**Scanning Electron Microscope Analysis of Articular Cartilage and Meniscus Surface Structures: A Comparative Study**

**Purpose:** A goal of arthroscopic soft tissue debridement in the knee is to remove unstable or diseased tissue that can contribute to mechanical symptoms and progressive deterioration. Both mechanical shavers and energy-based devices can be used to perform chondroplasty and meniscectomy procedures. The purpose of this study was to compare the surface structures in the soft tissue of the knee after treatment with a COBLATION\(^\circ\) device compared to a mechanical shaver.

**Experimental Study Design:** Articular cartilage and meniscus were harvested from cadaver specimens and treated with the WEREWOLF\(^\circ\) FLOW 50\(^\circ\) Wand (ArthroCare Corporation) or mechanical shaver. Treatment zones were created with the FLOW 50 Wand on the surface of articular cartilage at the Lo COBLATION setting and on the inner rim of meniscus at Med COBLATION setting. The mechanical shaver was used on oscillating mode at 1800RPM for both articular cartilage and meniscus. Healthy cartilage and degenerated meniscus were treated with each device. Visual inspection through Scanning Electron Microscopy (SEM) was performed and reported at 250X magnification for each cartilage treatment site, and 100X magnification for meniscus. Healthy and damaged tissue samples were imaged at the same magnification as points of reference.

**Results: Cartilage (Figure 1; images magnified 250X)**

![Figure 1: Articular cartilage 250X. Healthy (A) and degenerated (B) cartilage compared with treated sites with the FLOW 50 Wand (C) and mechanical shaver (D).](image)

References
1. Smith & Nephew Data on File. P/N 54950-01. The results of in-vitro simulation testing have not been proven to predict clinical performance.
2. Wand used on Lo Mode for chondroplasty and Med for meniscus/other tissue per product IFU.
3. Default setting.
Figure 1-A shows the smooth surface of healthy articular cartilage, presenting with no superficial lesions, cracks or fissures. Significant fissures and fibrillations can be seen in Figure 1-B, which depicts the rough surface of severely degenerated cartilage. The articular cartilage surface created by the FLOW 50 Wand (Figure 1-C) resembles that of the healthy cartilage (Figure 1-A). In contrast, small fibrillations and surface irregularities are apparent on the surface of the cartilage treated with the mechanical shaver (Figure 1-D).

**Meniscus (Figure 2; images magnified 100X)**

![Meniscus images](A-B-C-D)

Figure 2: Meniscus magnified 100X. Healthy (A) and degenerated (B) meniscus compared with treated sites with the FLOW 50 Wand (C) and mechanical shaver (D).

The smooth inner rim of healthy meniscus is shown in Figure 2-A, presenting with no superficial lesions, cracks or fissures. The FLOW 50 Wand and mechanical shaver were used to treat the degenerated inner rim of meniscus similar to image in Figure 2-B. The resulting surface structure after treatment with the FLOW 50 Wand (Figure 2-C) mimics that of the healthy meniscus (Figure 2-A). Meniscus surface fibrillation remains after mechanical shaver treatment (Figure 2-D).

**Conclusion:** This study demonstrated the surface effect of the FLOW 50 Wand and the mechanical shaver device on articular cartilage and meniscus. Representative micrographs using scanning electron microscopy show that the FLOW 50 Wand creates a smoother articular surface than the mechanical shaver for both cartilage and meniscus.

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