

## **Predictors of Improved Quality of Cartilage Healing After Microfracture Are Time, Increased Holes and Synovial Hypertrophy**

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**Objectives:** It was hypothesized that healing after microfracture could be improved if more holes were used, more time was allowed for healing, and increased mesenchymal hypertrophy occurred at the edge of the cartilage.

**Methods:** A rabbit trochlear groove chondral defect (3mm x 9mm) model was used. The microfracture study groups were: 2 hole (n=7) vs 6 hole (n=6) at eight weeks. Another comparison was 2 holes at eight weeks (n=7) vs 2 holes at 6 months (n=8). The ICRS Visual Histological Assessment Scale was used to score the healing regenerate tissue. Finally, healing of the "moat" was noted as: complete healing with no identifiable moat, some residual moat, complete moat present through all layers. Cell thickness of the peripheral mesenchyme at the cartilage edge was counted (near the synovial reflection), and this was correlated with moat healing.

**Results:** Time as a predictor: the ICRS score for a 2 hole microfracture at 8 weeks was 8.4 vs 13.8 at 6 months ( $p<.0001$ ). Number of holes as a predictor: the ICRS score for a 2 hole microfracture was 8.4 vs 9.6 for a 6 hole microfracture ( $p<.0001$ ). Mesenchymal hypertrophy as a predictor: the mesenchymal hypertrophy at 6 months was 8.93 cells thick for the 2 hole microfracture group vs. 5.69 cells thick for the abrasion group, and this correlated with ICRS regenerate scores of 13.88 vs. 8.50, respectively ( $p<.05$ ). For complete moat healing at 6 months (n=15) the average nearby mesenchymal thickness was 9 cells, as compared to 7 cells thick for incomplete moat healing ( $p=.16$ ). A power analysis showed that an N of 47 would be needed to determine if this trend was statistically significant.

**Conclusions:** Increased time in the early period, increased number of holes and increased synovial hypertrophy at the cartilage edge appear to be correlated with improved healing after microfracture.