FOOTPRINT CONTACT CHARACTERISTICS FOR AN ARTHROSCOPIC “TRANSOSSEOUS-EQUIVALENT” ROTATOR CUFF REPAIR TECHNIQUE COMPARED TO A DOUBLE-ROW Technique

INTRODUCTION:
Clinically, the remarkably high persistent-tear rate after open and arthroscopic rotator cuff repair is correlated to worse patient outcomes. Rotator cuff repair using transosseous tunnels improves footprint contact area and pressure when compared to suture anchor techniques. A double-row technique has been used clinically to improve contact area between tendon and bone. We hypothesized that an arthroscopic “transosseous-equivalent” rotator cuff repair using tendon suture-bridges between medial and distal-lateral fixation points will demonstrate improved pressurized contact between tendon and tuberosity when compared to a double-row technique.

METHODS:
In six fresh-frozen human shoulders, a “transosseous-equivalent” rotator cuff repair was performed: a suture limb from each of two medial anchors was bridged over the tendon, and fixed laterally with an interference screw (four suture-bridges) (Figure 1). In six of the contralateral specimens, two types of repair were performed randomly: 1) a double-row repair (Figure 2) and 2) a “transosseous-equivalent” repair using a single screw (two suture-bridges) (Figure 3). For all repairs, pressure-sensitive film was placed at the tendon-footprint interface, and NIH Image software was employed to obtain measurements for pressurized contact area and overall footprint pressure.

RESULTS:
The mean pressurized contact area between the tendon and insertion was significantly greater for the four suture-limb technique (115.69±12.78 mm², 72.3%) compared to both the double-row (56.22±25.79 mm², 35.1%) and two suture-limb (91.68±20.20 mm², 57.3%) techniques \( (p<0.05) \) (Figure 4).
The mean interface pressure exerted over the footprint by the tendon was also greater for both the two \( (0.23±0.04 \text{ MPa}) \) and four \( (0.27±0.04 \text{ MPa}) \) suture-limb techniques compared to the double-row technique \( (0.19±0.01 \text{ MPa}) \) \( (p<0.05) \) (Figure 5).

Figures 1, 2, and 3 show representative examples of pressure-sensitive film imprints for each type of repair.

DISCUSSION:
The persistent tear rate after rotator cuff repair remains remarkably high, using both open and arthroscopic techniques. Evolving techniques ideally would help optimize healing biology between injured tendon and bone. Pressure has been shown to influence healing between tendon and bone. The arthroscopic “transosseous-equivalent” rotator cuff repair technique improves pressurized contact area and overall pressure between tendon and footprint when compared to a double-row technique. Furthermore, a previous study has shown that the “transosseous-equivalent” technique has significantly higher ultimate failure strength than the double-row technique \( (p<0.05) \), and similar gap formation \( (p>0.05, \text{ power } = 97.2\%) \). The healing potential at a repaired rotator cuff footprint may be better optimized with the “transosseous-equivalent” technique when compared to a double-row technique. An in vivo study using this new “transosseous-equivalent” technique is required to further elucidate healing capability. Ideally, with increased healing rates via improved surgical techniques, patient shoulder function can be restored more consistently.

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