical irritating acromion type



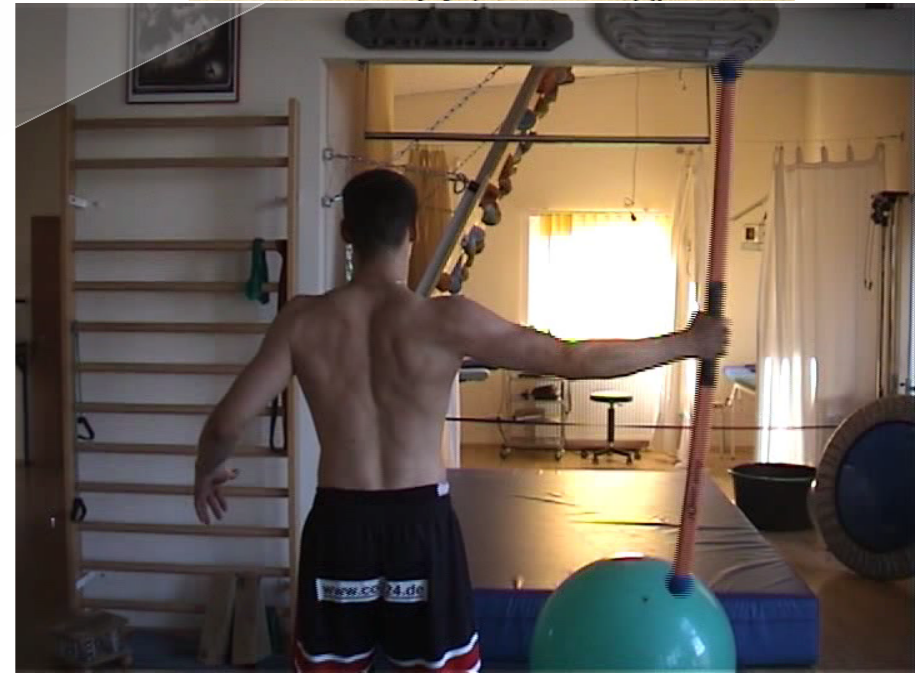
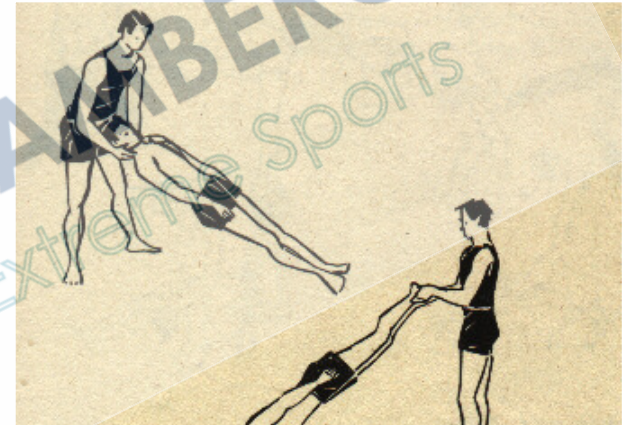
# Sec. Impingement: e.g.: rotator cuff tear





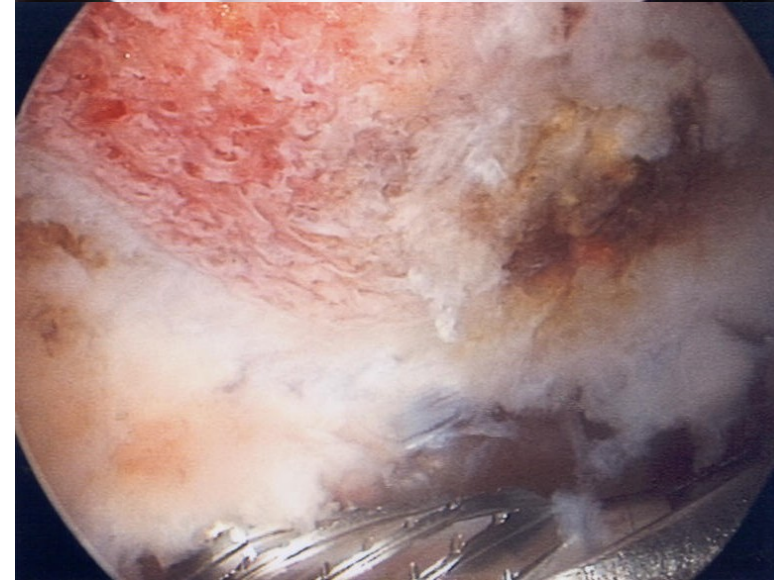
# Impingementsyndrome: Therapy

- conservative: stress reduction, physiotherapy, NSAID`s, infiltration, ice...
- indication for surgery:  
night pain  
positive Neer´s test  
PT>6weeks  
mechanical irritation



# Impingementsyndrome: Therapy

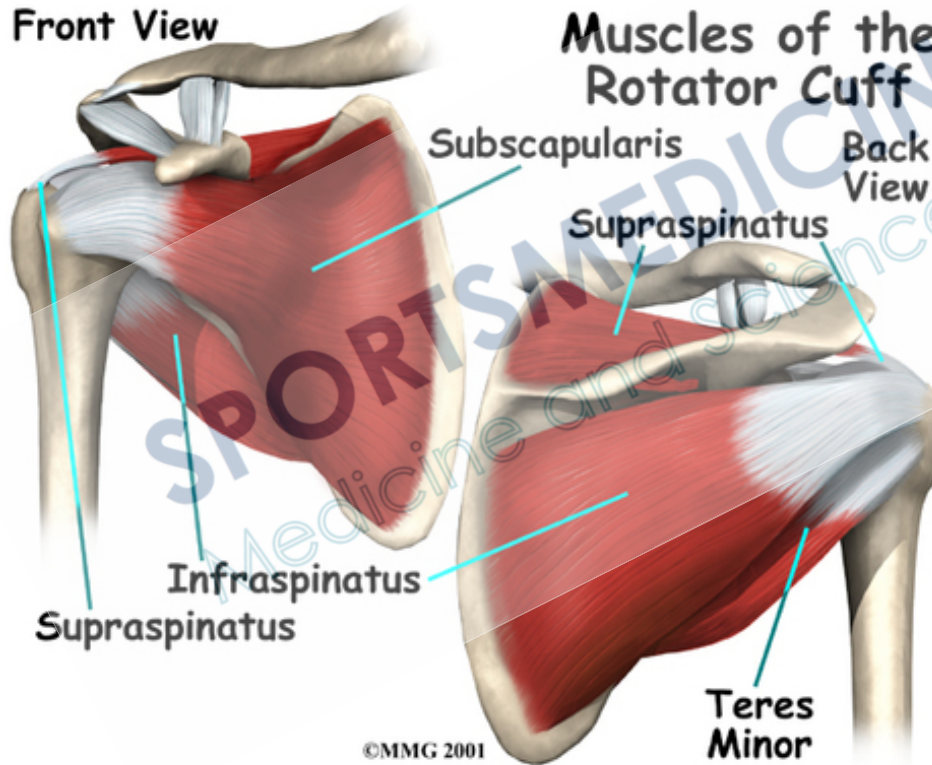
- Arthr. SAD
- Bursectomy
- (Coplaning)



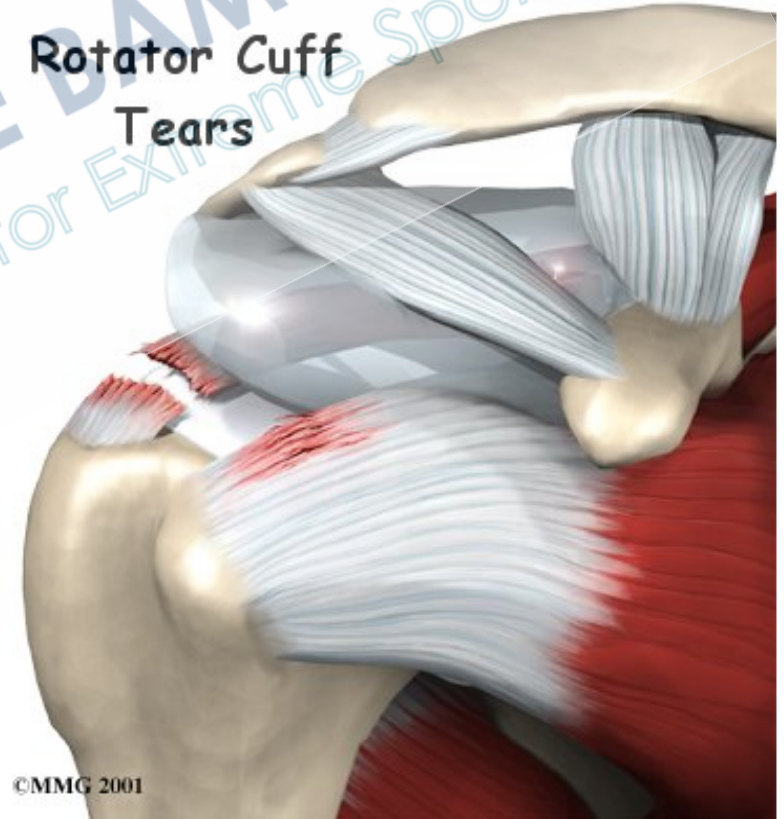
# Rotator Cuff Tears



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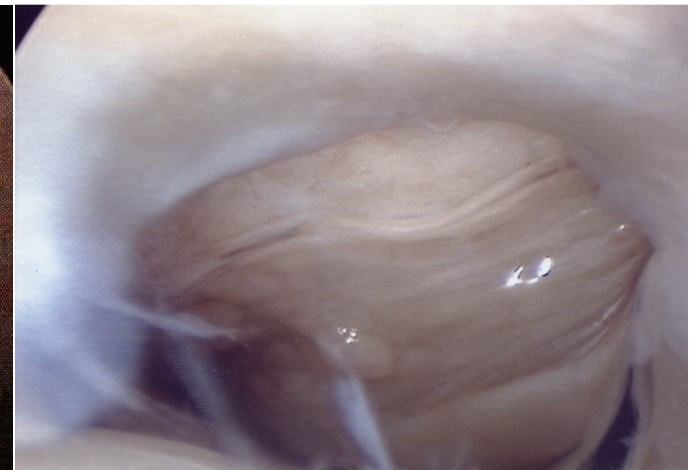
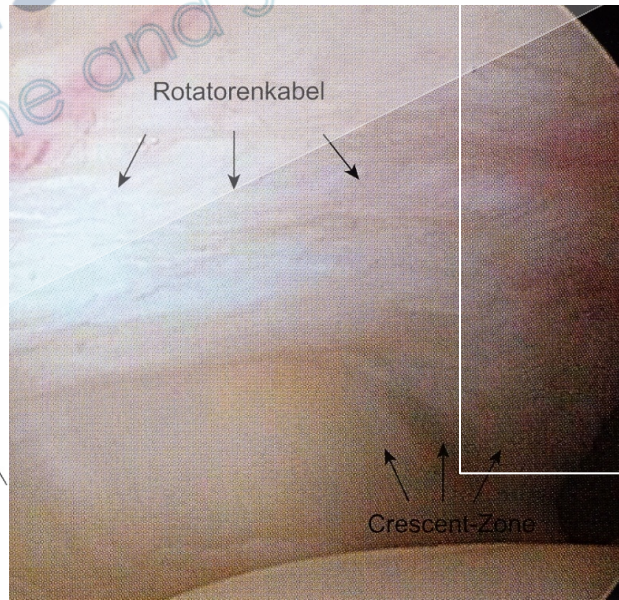
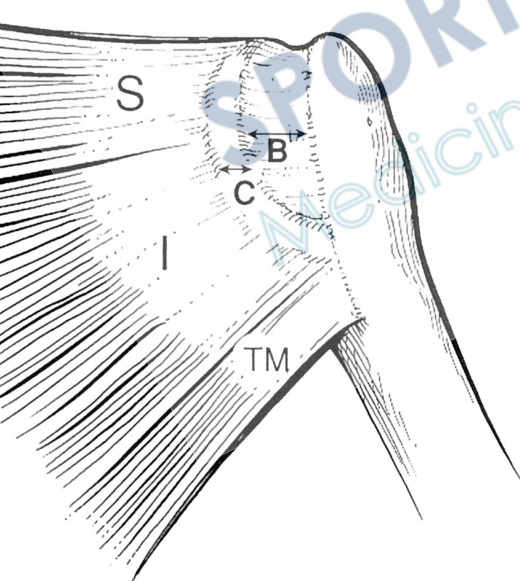


## Rotator Cuff Tears



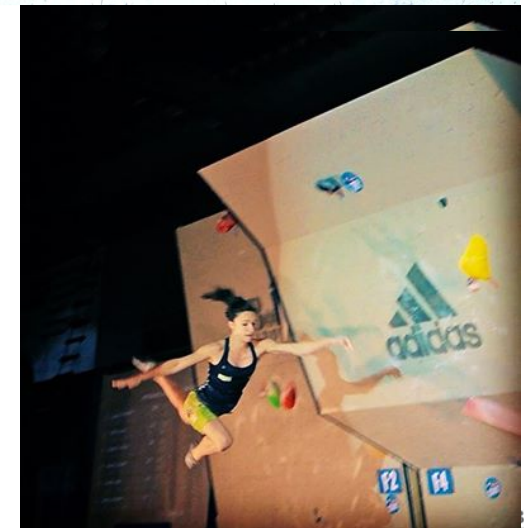
# Anatomical Specific Feature: Rotator Cable

- Rotator cable: The shoulders suspension bridge (Burkhart 1993)
- 1 cm prox. of the SPP/ISP insertion: crux of the rotator cuff (Codman 1934)
- E.g.: 52 y/old climber, surgery for LHB (long head of biceps) tear
- Random finding, no limitation, full range of motion, full strength (full time climber)



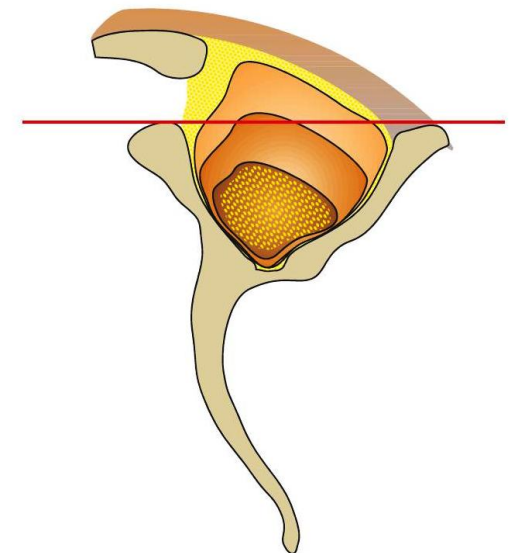
# Rotator Cuff Tears: Epidemiology

- degenerative rupture: > 60 y
- traumatic rupture: < 40 y
- traumatic (5-7%)
- degenerative (93-95%)



# Rotator Cuff: MRT/CT

- Fatty degeneration Goutallier (1994) CT
  - Stage 0 - Normal muscle
  - Stage 1 - Some fatty streaks
  - Stage 2 - Less than 50% fatty muscle atrophy
  - Stage 3 - 50% fatty muscle atrophy
  - Stage 4 - Greater than 50% fatty muscle atrophy
- MRI muscle atrophy: Thomazeau 1996:
  - Stage 1: Normal/ slight atrophy
  - Stage 2: Moderate atrophy
  - Stage 3: Severe atrophy



# Rotator Cuff: Therapy

- conservative:
  - partial tears (<50%)
  - old patients
  - muscle arthropathy,
  - muscle fatty degeneration
- surgical:
  - arthroscopic
  - or mini-open

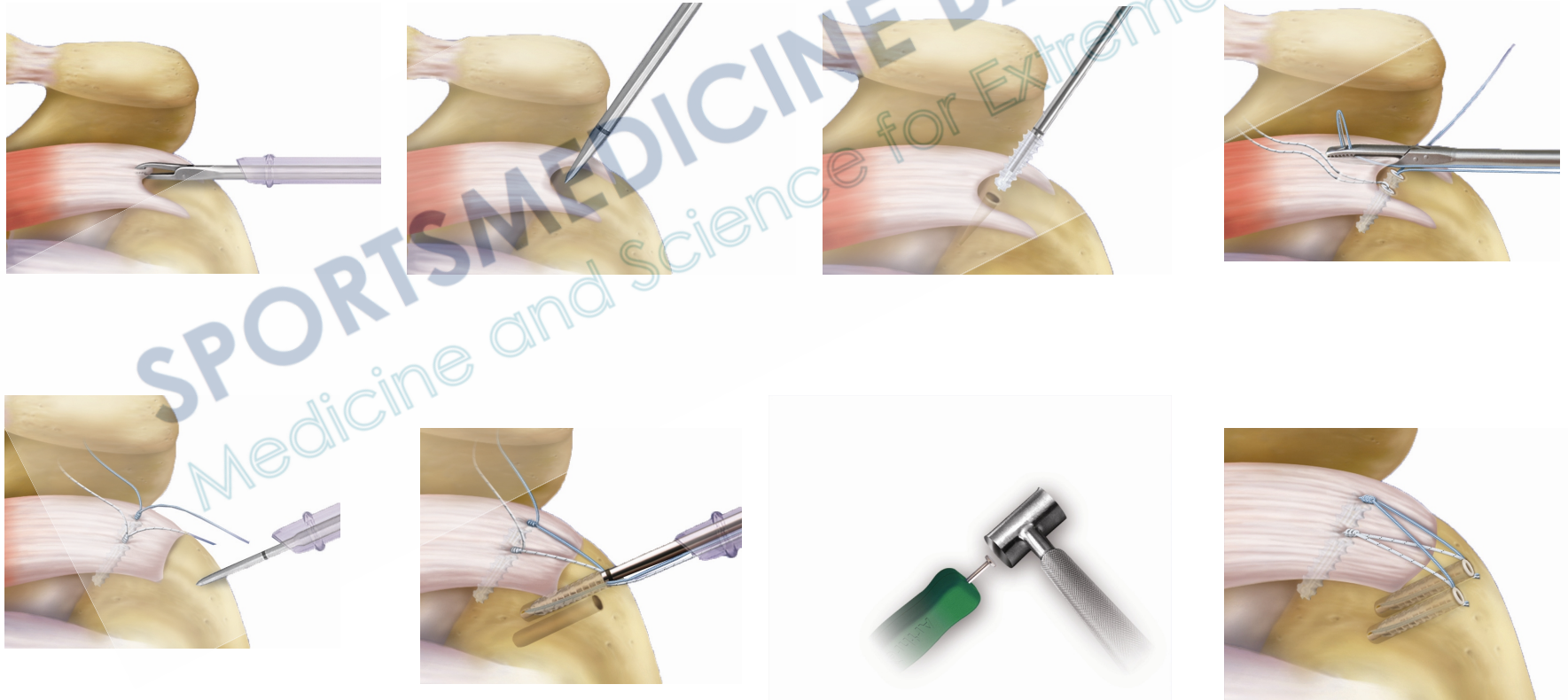
Cave: age is relatively



# Surgical Repair: Arth. double row suture bridge



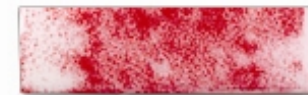
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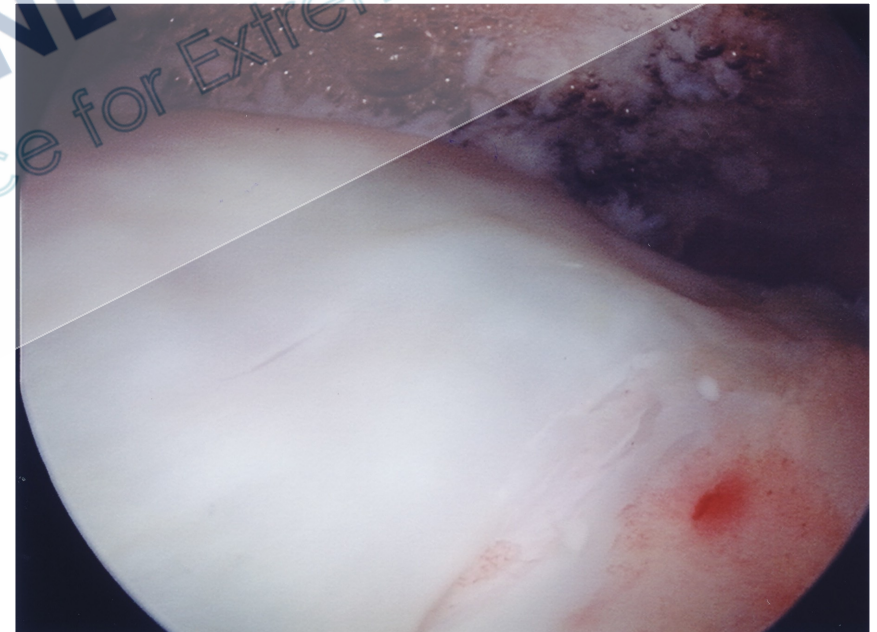


# Single versus double row

- **Mihata AJSM 2011**: suture bridge **sign.** less re-ruptures
- **Saridakis JBJS Am 2010** review : double row better tendon healing, functionell no differences
- **Duguin AJSM 2010** review 23 studies, 1252 repairs: double row sig. less re-ruptures



# Suture Bridge intra op and after 12 w



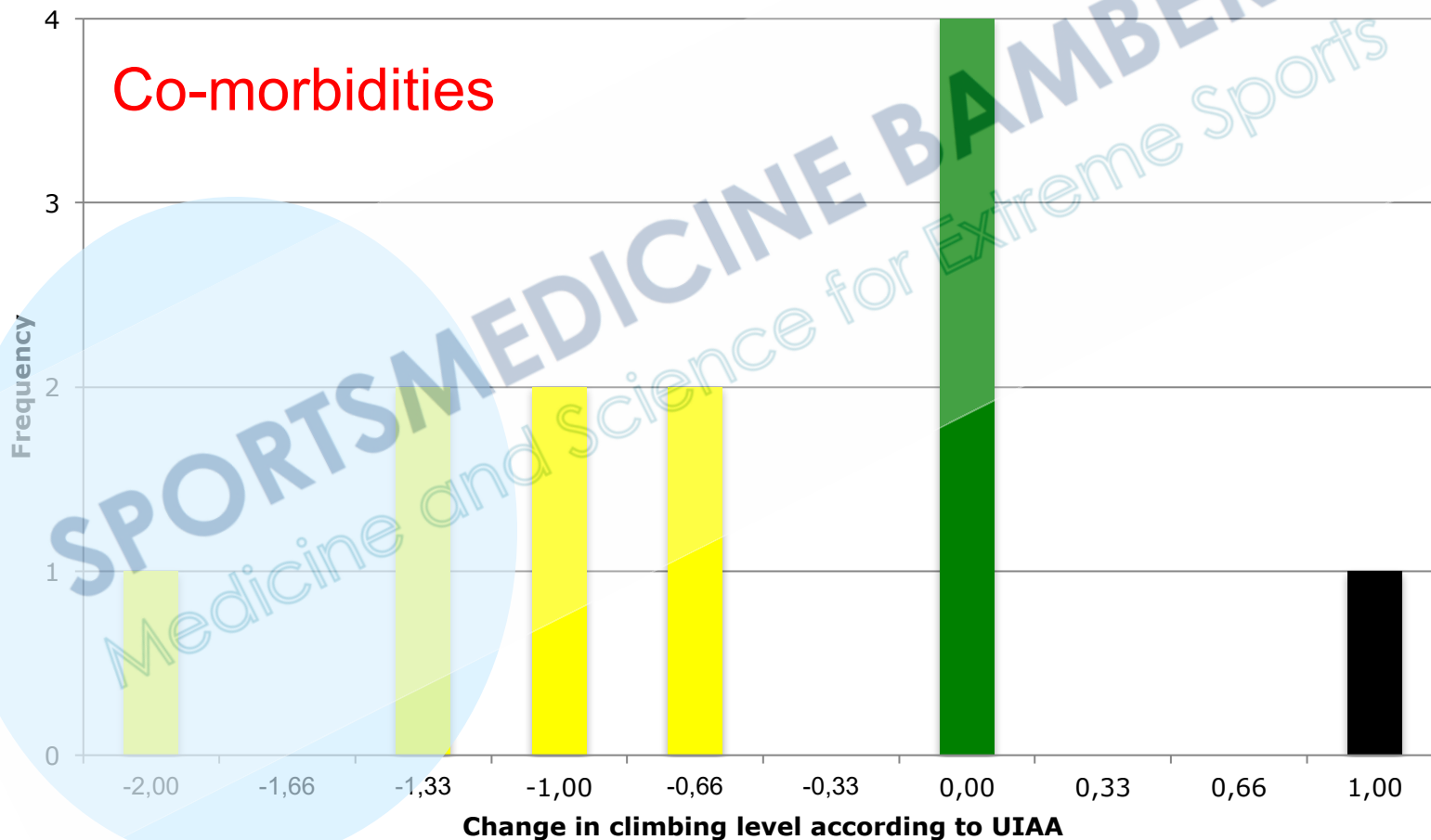
# Functional outcome after surgical repair of rotator cuff tears in rock climbers

- **12 rock climbers** (10 male, 2 female), age 28-66 years, mean 55.4 years,
- Aetiology: 6 acute and 6 chronic
- **follow up** examination between **12** and **72** months after surgery (**mean 27.3** months)
- **7 x complete rotator cuff tear** (retraction in the frontal plane according to Patte 4 grade 1, 2 grade 2, 1 grade 3)
- **5 x partial avulsion of the supraspinatus tendon** (PASTA lesion; Ellmann classification of partial thickness rotator cuff tears 1 grade 2, 4 grade 3)
- **No isolated rotator cuff pathologies** → 1x Bankart-Lesion, 1x Bankart fracture, 3x SLAP I, 2x SLAP II, 1xSLAP III, 1x SLAP V, 3x Impingement, 1x Tendinitis calcarea, 2x Long biceps tendon subluxation 1x rupture 2x AC-Joint Arthrosis
- **General Outcome**→ **Constant-Murley Score**
- **Sports-specific outcome**→ **3 hardest pre-injury vs. post surgery red point climbs** (UIAA classification) were evaluated for comparison

# Results

- average Constant Murley Score 91.45 (range 80-98)
- All patients had started climbing again
- mean UIAA metric climbing level:
  - pre-injury: 7.52 ( range: 5.66-9.66 )
  - post-injury: 7.02 ( range: 5.00-8.33)
- 7 climbers did not regain their initial climbing level until re-evaluation, 4 did and 1 exceeded his initial level. 11 of 12 climbers reached a climbing level between +/- 1.33 UIAA metric grades of their initial capability

# Distribution of change in climbing level post surgery



Wilderness Environ Med. 2017 Dec;28(4):342-347. doi: 10.1016/j.wem.2017.07.003. Epub 2017 Sep 20.

**Functional and Sports-Specific Outcome After Surgical Repair of Rotator Cuff Tears in Rock Climbers.**

Simon M<sup>1</sup>, Popp D<sup>2</sup>, Lutter C<sup>2</sup>, Schöffl V<sup>3</sup>.