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Patients with degenerative rotator cuff tears pose a challenging problem in the decision-making process for determining treatment. This is because shoulder symptoms are not necessarily the result of an observed rotator cuff tear. Furthermore, the results of conservative and surgical treatment are variable. There is a need for improvements in the identification of specific patient subgroups and treatment strategy. Therefore, the goal of this thesis was to create better understanding in the evaluation, clinical outcome and surgical treatment of degenerative rotator cuff tears.

In **Chapter 3**, the reliability of the Geometric Classification and 2-dimensional measurements of rotator cuff tears based on MR arthrography was evaluated. We retrospectively reviewed preoperative MR arthrograms of 73 consecutive patients who were surgically treated for their full-thickness rotator cuff tear. The images were blinded and evaluated twice by two orthopaedic shoulder surgeons and two musculoskeletal radiologists. The Geometric Classification and the 2-dimensional measurement of rotator cuff tears using MR arthrography have excellent intraobserver agreement among experienced observers. The interobserver agreement between orthopaedic surgeons and radiologists is found to be moderate to good. It meets the criteria of an efficient classification and is a valuable modality in the evaluation of rotator cuff tears.

A practical tool providing objective outcome measures and insight into etiology and potential patient subgroups with rotator cuff tears is desirable. In **Chapter 4**, a new method for the identification of symptomatic rotator cuff tears was introduced. Symptomatic cuff tears may coincide with upward migration of the humeral head leading to painful subacromial impingement of the soft tissue. Adductor co-activation during active arm abduction has been reported to reduce subacromial narrowing and pain in cuff patients. We presented an easy-to-use method to evaluate adductor co-activation. Twenty healthy controls and twenty full-thickness cuff tear patients exerted EMG-recorded isometric arm abduction and adduction tasks. The results showed that patients had significantly more adductor co-activation during abduction. The introduced method quantifies adductor co-activation in an interpretable

measure. It has potential as an objective outcome measure for distinguishing symptomatic from asymptomatic rotator cuff tear patients.

In **Chapter 5**, the progression of rotator cuff disease was prospectively evaluated in a cohort of 22 RA-patients (44 shoulders) with shoulder pain over an eight-year period using the Constant score, AP-radiographs (Upward Migration Index and Larsen score) and ultrasound. The results indicated that progression of rotator cuff disease in the rheumatoid arthritis was associated with the severity of the disease process in the shoulder, as reflected by upward migration of the humeral head and advanced articular destruction on an a AP-radiograph. There was no association between duration of active RA and disease activity. The recommendation is that patients should be monitored on a routine basis using standard AP-radiographs and ultrasound of the shoulder. These radiodiagnostic parameters can aid in surgical decision making and provide better outcome in soft tissue procedures and arthroplasty of the shoulder in patients with rheumatoid arthritis.

In **Chapter 6**, we set out to evaluate the clinical outcome of all-arthroscopic (AA) versus mini-open (MO) rotator cuff repair technique in small- to medium-sized tears in a randomised controlled trial in 100 patients. Patients were evaluated preoperatively, and at 6, 12, 26, 52 weeks postoperatively using the DASH as a primary outcome score, and the Constant, VAS-pain/VAS-impairment, and measuring active function as secondary outcome scores. 47 patients were analysed in the AA-group and 48 in the MO-group. 5 patients were lost to follow-up. Primary and secondary outcome scores showed significant improvement in both groups postoperatively. The difference in the overall mean primary and secondary postoperative outcome scores was not statistically significant between the treatment groups. However, at the 6 weeks follow-up moment, DASH-score, VAS-pain and VAS-impairment, and active forward flexion were significantly more improved in the AA-group compared to the MO-group. A retear was seen using ultrasound one year postoperatively in 8 patients (17%) in the AA-group and in 6 patients (13%) in the MO-group. Since both procedures have similar satisfactory results, and given that the arthroscopic technique is surgically more challenging, and taking into account that patients do attain the benefits of treatment somewhat sooner with the arthroscopic procedure after 6 weeks, we believe the decision regarding the technique used should be based on the surgeon's preference and experience.

In **Chapter 7**, the purpose was to evaluate the clinical outcomes of 21 patients

undergoing all-arthroscopic repair of degenerative full-thickness subscapularis tendon tears and postoperative structural integrity using magnetic resonance imaging with a short-term follow-up. Mean active range of motion showed significant postoperative improvement ($p<0.001$). Clinical outcome scores improved significantly ($p<0.001$) after surgery. 2 patients had failure of the repair on postoperative MRI. 12 patients (57%) showed postoperative progression of fatty muscle infiltration. The results show that all-arthroscopic repair of degenerative subscapularis tendon tears with an anterosuperior tear pattern is an effective treament modality with good clinical results and high patient satisfaction.

In **Chapter 8**, a prospective study was performed to evaluate the clinical effectiveness of a new arthroscopic side-to-side repair technique for massive rotator cuff tears using a single uninterrupted suture, the Shoestring Bridge technique. Thirty-one consecutive patients had a primary arthroscopic repair of their massive, contracted cuff tear using the new technique. Preoperative and postoperatively active forward flexion,VAS-pain, SST and DASH scores were collected. Repair integrity was evaluated by ultrasound. At a mean follow up of 26.5 months all outcome measures showed significant improvement ($p<0.001$). Ultrasound evaluation showed that 25 out of 31 patients (81%) had healed tendons. 6 out of 31 patients (19%) had a complete retear. Only 3 of these 6 patients were not satisfied with the result. Arthroscopic side-to-side repair using the Shoestring Bridge technique is effective in the treatment of massive, contracted supraspinatus and infraspinatus tears. It provides the shoulder surgeon with treatment modality with significant improvement in pain and function, high patient satisfaction and a low retear rate.

In **Chapter 9**, a prospective cohort study was performed to evaluate the short term clinical results of twenty-eight consecutive patients with an irreparable posterosuperior rotator cuff tear, who were treated with a teres major tendon transfer. Active abduction improved to 105° from 79° preoperative and the average postoperative active external rotation in 90° abduction was 55°, from 25° preoperatively. Mean Constant and VAS-pain scores improved significantly postoperatively ($p < 0.001$). The teres major transfer effectively restores function and relieves pain for the treatment of massive irreparable rotator cuff tears leading to an overall clinical improvement in a relatively young and active patient group with limited treatment options.

In **Chapter 10** the conclusions of this thesis are discussed.