Test-retest reliability study of elbow and hand dynamometric assessment following distal biceps brachii tendon repair with a non-widespread bone tunnel technique through a single incision. Preliminary results.

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OBJECTIVE
Dynamometric assessment of muscle groups with tendon disorders is performed to interpret their mechanical profile and to assess treatment effects. Accurate functional assessment of muscular strength is fundamental. A same-day test-retest reliability study, for the muscle groups of elbow flexion, extension, forearm pronation, supination and grip strength, following distal biceps tendon rupture was performed.

METHODS
A sample of 16 male patients, who underwent the same technique surgery, from the same surgeon, for the repair of rapture on the distal biceps tendon, where assessed one year plus post operatively.

The assessment included the use of an isokinetic device, Humac Norm Isokinetic Extremity System and a digital hand held dynamometer, "Biometrics Ltd".

The protocol of isokinetic device assessment included:
• isometric flexion, at 90° elbow flexion, 3 reps;
• isometric extension, at 90° elbow flexion, 3 reps;
• isometric supination, at 0° and 45° of pronation, 3 reps for each position;
• concentric flexion-extension, speed test 60°.s-1, 5 reps;
• concentric flexion-extension, speed test 120°.s-1, 5 reps;
• concentric pronation-supination, speed test 60°.s-1, 3 reps;
• concentric pronation-supination, speed test 120°.s-1, 3 reps.

The selection of isokinetic speeds were based on the characteristics of the sample.

The slow speed (60°.s-1) was selected for the purpose of gaining highest torque without the fatigue of a slower speed. The more rapid speed was selected for best representing functionality. Eccentric testing was not performed, to ensure the safety of the re-attached tendon.

The protocol of grip strength assessment included:
• the isometric maximum grip strength measurement, 3 reps.

The assessment included both right and left upper limbs, with random side selection. The grip strength evaluation was performed to assess whether surgery affected the total capability of hand grip.

RESULTS
Patient mean (range) age at the time of surgery was 47 (24-60) years and measurements were conducted 62 months (range 12-174) postoperatively. The protocol included reliability measurements for 26 contractions: 10 isometric and 16 isokinetic concentric, involving both upper limbs. The proposed method was found to be equally reliable for both the isometric and isokinetic concentric contractions.

Intraclass Correlation Coefficients (ICCs Model 3,1) ranged between 0.92-0.98 for the isometric and between 0.87-0.98 for the isokinetic assessments.

Standard Error of the Measurement (SEM) % values ranged between 3.79-13.56 % for the isometric and between 4.68-14.06 % for the isokinetic assessments.

All testing has been successfully completed by all subjects and the procedures involved in the assessment protocol were easy to comprehend. Better stabilization and isolation of the assessed muscle groups, with elimination of the effect of gravity was achieved with the isokinetic dynamometer.

CONCLUSIONS
• The application of a dynamometric evaluation of elbow and hand muscles has been tested in a population of subjects with distal biceps tendon rupture.
• Contrary to what has been done so far, all muscle groups involved were evaluated under both static and dynamic contractions.
• We believe it has a clinical applicability in assessing the muscle changes that occur in people undergoing surgery that affect upper limb strength.
• These are the preliminary results of a project in progress.