

## Comparison Between *In Vitro* and Simulated Arthroscopy Electromechanical Measurements of Human Articular Surfaces Using the Arthro-BST

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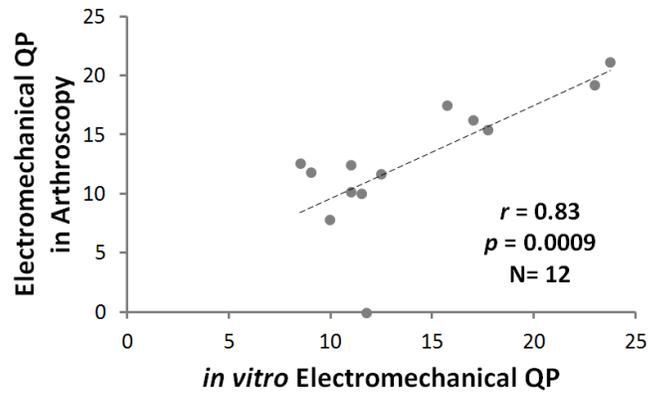
**KEYWORDS:** Cartilage Mechanics, Articular Cartilage, Streaming Potentials

**Purpose:** The output of the Arthro-BST was originally streaming potentials integral (SPI) parameter (Abedian-2013). Since then, the output has changed to a quantitative parameter (QP) (Sim-2014). The purpose of this study was to reanalyzed old data to investigate whether QP values are reliable for assessing articular cartilage in a clinical context.

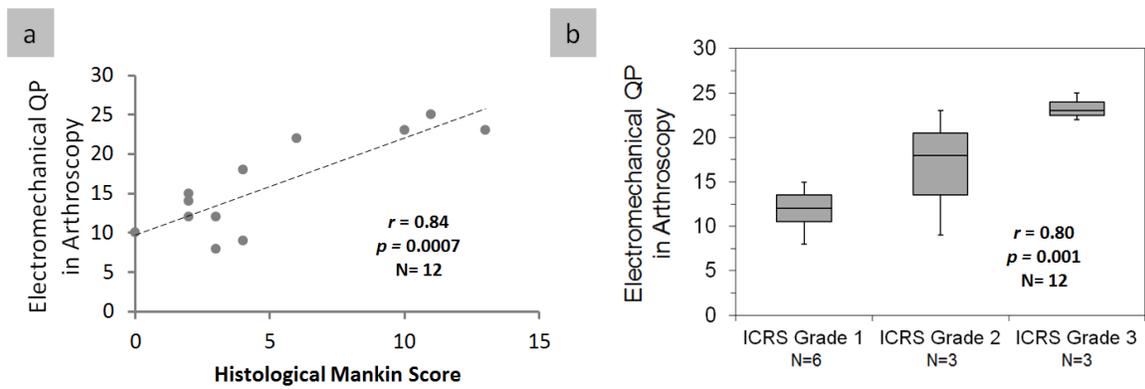
**Materials & Methods:** One closed cadaveric knee joint was obtained from Science Care (Arizona, USA). An orthopaedist opened the joint and defined 12 measurement sites on the distal femur with a permanent marker. The joint was then closed with stitches to perform arthroscopy. The distal femur was then isolated from the joint and *in vitro* measurements were performed at matched sites by 4 users (the orthopaedist and 3 engineers). Visual ICRS scoring and histological Mankin scores were obtained for all sites. In this study, we reanalyzed all electromechanical output from the Arthro-BST by taking the first valid measurement only. The Arthro-BST (Biomomentum Inc., Laval, Canada) calculates a quantitative parameter which is inversely proportional to the electromechanical activity of cartilage.

**Results:** An intraclass correlation coefficient (ICC) of 0.85 (95%CI: 0.68–0.95) was calculated among the four users, while an ICC of 0.89 (95%CI: 0.63–0.97) was found between QP values obtained under simulated arthroscopy and *in vitro*. Strong correlations were found between simulated arthroscopy and *in vitro* QP values ( $r=0.83$ ,  $p=0.0009$ ,  $N=12$ , Fig.1). Strong correlations were also obtained between the QP values obtained arthroscopically and the Mankin Score ( $r=0.84$ ,  $p=0.0007$ ,  $N=12$ , Fig.2a) and the ICRS Scoring ( $r=0.80$ ,  $p=0.001$ ,  $N=12$ , Fig.2b).

**Conclusion:** This study revealed strong correlations of QP values obtained in arthroscopy with histological Mankin and visual ICRS scores. In addition to correlation of QP with gold standards, high ICCs suggest that the Arthro-BST could be considered as a powerful tool for articular cartilage assessment in a clinical context.



**Figure 1.** Positive correlation between simulated arthroscopy and *in vitro* electromechanical QP values at 12 positions.



**Figure 2.** a) Positive correlation between electromechanical QP in arthroscopy and histological Mankin Score b) Positive correlation between electromechanical QP in arthroscopy and ICRS Grade. Boxplots displays median values (central horizontal line), first and third quartiles (box) and 1.5 x interquartile range (bars).