# Ramazzini Presentation

## THE TEMPORAL RELATIONSHIP BETWEEN SUPRASPINATUS TENDON RUPTURE AND FATTY INFILTRATION OF THE SUPRASPINATUS MUSCLE

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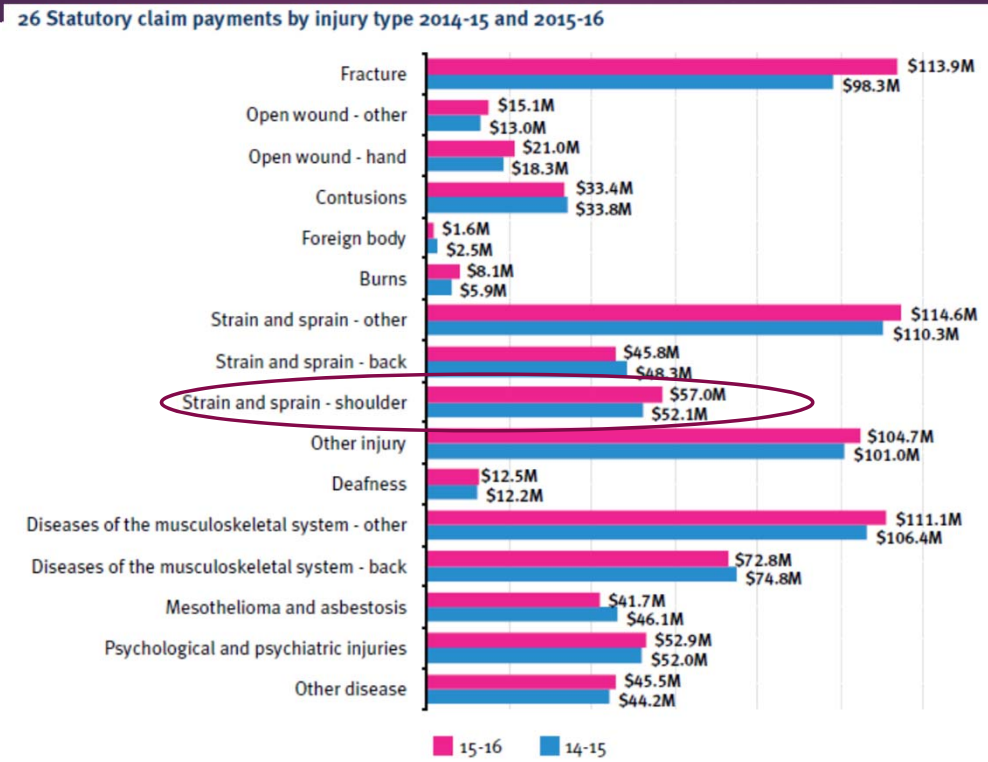
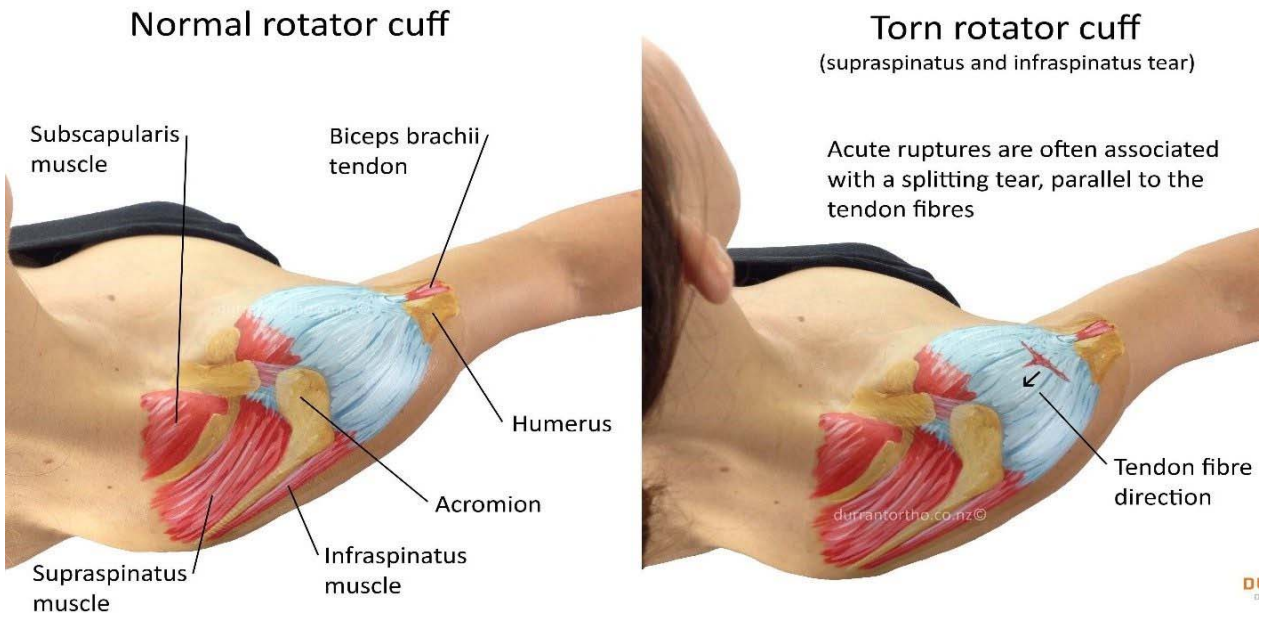
# Shoulder injuries in QLD 2014-5[1]




1. The State of Queensland 2016, Queensland workers' compensation scheme statistics, 2015-6. Office of Industrial Relations.

# Rotator Cuff Tears





1. Shen P, et al .Long-term functional outcomes after repair of rotator cuff tears correlated with atrophy of the Supraspinatus muscles on magnetic resonance images. *Journal of Shoulder And Elbow Surgery,* January 2008
2. Kim H, et al. Relationship of tear size and location to fatty degeneration of the rotator cuff. *Journal of Bone & Joint Surgery, American Volume* April 2010

# Aim of Study

- To assess the relationship of a traumatic tear to the Supraspinatus tendon and the time required for varying levels of development of fatty degeneration in the Supraspinatus muscle.

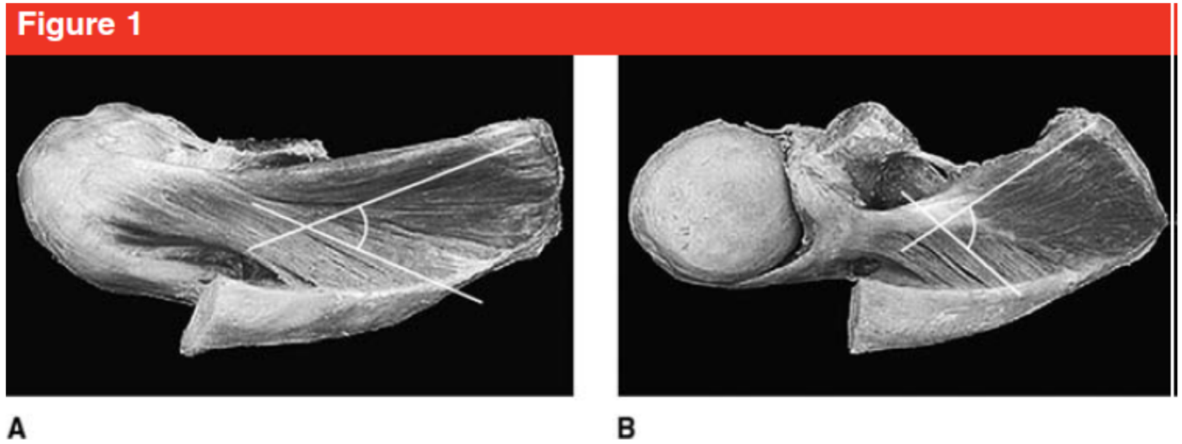
# Prevalence of Supraspinatus Injuries

| Age | | Percentage |
|---|---|---|
| All ages[1] | | 5-39% |
| <50yrs[2] | | 0% |
| 51-60yrs | | 10.70% |
| 61-70 | | 15.20% |
| 71-80 | | 26.50% |
| >80 | | 36.60% |


1. Yamamoto A, et al. Prevalence and risk factors of a rotator cuff tear in the general population. *Journal Of Shoulder And Elbow Surgery* January 2010
2. Minagawa H, Itoi E. Clinical relevance of the rotator cuff in the shoulder with pain and dysfunction. *Kansetsugeka* 2006

# Proposed Pathology of Fatty Infiltration of the Supraspinatus Muscle

- Loss of traction on the muscle and resultant loss of permutation angle and;
- Loss neurological input





- Kuzel B, et al Fatty infiltration and rotator cuff atrophy. The Journal Of The American Academy Of Orthopaedic Surgeons October 2013
- Nakagaki K, et al Fatty degeneration in the supraspinatus muscle after rotator cuff tear. *Journal Of Shoulder And Elbow Surgery*, May 1996

# Rate of Fatty Infiltration Progression

- Melis *et al* showed that fatty infiltration can be found at an average of 3 years from traumatic injury.
  - Melis *et al* had no description of size of tendon tears
  - This research looked at large tendon tears (Patte Classification Stage 3)
  - Animal studies suggest that the rate of fatty infiltration can be much faster


- Melis B, et al. Natural history of fatty infiltration and atrophy of the Supraspinatus muscle in rotator cuff tears. *Clinical Orthopaedics & Related Research* June 2010

# Study Design/Process

- This is a correlation study
- Patients under the care of two co-located surgeons
- Imaging completed at Brisbane Private Hospital Imaging
- The retraction of the Supraspinatus tendon was assessed as greater than stage 3 Patte classification.
- The Goutallier grade of fatty infiltration was noted
- The patients file was examined for a date of injury
- The time from the injury to the MRI was calculated
- The time from injury to MRI was compared to the grade of fatty infiltration for correlation

# Study Inclusions

Inclusion criteria were established to assess participant eligibility.

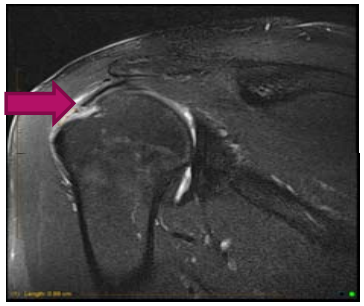
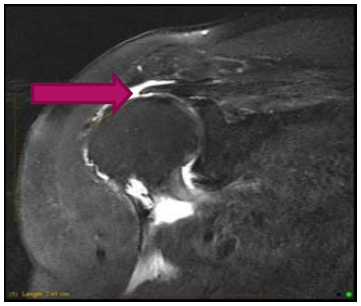
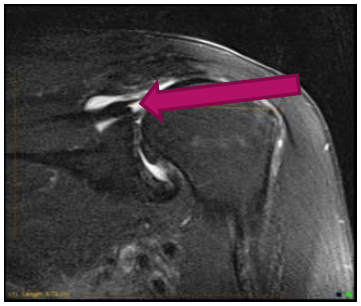
- The patient must be over the age of 18 years;
- Provide consent;
- Had an MRI completed at the Medical Imaging Practice with in the years 2011 and 2016; and,
- Retraction greater Patte Stage 3 as assessed by the medical imaging practice radiologists;

# Study Exclusions

Patients were excluded from the study for the following reasons:

- Retraction less than Stage 3  as measured by the medical imaging practice radiologists on MRI;
- No date of injury recorded in the patient records; and,
- Patient had undergone previous surgery or had a significant previous injury as noted in patient records

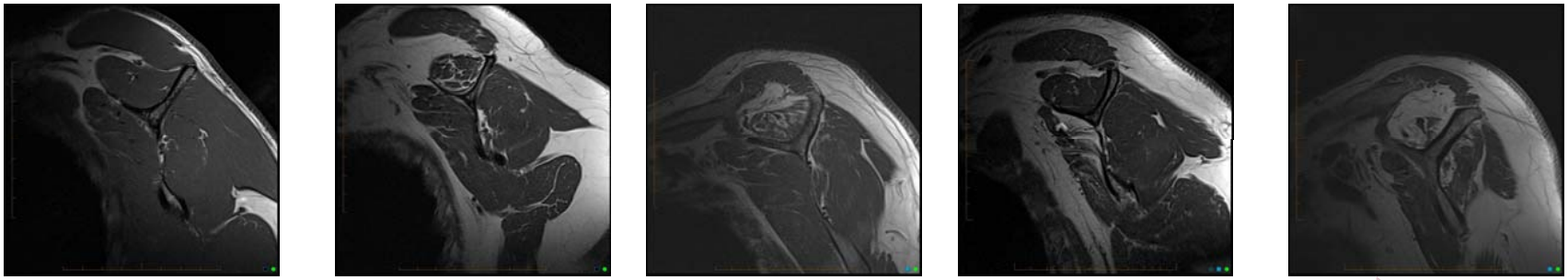
# Degree of retraction of the Supraspinatus Tendon

Stage 0 | Stage 1 | Stage 2 | Stage 3

1. Patte D. Classification of rotator cuff lesions. *Clinical Orthopaedics And Related Research* [serial online]. May 1990

# Goutallier Stages of Fatty Infiltration



Normal | Grade 1 | Grade 2 | Grade 3 | Grade 4

1. Goutallier D, Le Guilloux P, Postel J-M, Gleyze P. La degenerescence musculaire graisseuse. Rev Chir Orthop 1999

# Data Collection

- 244 Reports identified
- 102 had less than Stage 3 retraction
- 33 had no date of injury
- 30 had previous surgery
- 79 reports meet criteria

# Results

| Age Groups | Number of Patients | Male | Female | Average FI | Range of FI | Average Time Elapsed (Days) | Range of Time |
|---|---|---|---|---|---|---|---|
| < 55years | 23 | 19 | 4 | 1.3 | 0-3 | 104.3 | 7-459 |
| 55-70 years | 40 | 34 | 6 | 1.6 | 0-3.5 | 119.5 | 7-459 |
| > 70 years | 16 | 9 | 7 | 2.1 | 0-4 | 106.9 | 7-756 |
| All ages | 79 | 62 | 17 | 1.6 | 0-4 | 112.5 | 6-380 |

FI = Fatty Infiltration

# Results

| Ages | Correlation | p value | Number of Participants |
|---|---|---|---|
| All ages | 0.18 | 0.11 | 79 |
| <55years | 0.24 | 0.26 | 23 |
| 55-70 years | 0.29 | 0.07 | 40 |
| >70 years | -0.31 | 0.24 | 16 |

# Discussion

- The aim of this study was to investigate if there was a correlation between fatty infiltration and time elapsed from the time of injury to time of imaging
  - The correlation was negligible
  - The p value did not reach significance

# Discussion

- The rate of pre existing fatty infiltration in the community[1]
- The presence of pre existing asymptomatic supraspinatus tendon tears in the community[2]
- The length of time from when the injury occurred to the time of imaging being too short[3]


1. Sher J, et al. Abnormal findings on magnetic resonance images of asymptomatic shoulders. *The Journal of Bone And Joint Surgery. American Volume* January 1995
2. Tempelhof S, Rupp S, Seil R. Age-related prevalence of rotator cuff tears in asymptomatic shoulders. *Journal of Shoulder and Elbow Surgery* July 1999
3. Melis B, et al. Natural history of fatty infiltration and atrophy of the Supraspinatus muscle in rotator cuff tears. *Clinical Orthopaedics & Related Research*, June 2010

# Discussion

- This suggests that fatty infiltration would most likely pre-dates an acute injury
- This may assist with some insurance claim determinations

# Limitations

- Lack of statistical significance
  - Increased number of participants
    - Increasing the number of surgeons, and
    - Increasing the number of medical imaging practices

# Limitations

- Lack of understanding of pre-existing state of the muscle
  - A new tear of the supraspinatus muscle
  - Extension of a pre-existing partial thickness tear
  - Pre-existing non-symptomatic full thickness tears that is now symptomatic

# Limitations

- Lack of time for fatty infiltration to developed
  - Melis et al[1] found a period of 3-6 years was required for fatty infiltration to develop
  - The longest period in this study was 459 days
  - It would be unethical to let such a condition develop as repairable prior to Goutallier grade 2


1. Melis B, et al. Natural history of fatty infiltration and atrophy of the Supraspinatus muscle in rotator cuff tears. *Clinical Orthopaedics & Related Research* June 2010

# Future Directions

- Prospective study of at risk working populations
  - Regular MRI's to identify fatty infiltration and tendon tears in asymptomatic patients
  - Unethical to leave a young symptomatic patient to develop fatty infiltration as tendon are repairable

# Summary

- This study failed to demonstrate a correlation between the time elapsed between an acute rupture of the Supraspinatus tendon and MRI was related to the development of fatty infiltration of the supraspinatus muscle
- Further investigation of the natural history of fatty infiltration of the Supraspinatus muscle following trauma is required
- Such studies may be unethical to conduct due to good outcomes of repairs of the Supraspinatus tendon