

Supraspinatus Muscle Fiber Composition in Rotator Cuff Tear Condition

Frich, Lars Henrik; Ravn, Morten Kjaer; Ostergaard, Trine Ivarsen; Schrøder, Henrik Daa; Nyengaard, Jens Randel; Lambertsen, Kate Lykke

Published in:
JSES International

DOI:
[10.1016/j.jses.2019.10.076](https://doi.org/10.1016/j.jses.2019.10.076)

Publication date:
2019

Document version:
Final published version

Document license:
CC BY-NC-ND

Citation for pulished version (APA):
Frich, L. H., Ravn, M. K., Ostergaard, T. I., Schrøder, H. D., Nyengaard, J. R., & Lambertsen, K. L. (2019).
Supraspinatus Muscle Fiber Composition in Rotator Cuff Tear Condition. *JSES International*, 3(4), 253.
<https://doi.org/10.1016/j.jses.2019.10.076>

Go to publication entry in University of Southern Denmark's Research Portal

Terms of use

This work is brought to you by the University of Southern Denmark.
Unless otherwise specified it has been shared according to the terms for self-archiving.
If no other license is stated, these terms apply:

- You may download this work for personal use only.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying this open access version

If you believe that this document breaches copyright please contact us providing details and we will investigate your claim.
Please direct all enquiries to puresupport@bib.sdu.dk

discussion. The content validity of the classification was assessed by comparing each subgroup classification with the intraoperative findings.

The primary outcome measures were the range of movement and Mayo Elbow Performance Score (MEPS). Complications were collected as a secondary outcome. Ethical approval was obtained and data was obtained by retrospective case note review

Results: Sixty patients were managed using the Wrightington classification. This comprised thirty two(53%) females and 28(47%) males with a mean age of 48 yrs (range 19-84). In order of observed frequency 20 cases (33%) were classified as type B+,18(30%) Type C,11(28%) Type B, and 7(12%) Type A. There were 3 Type D+ and 1 Type D.

Fifty eight(96.7%) patients completed a minimum of 3 months follow up. Average follow up was 5.7 months (range 2-18).The average Mayo Elbow Performance Score (MEPS) at final follow up was 93(range 55-100) and the mean arc of movement was 15- 131. Sub group analysis showed average MEPS of 91(65-100) in group A, 93(70-100) in group B, 92(55-100) in group B+,94 (65-100) in group C,100 in group D and 90(70-100) in group D+. The average arc of movement was 10-136 degrees in group A, 22-128 degrees in group B, 17-127 degrees in group B+, 12-134 degrees in group C, 0-130 degrees in group D and 18-131 degrees in group D+.

Four patients underwent secondary surgery. One patient underwent arthrolysis with excellent outcomes, 1 patient underwent revision of radial head replacement due to over stuffing, 1 patient had non-union of radial head fixation and underwent excision surgery and 1 patient had CRPS and prominence of ulna plate and underwent removal of metal work. All 4 patients had improved outcomes with average MEPS score improvement from 65 to 94 and improved arc of motion.

Conclusions: The Wrightington Classification system facilitates pattern recognition and provides an algorithm for management for these complex injuries. Our results suggest that predictably good outcomes can be achieved by application of surgical algorithms related to this classification.

SUPRASPINATUS MUSCLE FIBER COMPOSITION IN ROTATOR CUFF TEAR CONDITION



Lars Henrik Frich^a, **Morten Kjaer Ravn**^b, **Trine Ivarsen Ostergaard**^b, **Henrik Daa Schroder**^b, **Jens Randel Nyengaard**^c, **Kate Lykke Lambertsen**^b.^a Odense University Hospital, Odense, Denmark. ^b University of Southern Denmark, Odense, Denmark. ^c University of Aarhus, Aarhus, Denmark

Aim: The aim of this study was to assess the composition of muscle fiber myosin heavy chain (MHC) isoforms in tear conditions and to establish gender specific differences in fiber types. We also assessed fiber atrophy and/or hypertrophy by measuring the Feret's diameter and cross-sectional area (CSA) of the Supraspinatus (SS) muscle fibers to give an insight into the size of the muscle cells. We further aimed to explore if changes in muscle composition were caused by a loss of fibers types or a shift from one fiber type to another.

Background: Rotator cuff (RC) tears are associated with secondary RC muscle pathology that is decisive for the prognosis of RC repair. The importance of the compositional and degenerative changes in the RC muscles as a cause to surgical failure has become more and more apparent. However, the pathophysiology of the RC muscles in tear conditions are poorly understood.

Skeletal muscles in humans are composed of a mixture of type 1 (slow twitch) and type 2 (fast twitch) fibers. A non-pathological SS muscle consists of approximately 54% type 1 fibers (15), but physical activity and tear of the SS tendon may alter the fiber type composition.

Methods: Muscle biopsies were obtained from 21 patients undergoing surgery for RC tendon tear. Biopsies were obtained from the musculotendinous junction of the SS muscle and control biopsies were harvested from the deltoid muscle (DT). Biopsies were immunohistochemically processed for detection of type 1 (slow type) and type 2 (fast type) fibers and analyzed using unbiased, stereological principles. We counted the total numbers of type 1 and 2 muscle fibers/mm² and Feret's diameter was used to estimate muscle fiber atrophy and hypertrophy.

Results: We found significantly more type 2 cells/mm² in the SS compared to the DT (p<0.01). In addition, we found a significantly higher fraction of type 1 fibers than type 2 fibers in the DT (p<0.01), whereas both fiber types were equally present in the SS. The diameters of SS cells were generally smaller than those of DT cells. Atrophy of especially SS type 2 fibers was also demonstrated. Fiber atrophy was more pronounced in men than women.

Conclusions: The changes in the composition of SS muscle cell types suggest a shift from type 1 to type 2 muscle fibers and atrophy of both type 1

and 2 fibers. This composition indicates loss of endurance and rapid fatigue of the SS muscle under RC tear conditions

SUPERIOR CAPSULAR RECONSTRUCTION USING A PORCINE XENOGRAFT FOR IRREPARABLE ROTATOR CUFF TEARS: SHORT- TO MID-TERM CLINICAL RESULTS



Albert Ferrando^a, **Ross Kingston**^b, **Ruth Delaney**^a.^a Sports Surgery Clinic, Dublin, Ireland. ^b Bon Secours, Tralee, Ireland

Aim: To evaluate the early to midterm outcomes of arthroscopic superior capsular reconstruction(SCR) using a decellularized porcine dermal xenograft in patients with massive, irreparable rotator cuff tears.

Background:

Massive irreparable rotator cuff tears in young active patients with minimal glenohumeral arthritis remain a challenge. For patients with irreparable rotator cuff tears, a reverse shoulder arthroplasty or a tendon transfer are often performed. However, both procedures have high complication rates. In order to avoid these type of surgeries, SCR represents a treatment option that may delay the need for more invasive surgery.

Methods: Retrospective study of patients with minimum six-month follow-up. Pre-operative and post-operative range of motion, American Shoulder and Elbow Surgeons(ASES) score, Subjective Shoulder Value(SSV), and Visual Analogue Score(VAS) for pain were measured. Post-operative data was collected at 24 weeks, 12 months and 24 months.

Results: 50 patients with a mean age of 65+9 years were included, 34 males(68%). Mean follow-up was 22+7 months. Failure of the SCR graft was observed in six patients with three of them needing a reverse shoulder replacement.

In the remaining patients, there was a statistically significant improvement in all outcome scores at the six-month follow-up: mean ASES preop. 42 +- 20 vs postop. 79 +-18, p< 0.001; mean VAS preop. 6.8 +- 1.7 vs postop. 1.4 +- 2.2, p< 0.001; mean SSV 38 +-17 vs postop. 72 +- 19, p< 0.001.

At one-year follow-up, patients continued to improve (ASES 86 +- 16, p<0.001; VAS 0.8 +- 1.3, p=0.004; SSV 77 +- 18, p=0.014).

There were no statistically significant differences found in forward flexion and external rotation after SCR.

Eight patients were pseudoparalytic prior to surgery; in four cases pseudoparalysis was reversed after SCR.

Patients with pseudoparalysis pre-operatively had worse mean SSV at 12 months than those without pseudoparalysis (64.3+-7.5 vs 95.5+-0.70; p=0.011).

There were no differences between patients with an intact or repaired subscapularis in ASES, SSV, VAS or range of motion.

There was no association between preoperative Hamada grade and post-operative outcome scores.

Conclusions: SCR can alleviate pain and disability from irreparable rotator cuff tears and provide significant improvements in shoulder function. In our experience, SCR results in inconsistent reversal of pseudoparalysis.

DETERMINATION OF CARRYING ANGLE OF ELBOW AMONG ADULT PAKISTANI POPULATION



Syed Kamran Ahmed, **Javed Ali Markhand**, **Sundus Iftikhar**. The Indus Hospital, Karachi, Pakistan

Aim: To determine the carrying angle of elbow among adult Pakistani population presenting to a tertiary care hospital.

Background: The elbow joint is a compound synovial joint consisting of the distal humerus, proximal radius and ulna with two articulating surfaces, humeroulnar and radioulnar joints. The average value of the carrying angle is considered 12.5 ±0.57 degrees in males and 15.26 ±0.45 degrees in females. Determination of carrying angle in our population will assist in better understanding of elbow biomechanics, improvement in prosthesis designs and development of pre contoured anatomic implants for our population.

Methods: This Descriptive cross-sectional study was done at The Indus Hospital Karachi, a free of cost tertiary care facility, for a period of six months after approval from IRB. Population who met with inclusion criteria were recruited and carrying angle of both elbow and length of forearm measured with the help of Goniometer and inch tape respectively. The data were entered in SPSS V.24.0 and analyzed using SPSS and R studio. . Mean ±SD/ Median (IQR) were computed for all the categorical variables as appropriate. Kruskal Wallis/ANOVA was applied as appropriate to assess significant difference in age, height, weight, carrying angle, length of arm and extension