

# Massive and irreparable Cuff Tears - Defining the problem

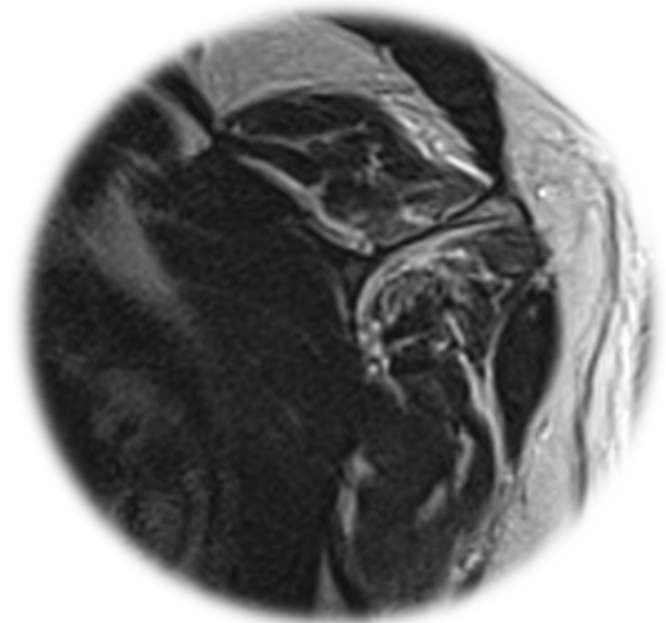
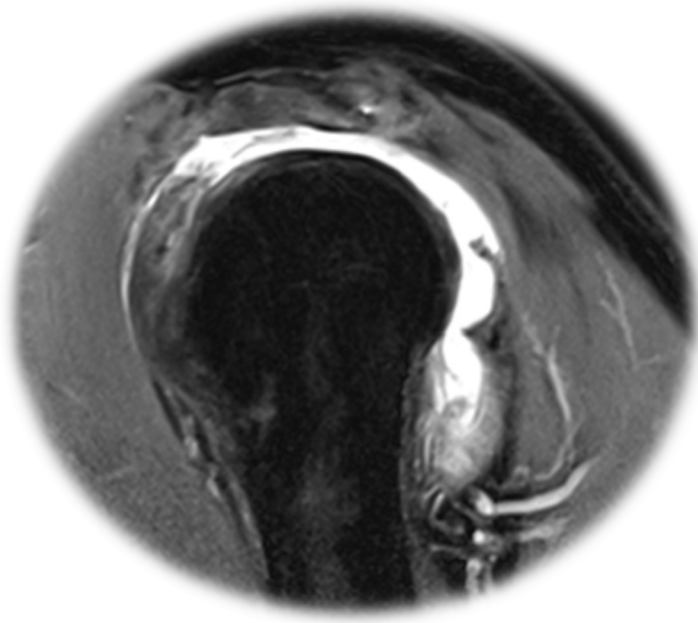
Prof. Dr. med. Knut Beitzel, M.A.

Schulterinstitut, ATOS Orthoparc Klinik, Köln

## Multiple Factors we are talking about...

Pain ?

Tear / Atrophy ?

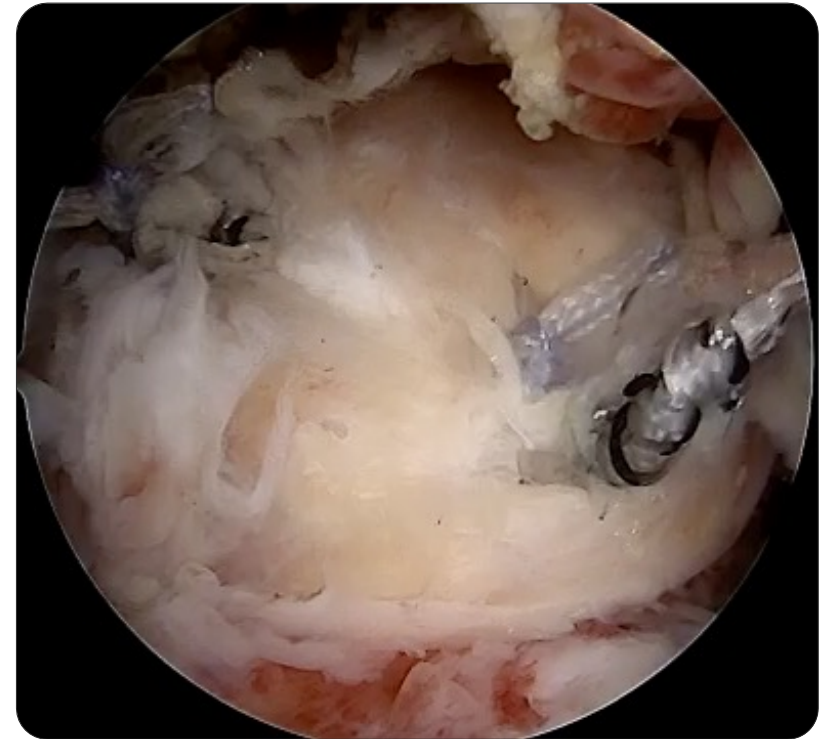
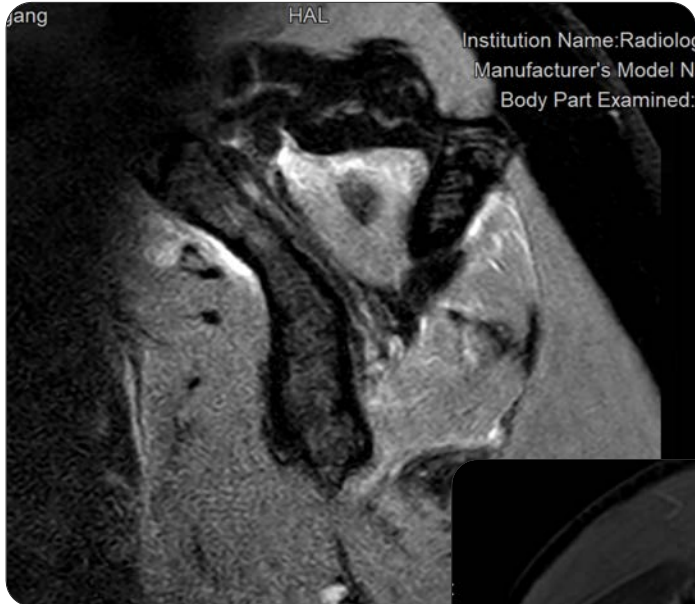


Weakness ?

OA ?

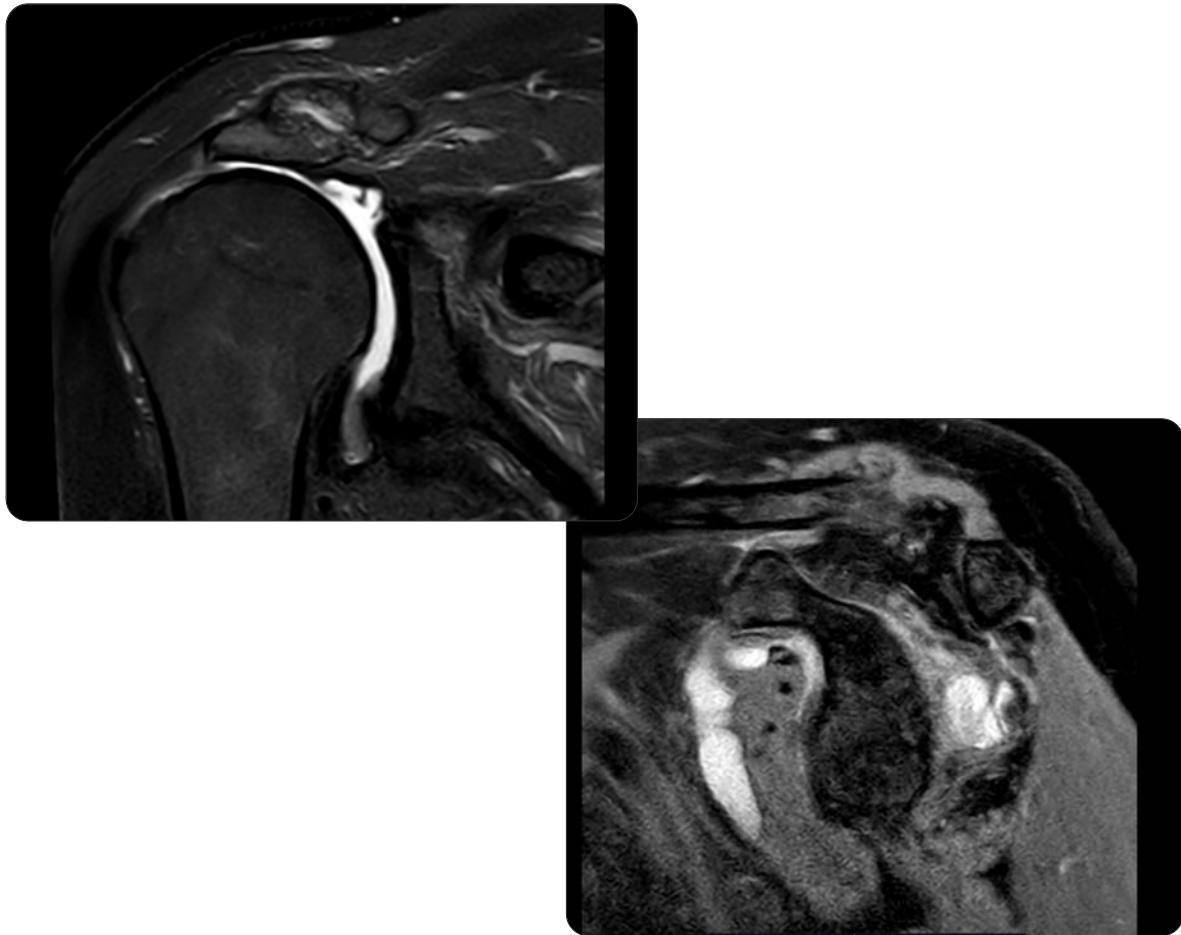
# Massive vs. Irreparable

Male, 72y



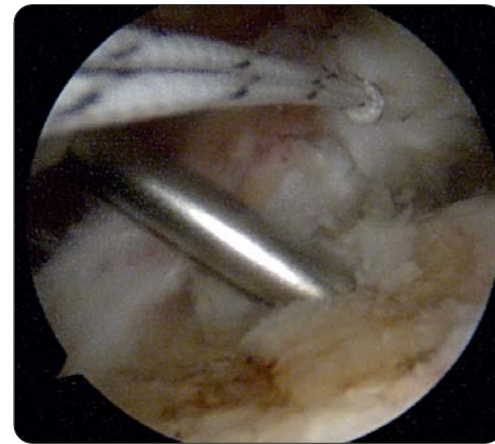
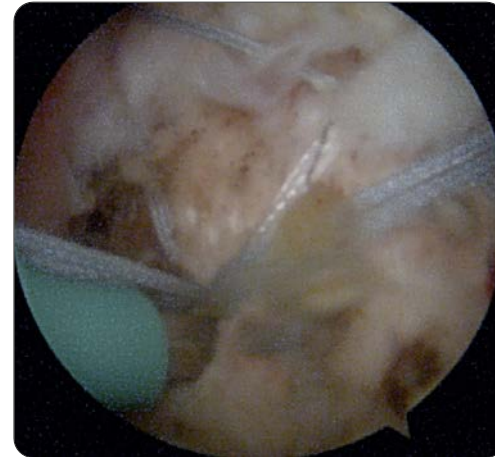
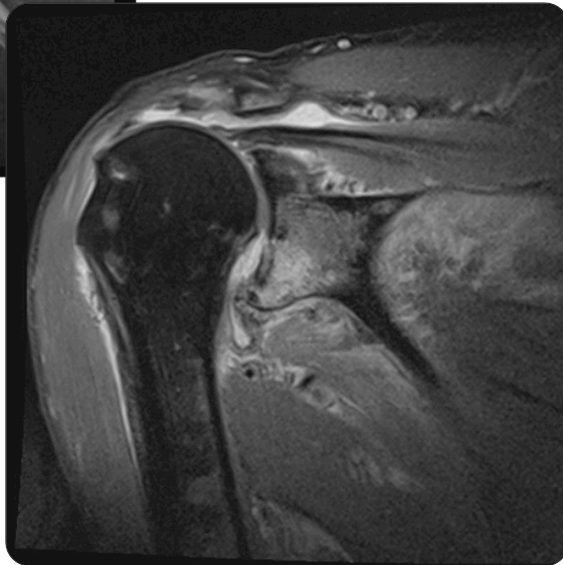
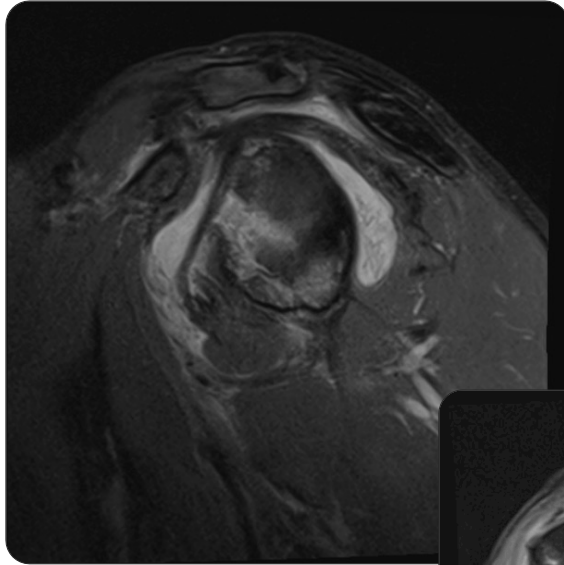
Failed.....

Male, 72y – 6 months after cuff repair



# Massive vs. Irreparable

Male, 68 years



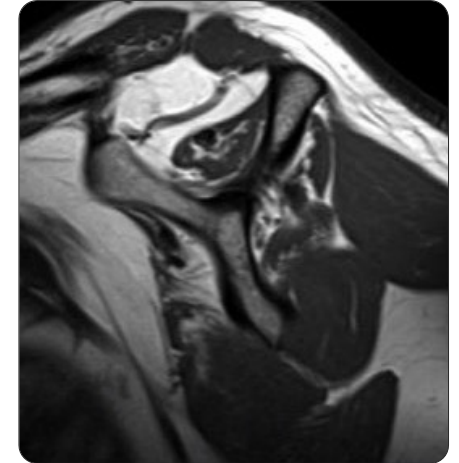
Healed.....

# What do we know about a Rotator Cuff Tear

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## The natural history of a RC-lesion

- Degenerative posterior ruptures have **less risk of fatty degeneration**
- Fatty infiltration & atrophy show **greater progression in symptomatic ruptures**
- Without progression of the rupture, patients remain relatively asymptomatic for a relatively long time -> **pain progression indicates an increase in the size of the rupture**
- Moderate fatty infiltration after about **3 years**



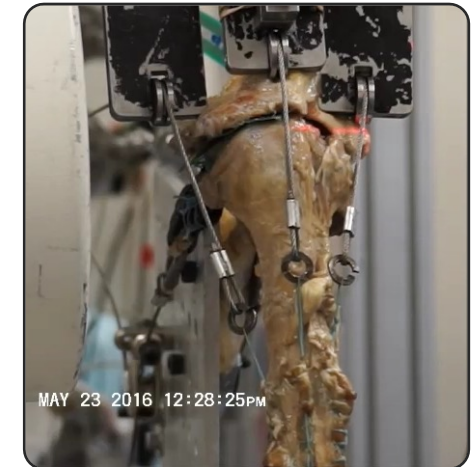
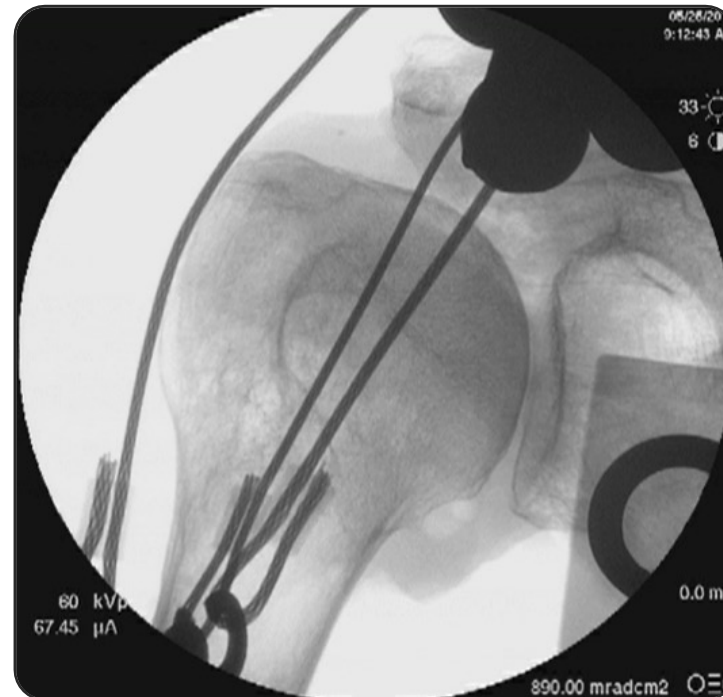
DeFranco et al., Clin Orthop Relat Res. 2010  
Moosmayer et al., J Bone Joint Surg Am. 2013  
Melis et al., Orthop Traumatol Surg Res. 2009

## What are the effects of a RC Tear ?

### Relationship Between Deltoid and Rotator Cuff Muscles During Dynamic Shoulder Abduction

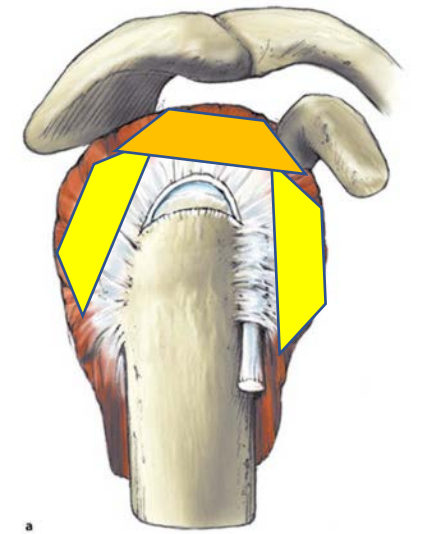
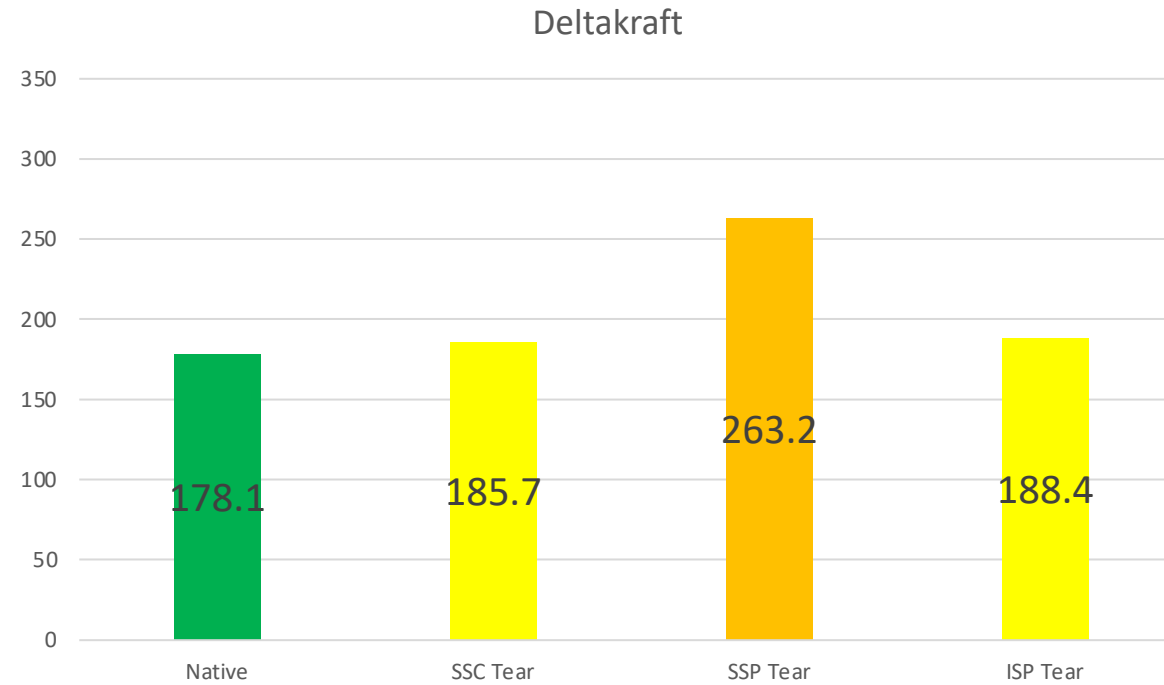
#### A Biomechanical Study of Rotator Cuff Tear Progression

Felix Dyrna,\* MD, Neil S. Kumar,<sup>†‡</sup> MD, MBA, Elifho Obopilwe,<sup>†</sup> MS,  
Bastian Scheiderer,\* MD, Brendan Comer,<sup>†</sup> BS, Michael Nowak,<sup>†</sup> ScD,  
Anthony A. Romeo,<sup>§</sup> MD, Augustus D. Mazzocca,<sup>†</sup> MD, MS, and Knut Beitzel<sup>||</sup>  
*Investigation performed at the University of Connecticut Health Center,  
Farmington, Connecticut, USA*



Dyrna, Mazzocca, Beitzel et al., AJSM, 2018

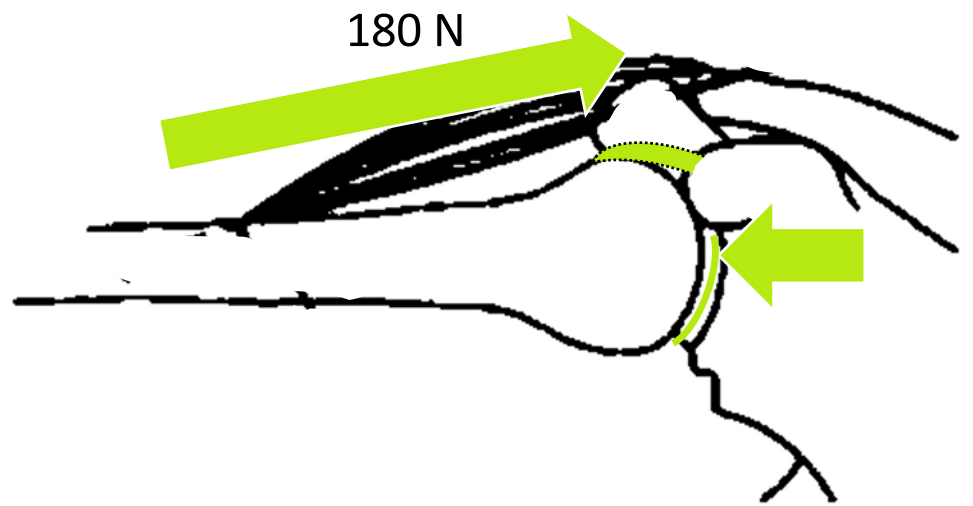




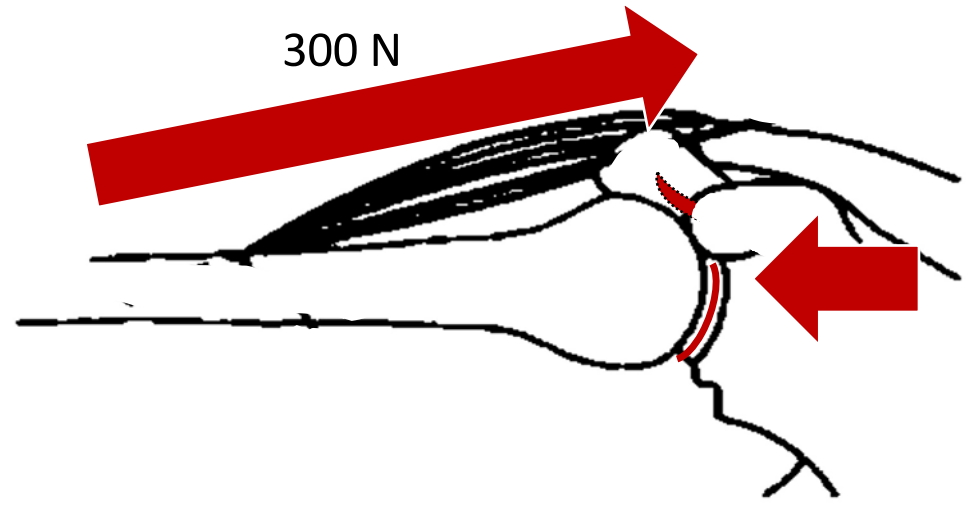
Dyrna, Mazzocca, Beitzel et al., AJSM, 2018

It is to be expected that increased deltoid forces lead to greater stress on the shoulder joint!

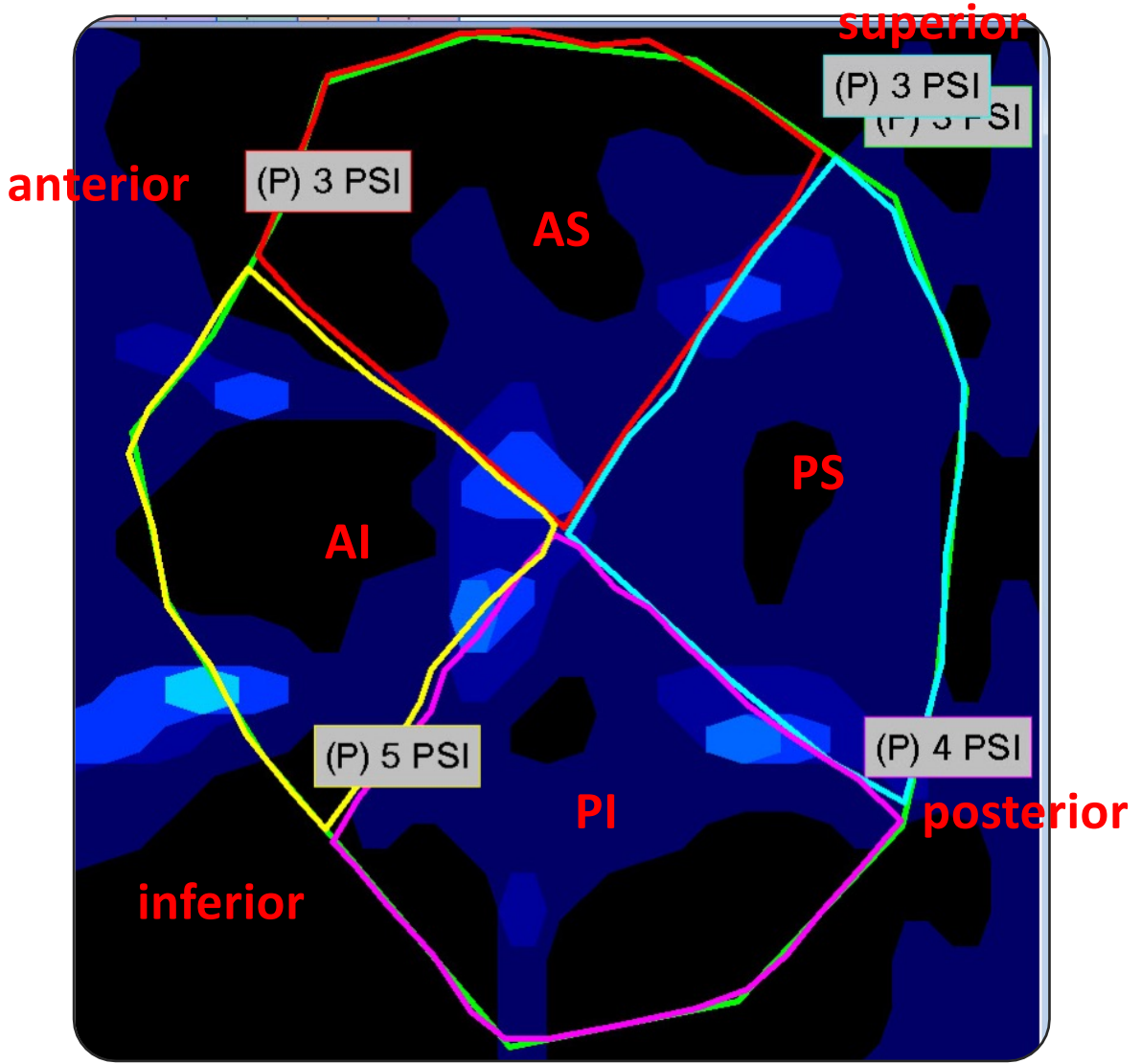
Intakter SSP



SSP-Ruptur



# RC-Tear as Riskfactor for OA



TekScan zwischen  
Humeruskopf und  
Glenoidoberfläche

Native



SSP Defect



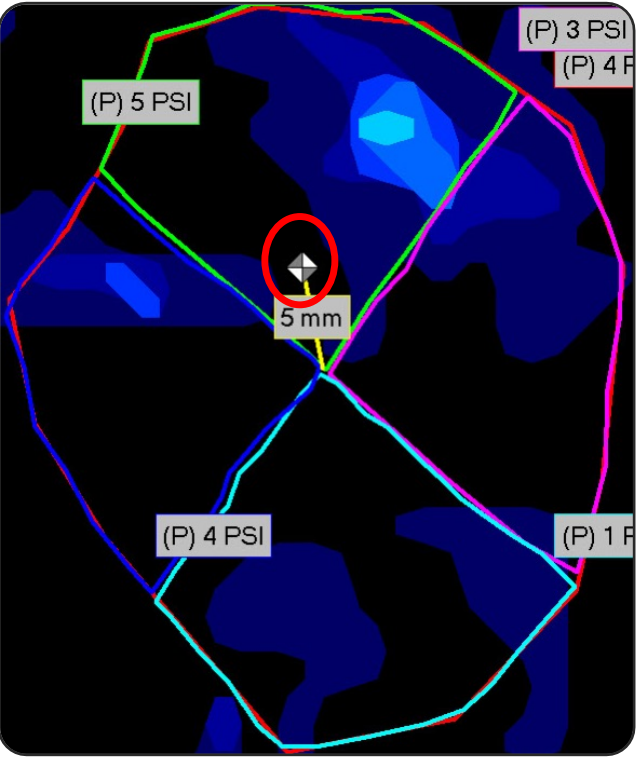
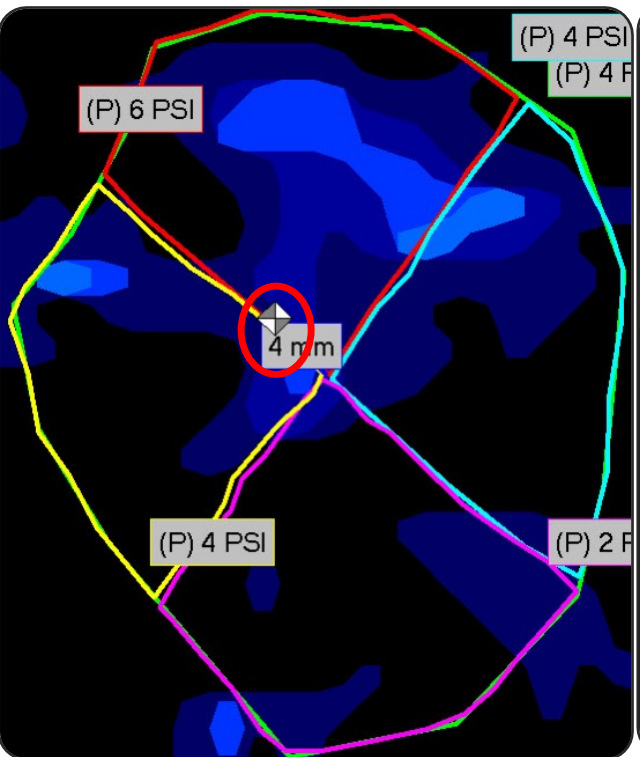
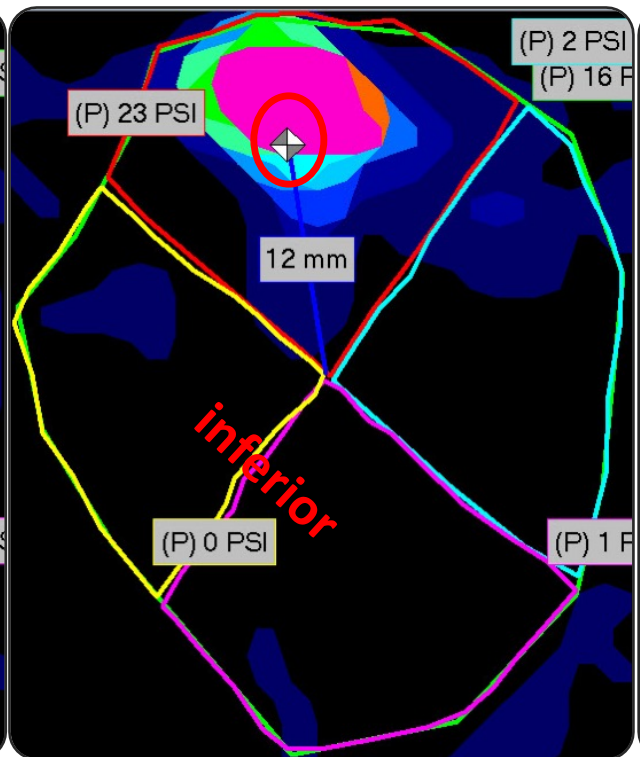
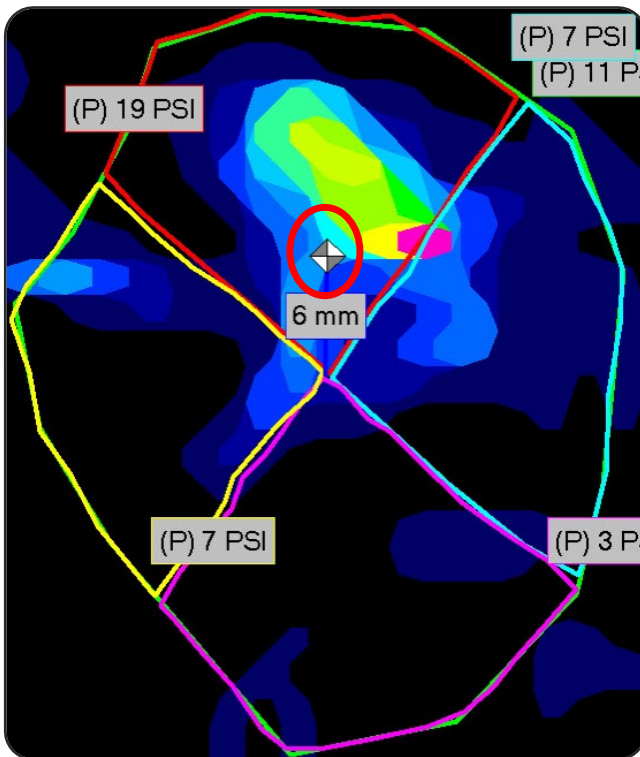
SSP Repair  
(Speedbridge)



SCR



# SSP Repair resultiert in re-Zentrierung des Druckzentrums



45° of abduction

# What do we call a „Massive Tear“

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## „Massive Tear“

- Prevalence ranges from **10% to 40% of all rotator cuff tears**
- Harryman et al. reported that 28% of all surgically repaired rotator cuff tears in a five-year period were **massive posterosuperior tears**
- Massive **anterosuperior tear configurations involving the supraspinatus and subscapularis tendons are less common**, ranging 5% to 20% of all rotator cuff tears

## „Massive Tear“

- **No consensus** regarding the definition

- Tendons: **> 2**

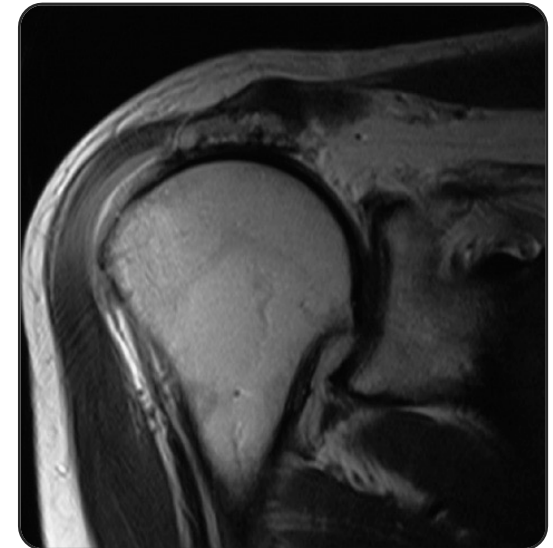
Zumstein et al.; J Bone Joint Surg Am. 2008.

- Diameter: **> 5 cm**

Cofield et al., J Bone Joint Surg Am. 2001

- Tear Patter: **2 x 2 cm**

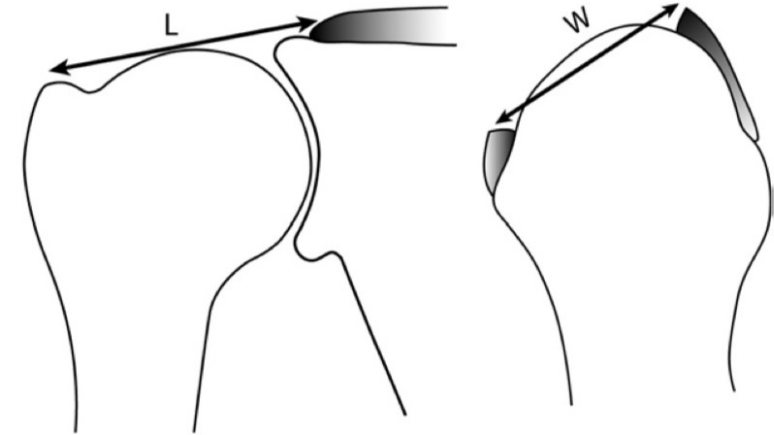
Davidson & Burkhart SS. Arthroscopy, 2010





## „Massive Tear“

- Measure maximum tear length (L) coronal image.
- Measure maximum tear width (W) on sagittal image.



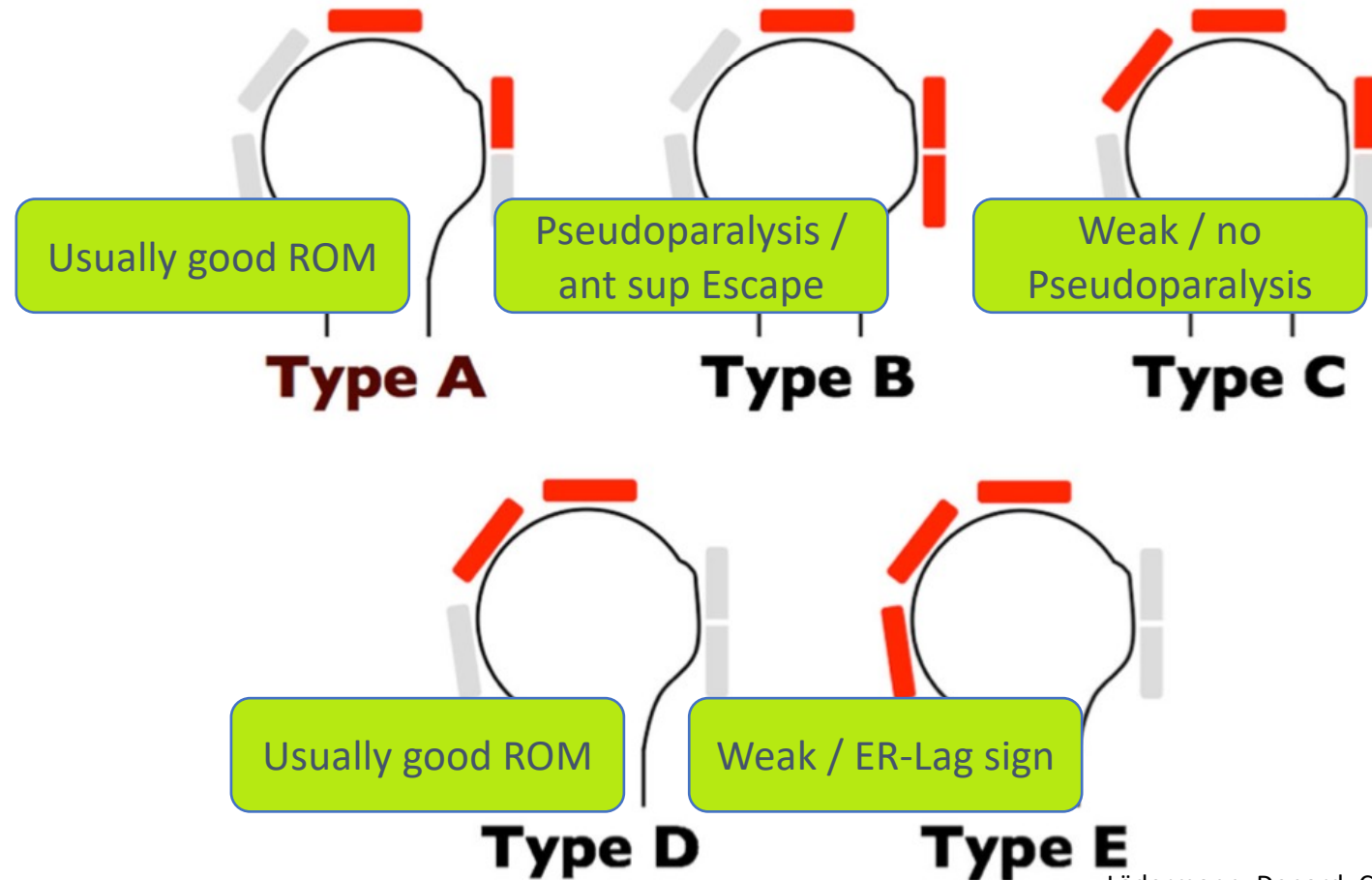
- $L < W$  and  $L < 2$  cm -> crescent-shaped tear and end-to-bone repair.
- $L > W$  and  $W < 2$  cm -> longitudinal tear and side-to-side/margin convergence repair.
- **$L > 2$  cm and  $W > 2$  cm** -> **in over 75% of cases, direct primary repair is not possible.**
- **$L > 3$  cm and  $W > 3$  cm** -> **in all cases, direct primary repair is not possible**

# „Massive Tear“ – Collin Classification

International Orthopaedics (SICOT) (2015) 39:2403–2414  
DOI 10.1007/s00264-015-2796-5  
ORIGINAL PAPER

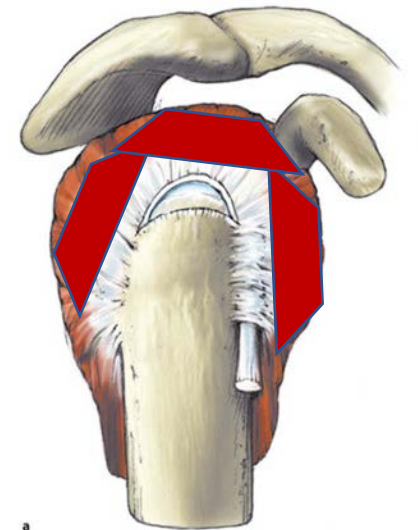
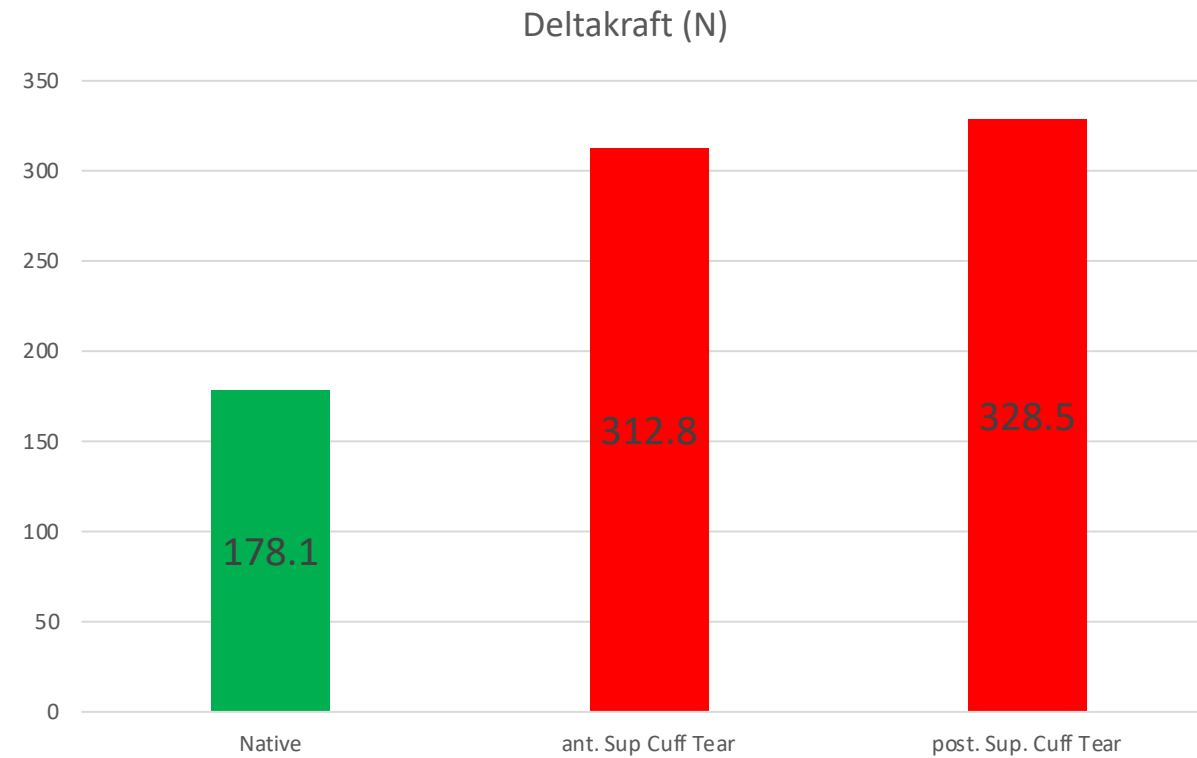
**Massive rotator cuff tears: definition and treatment**

Alexandre Lädermann<sup>1,2,3</sup> · Patrick J. Denard<sup>4,5</sup> · Philippe Collin<sup>6</sup>



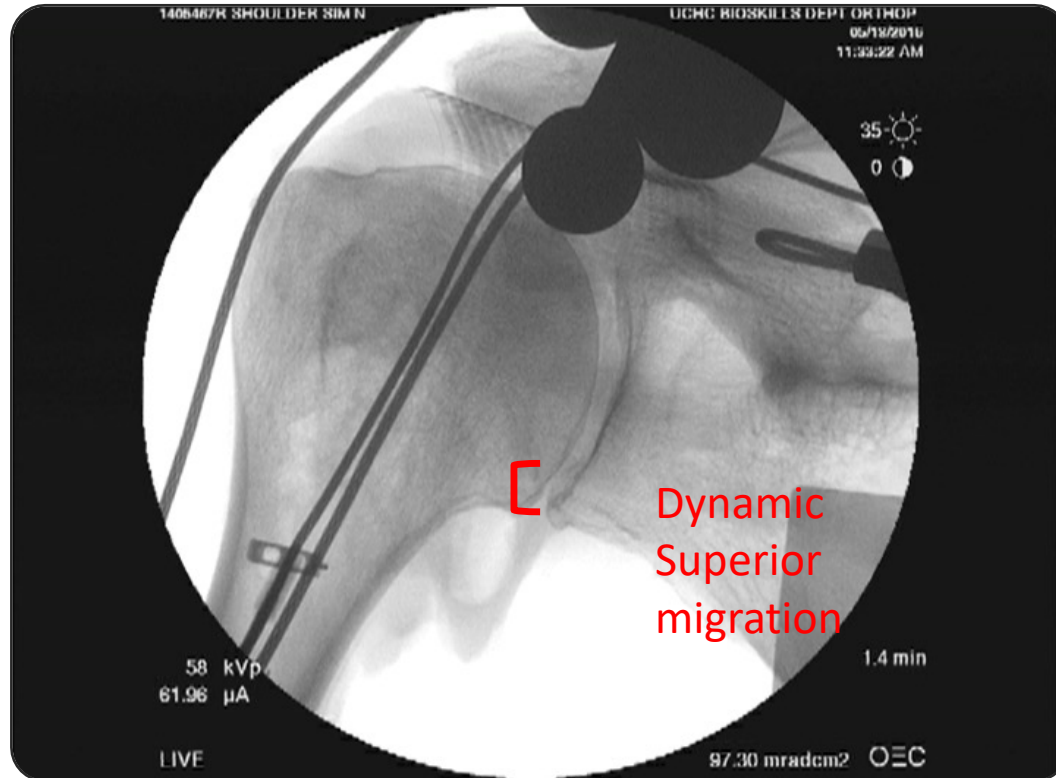
Lädermann, Denard, Collin, Int Orth, 2015  
Warner, DVSE 2018

## Biomechanics of „massive tear“

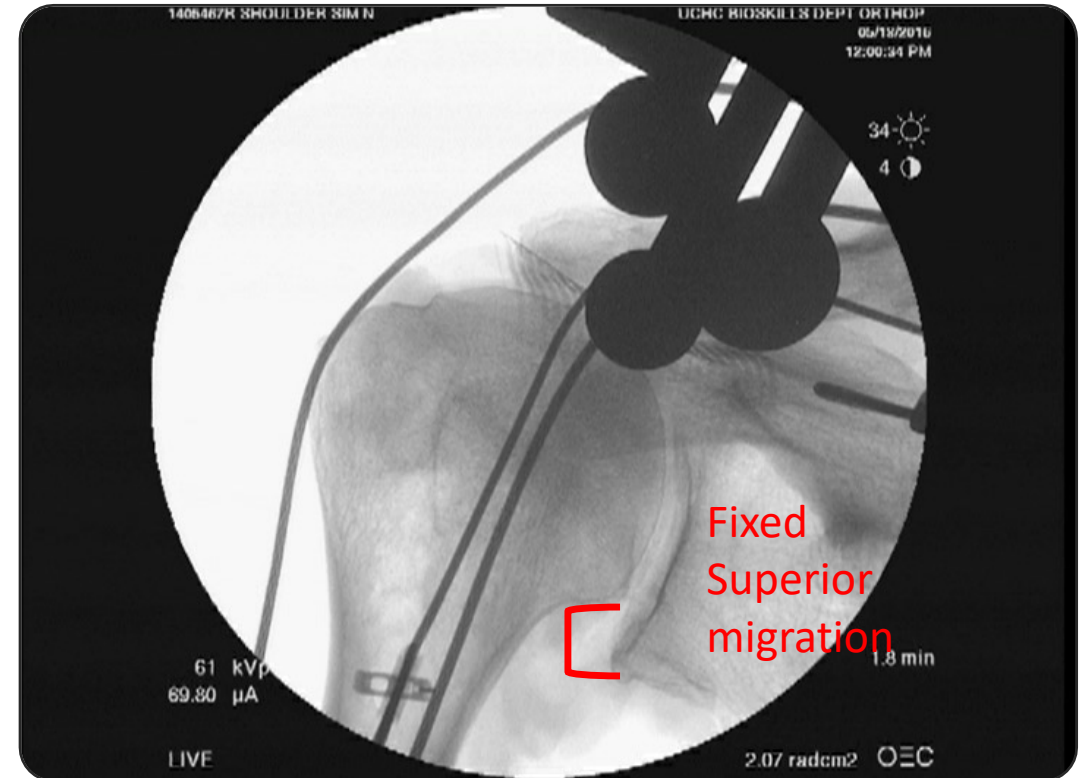


Dyrna, Mazzocca, Beitzel et al., AJSM, 2018

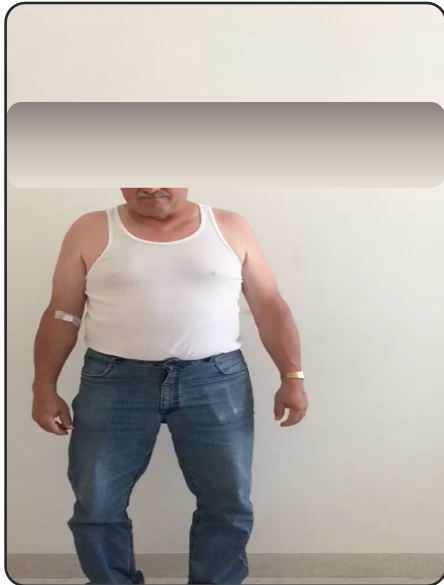
## Motion Deficit correlates with Head Migration



SSP TEAR



MASSIVE TEAR

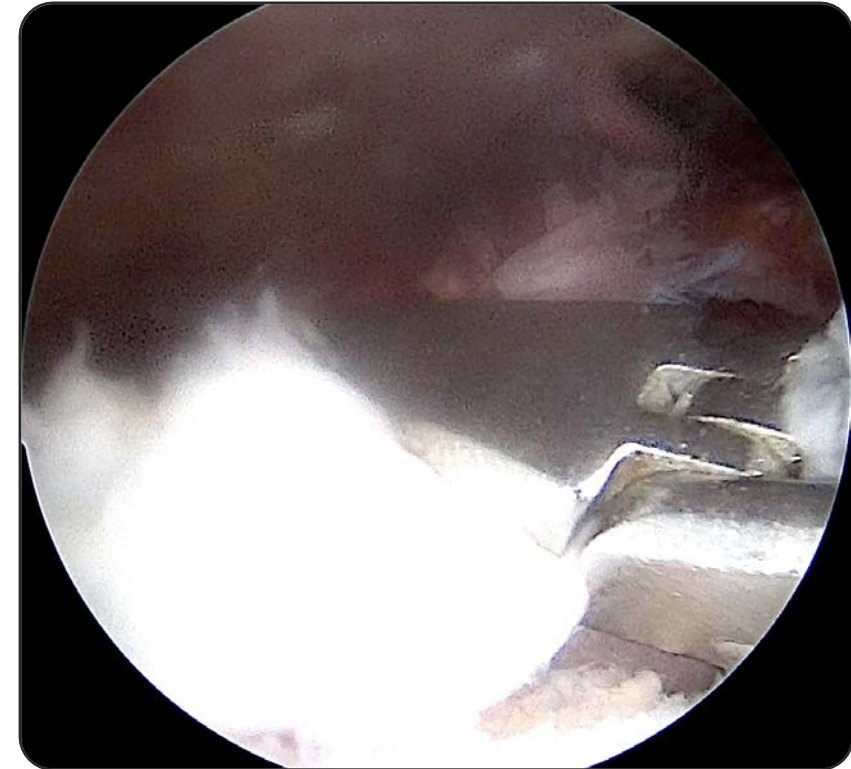
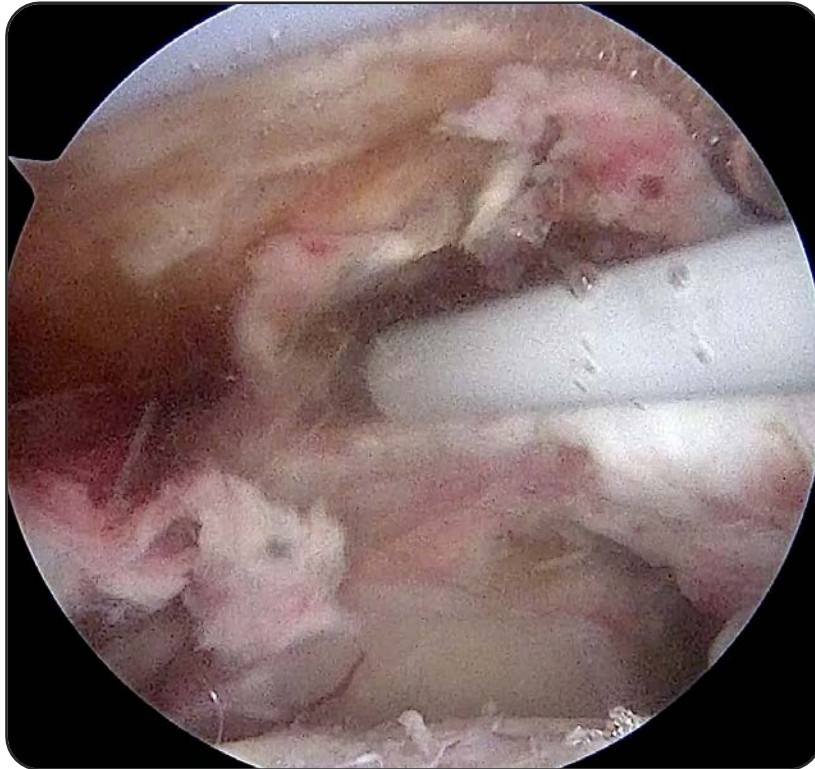


# What factors make the tear „irreparable“?

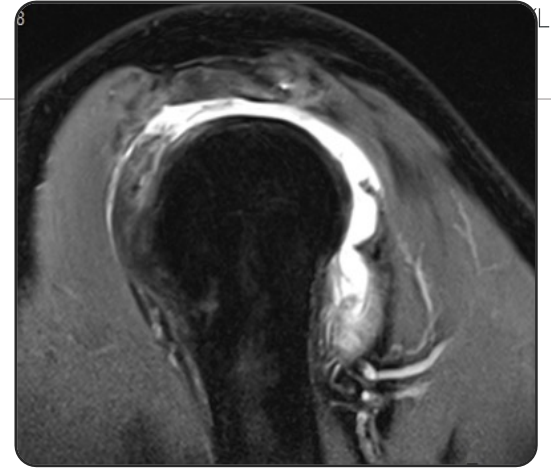
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„Massive Tear“ ?

**Massive rotator cuff tears** are not necessarily  
synonymous with **Irreparable tears**.



# „Massive Tear“ is a problem



Annals of Biomedical Engineering (© 2015)  
DOI: 10.1007/s10439-015-1262-1

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**Scaffolds for Tendon and Ligament Repair and Regeneration**

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(Received 8 September 2014; accepted 20 January 2015)

Associate Editor Fei Wang oversaw the review of this article.

**TABLE 1. The success rates for surgical repair of rotator cuff.**

Tear size	Published studies	Success by imaging Mean ± SD (range)
Small to medium (1–3 cm)	5–7, 17, 26, 30, 32, 34, 39, 40, 43, 52, 58–60, 68, 74	78 ± 7% (60–90%)
Large (3–5 cm)	5, 24, 25, 30, 33, 39, 41, 54, 84	54 ± 21% (5–90%)
Massive (2 or more tendons)	25, 30, 33, 59, 61, 73	42 ± 12% (24–63%)

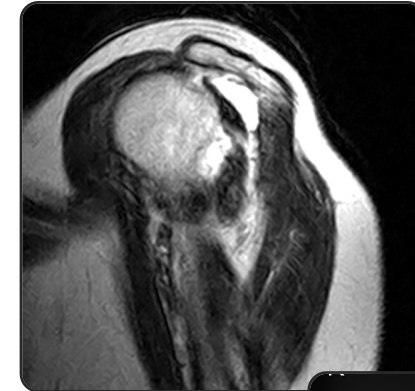


## Criteria for unfavourable outcomes („Irreparable Tear“)

- **Age (>65)**
- **Tendon retraction** type III according to Patte

(cave 3D Tear-Pattern)

- „Antero-superior Escape“
- Static superior migration



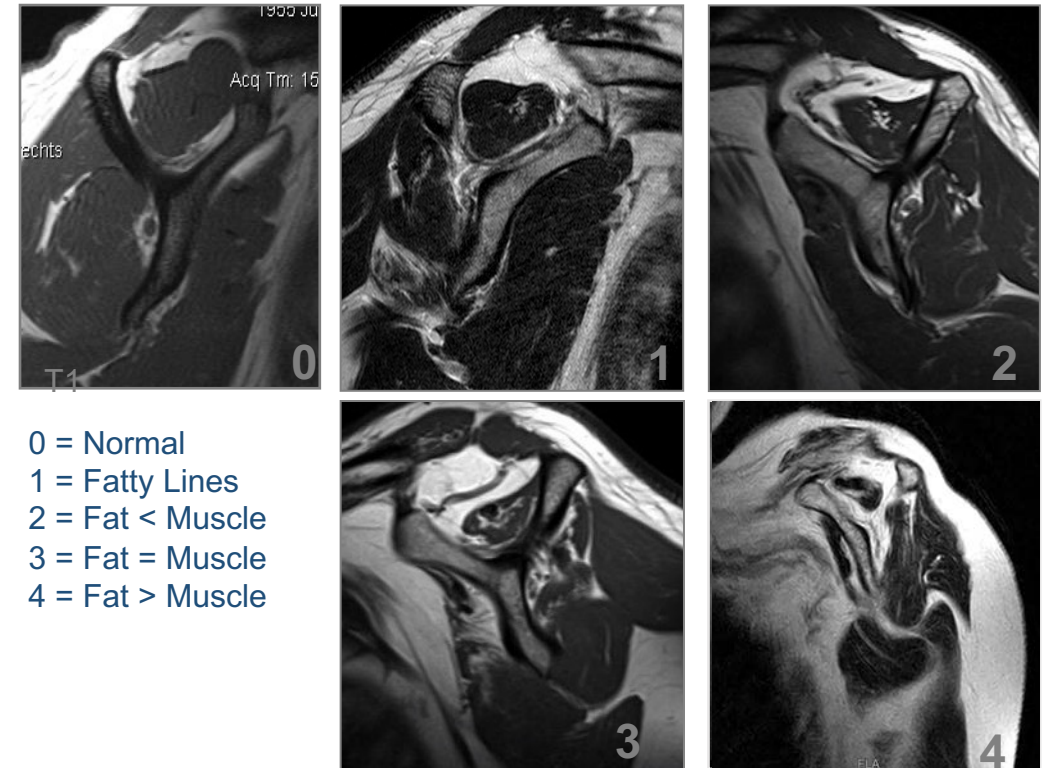
Boileau et al., JBJS, 2005

Rhee et al., Arthroscopy, 2017

Rashid et al., Act Orth, 2017

## Criteria for unfavourable outcomes („Irreparable Tear“)

- **Muscle atrophy** type III according to Thomazeau
  - **Fatty infiltration** type >III according to Goutallier / Fuchs
- Infraspinatus !



Khair et al., HSSJ, 2016  
Collin et al., JSES, 2020  
Gladstone et al., AJSM 2007

## Criteria for unfavourable outcomes („Irreparable Tear“)

- **History – acute vs. chronic**

- Early repair of an acute-on-chronic full-thickness RCT results in a statistically and clinically superior improvement in outcomes compared with repairs of chronic RCTs.

- **Diabetes**

- **Hyperlipidaemia**



Jeong et al., JSES, 2017  
Killian et al., AJSM, 2015  
Park et al., AJSM, 2015

## The Rotator Cuff Healing Index

### A New Scoring System to Predict Rotator Cuff Healing After Surgical Repair

Jieun Kwon,<sup>\*</sup> MD, Sae Hoon Kim,<sup>†</sup> MD, PhD, Ye Hyun Lee,<sup>\*</sup> MD,  
Tae In Kim,<sup>‡</sup> MD, and Joo Han Oh,<sup>§||</sup> MD, PhD  
*Investigation performed at Seoul National University Bundang Hospital, Seongnam, Republic of Korea*

Kwon et al., AJSM, 2018

### Healing Failure Rate:

< 4 points            -> 6.0 %  
> 5 points            -> 60.7 %  
> 10 points           -> 86.2 %

Factor	Points
Retraction > 3 cm	4
Tear Size ≥ 2.5 cm	2
Bone mineral density	2
High Work Load / Activity	2
Age > 70	2
Fatty Infiltration ISP ≥ 2	3



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**Thank you !**