The Validity and Interrater Reliability of a New Non-Invasive Model for Objective Measurements of Scapular Kinematics

Abstract ID# 22201
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Summary:
The presentation of a promising model for quantitative measurements and objective assessment of scapular kinematics for clinical use.

Data:
Background: Primary or secondary scapular dyskinesis is characterized by abnormal scapular rotations. It can be painful and impair the shoulder function. A skin marker-based motion capture model providing quantitative measures of the rotations of the scapula was recently developed and can potentially be used to diagnose and monitor scapular dyskinesis. Aim: To investigate the concurrent validity and the interrater reliability of a new model for analysis of scapular kinematics. Materials and Methods: Twelve infrared cameras were used to track reflections from moving skin markers in the motion capture model. A strict protocol for placement of the skin markers was followed. Shoulder range of motion (ROM) and activities of daily living (ADL) were tested in healthy volunteers. To investigate the validity, the skin marker-based model was compared to a gold standard through simultaneous data collection from markers fitted to an incalrotical pin in the scapula. Interrater reliability was tested in a different group of healthy volunteers by comparing the skin marker-based protocol performed by two investigators blinded to each other’s results. The mean Root Mean Square Error (RMSE) was calculated for each tested motion to determine the validity. The interrater reliability was determined as Intraclass Correlation (ICC,2.1) for each tested motion. Results: Eight subjects were included in the validity test: female/male = 2/6, mean (standard deviation) age 35.0 (3.0) and BMI 23.4 (3.3). The mean RMSE of all scapular rotations ranged 2.3-6.7 during shoulder ROM and 2.4-7.6 during ADL. The highest errors were seen for movements in front of the body: sagittal/scapular plane flexion, hair combing and eating. In 19 out of 24 measurements, the model showed larger range of rotation than the gold standard. In the reliability test, 20 subjects were included: female/male = 8/12, mean (standard deviation) age 31.4 (4.9) and BMI 22.9 (1.7), ICC for measuring projection ranged 0.07-0.60 during ROM and 0.27-0.69 for ADL. Correspondingly, ICC ranged 0.01-0.64 and 0.38-0.60 for upward rotation, and 0.25-0.83 and 0.25-0.62 for anterior tilt. Conclusion: Our results indicate that the model’s validity and reliability are task dependent and interpretation should be made with caution. The model provides quantitative measurements for objective assessment of the scapular movements and can be an important supplement to the clinical examination. Taking the inherent limitations of the method into consideration, the model is promising for clinical use.

Category: Shoulder - Rotator Cuff

Differentiating Partial from Complete Rotator Cuff Tears Using Thermal Imaging in Patients Scheduled for Arthroscopic Repair

Abstract ID# 21969
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Summary:
In this study we present clinical evidence showing that thermal imaging may be a useful, simple, low-cost adjunct imaging tool for evaluation of rotator-cuff tears and may provide additional capability for identiﬁcation of complete versus partial tears before surgery.

Data:
Objective: This study evaluates the usefulness of smartphone-based thermal imaging for diagnosis of rotator-cuff tears (RCT) and whether this imaging modality can discriminate between partial and complete tears. Methods: Forty-ﬁve patients (age 55±8 years old; male:female=27:18; complete:partial=24:21) with moderate-to-severe limitation in range of motion (ROM), and scheduled to undergo primary rotator-cuff arthroscopic repair, participated (ethics-approval #HFH-192-2020). Thermal images were captured and skin temperature (ST) measured over the rotator cuff tear (RCT) and over the trapezius away from the tear from the superior and posterior aspects respectively using a FLIR-One-Pro thermal camera (FLIR Systems, Wilsonville, OR, USA) attached to a smartphone incorporating FLIRtools software. The primary outcomes were: (1) the difference between the ST over the RCT and that of similar sites of the contralateral, unaffected shoulder (7ST-RCT), and (2) the difference between the ST over the uninjured trapezius on the side of the RCT and that of the unaffected side (7ST-trapezius). Tear status (complete/ partial) was determined from the surgical records. Results: When considering all patients together, the ST over the RCT, posterioroalateral to the acromioclavicular (AC) joint, was signiﬁcantly warmer on the affected vs the unaffected side (mean±SD=n=45): 7ST-RCT—0.34±0.14, p=0.008 by paired t-test). No difference in ST was detected over the area of the trapezius between affected and unaffected sides. However, patients with complete tear, had a greater (warmer) ?ST-RCT than those with partial tear (7ST-RCT, complete [n=24] vs partial [n=21]; 0.45±0.17, vs 0.22±0.02, p=0.008 vs p=0.162). Conclusions: These studies provide evidence that thermal imaging may be a useful, simple, low-cost adjunct imaging tool for evaluation of rotator-cuff tears and may provide additional capability for identiﬁcation of complete versus partial tears and the determination of the need for surgical intervention. Further studies involving advanced thermal properties are in progress.

Category: Shoulder - Rotator Cuff

The Validity and Interrater Reliability of a New Non-Invasive Model for Objective Measurements of Scapular Kinematics

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Category: Shoulder - Rotator Cuff

Subacromial Platelet Rich Plasma Injections For Rotator Cuff Tendinopathy Are Partial Thickness Tears Associated With Poor Functional Outcomes?

Abstract ID# 22225
All Authors:
improvement after the injection (P < 0.0001) and preoperative tendon length (r = 0.46; p < 0.0001). Tendon length at 3, 6, and 24 months after surgery was significantly longer than those before surgery (26.7 ± 5.8 mm, 27.9 ± 6.6 mm, 28.5 ± 5.6 mm, and 21.5 ± 5.1 mm, respectively). From before surgery to 24 months after surgery, the MTJ location moved 8.4 ± 8.6 mm laterally and the tendon extended 7.0 ± 6.1 mm. A significant and weak negative correlation was found between tendon shortening and the abduction strength index (r = -0.22; p = 0.03); however, no significant correlation with pain, range of shoulder motion, external rotation strength index, Constant score, and UCLA score was found. Multiple linear regression analysis also showed that tendon lengthening was only associated with the abduction strength index (standardized coefficient = -0.20, p = 0.03). Conclusions: In this study, preoperative MRI showed that the more retracted the cuff tear, the more medially retracted the MTJ and the shorter the tendon length. With successful tendon repair, the shortened tendons appeared to be lengthened over time after surgery, extending an average of 7.0 mm at 2 years after surgery, and larger preoperative cuff tears appeared to have more postoperative tendon shortening and lateral shift of MTJ location. The tendon shortening did not affect postoperative pain, range of motion, or clinical scores; however, the amount of tendon shortening had a weak negative correlation with the abduction strength index. Tendon elongation may decrease the tension of the supraspinatus muscle belly, resulting insufficient recovery of strength.

Category: Shoulder - Rotator Cuff

A Randomised Controlled Trial Of Autologous Tenocyte Versus Corticosteroid Injection for Partial Thickness Rotator Cuff Tears and Impingement Syndrome

Abstract ID# 22488
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Summary:
This is the first Level 1 prospective randomised controlled trial demonstrating that Autologous Tenocyte Injection resulted in a significantly better and sustained reduction in pain and improvement in shoulder function, compared with corticosteroid injection, as treatment for tendinopathy and interstitial tears of the rotator cuff.

Data:
Introduction: Intersitial supraspinatus tears can cause persistent subacromial impingement symptoms despite non operative treatment. Preclinical and clinical studies of Autologous Tenocyte Injection (ATI) have shown that cultured tenocytes can synthesise extracellular matrix and facilitate healing of damaged tendon tissue. Therefore, ATI may be an effective treatment for interstitial cuff tears. This study presents the results from the first randomised controlled study to investigate the safety and efficacy of ATI compared to corticosteroid injection (CS) as treatment for tendinopathy and interstitial tears of the rotator cuff.

Methods: Eligible participants were randomised to receive ATI to the interstitial tear or CS to the subacromial bursa in a 2:1 ratio, under ultrasound guidance. Inclusion criteria were duration of symptoms >6 months, magnetic resonance imaging (MRI) confirmed intra-substance supraspinatus tear and had previously undergone physiotherapy and at least one CS injection. Assessments were undertaken pre-treatment and at 1, 3, 6 and 12 months post-treatment, including the Constant Score, Visual Analogue Pain Scale (VAS) and American Shoulder and Elbow Surgeons Assessment (ASES). 3 T MRI was performed at baseline, 6 and 12 months post treatment. Results: Thirty participants were enrolled (19 randomised to ATI and 11 to CS). The mean age of enrolled participants was 50.5 years (SD 8.5, range 30.2-63.3) and there were 10 female and 20 male participants. Mean duration of shoulder symptoms was 21.8 months (SD 12.1, range 7-48). No pre-treatment group differences (>0.05) existed. The ATI group performed significantly better in the Constant Score at 1 (p=0.020, ATI = 81.8, CS = 67.6), 6 (p=0.026, ATI = 84.9, CS = 71.1) and 12 (p=0.024, ATI = 86.5, CS = 65.4) months, reported better (p<0.05) VAS scores at all post-treatment time-points and reported better ASES scores at all timepoints including 6 (p=0.012,}

Category: Shoulder - Rotator Cuff

Clinical Outcomes and Tendon Lengthening After Arthroscopic Rotator Cuff Repair

Abstract ID# 22403
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Summary:
It was a common phenomenon that the shortened supraspinatus tendon appeared to be lengthened after rotator cuff repair, and the tendon lengthening did not affect postoperative outcomes such as shoulder motion, clinical scores and postoperative pain; however, the amount of the lengthening had negative weak correlation with abduction strength index.

Data:
Introduction: There is a phenomenon in which the tendon appears to be extended over time, amount of the lengthening had negative weak correlation with pain, range of shoulder motion, external rotation strength index, Constant score, and UCLA score was found. Multiple linear regression analysis also showed that tendon lengthening was only associated with the abduction strength index (standardized coefficient = -0.20, p = 0.03). Conclusions: In this study, preoperative MRI showed that the more retracted the cuff tear, the more medially retracted the MTJ and the shorter the tendon length. With successful tendon repair, the shortened tendons appeared to be lengthened over time after surgery, extending an average of 7.0 mm at 2 years after surgery, and larger preoperative cuff tears appeared to have more postoperative tendon shortening and lateral shift of MTJ location. The tendon shortening did not affect postoperative pain, range of motion, or clinical scores; however, the amount of tendon shortening had a weak negative correlation with the abduction strength index. Tendon elongation may decrease the tension of the supraspinatus muscle belly, resulting insufficient recovery of strength.

Category: Shoulder - Rotator Cuff

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