INTRODUCTION: The use of radiofrequency (RF) energy for the treatment of redundant joint capsule has become widespread in the orthopedic sports medicine community. Recently, monopolar and bipolar RF have been recommended for chondroplasty of partial thickness osteoarthritic or chondromalacic cartilage. The purpose of this study was to compare chondrocyte viability and cartilage surface changes following treatment with monopolar (Oratec) and bipolar (Mitek) RF at the manufacturers’ recommended RF generator settings. Twenty-four bovine femoral osteochondral sections (approximately 2 x 3 x 5 cm³) from 8 cows were used in this study. Cartilage thickness of the distal femoral condyle ranged from 2.3-mm and was considered consistent with the thickness of the human femoral condyle. All treatments were performed in physiologic saline (0.15 M) at 22° C. In the Oratec treatment group, 8 osteochondral sections from 8 cows were treated using the Oratec TAC-C probe. The depth of chondrocyte death following a single pass treatment as determined by confocal microscopy was 1111 ± 187 m for the Oratec and 1780 ± 492 m for the Mitek. The mean RF penetration following paintbrush treatment as measured by Adobe PhotoShop™. An unpaired t-test was used to evaluate differences in RF treatment time and penetration depth between the two treatment groups. P-values less than 0.05 were considered significant.

RESULTS: The linear probe pass was clearly visible and cartilage color changed to a light yellow opaque appearance following machine treatment with the Mitek VAPR system, whereas the probe pass was barely visible when using the Oratec TAC-C probe. The depth of chondrocyte death following a single pass treatment as determined by confocal microscopy was 793 ± 135 µm (mean ± SD) for the Oratec and 1780 ± 360 µm for the Mitek. The mean RF treatment time for the paintbrush treatment using the Oratec system (195 ± 55 secs) was significantly longer than using the Mitek system (59 ± 16) (p<0.05). RF penetration following paintbrush treatment as measured by chondrocyte death was 1111 ± 187 µm for the Oratec and 1976 ± 492 µm for the Mitek system. Confocal microscopy demonstrated that the Mitek system produced significantly deeper chondrocyte death than the Oratec system in both single pass treatment and paintbrush treatment groups (p<0.05) (Fig. 1).

DISCUSSION: This in vitro study revealed that both Oratec and Mitek RF systems caused immediate chondrocyte death when used to smooth the roughened cartilage surface at the manufacturers’ recommended settings. The Oratec monopolar RF system used at the manufacturer’s recommended settings took longer to achieve a visually smooth surface with paintbrush treatment than the Mitek bipolar RF system, but chondrocyte death was not as deep with the Oratec system as the Mitek system in both single pass and paintbrush treatment groups. Although the roughened cartilage surface can be visually altered by these two RF systems at the manufacturers’ recommended settings, the treated cartilage area may degrade further following treatment secondary to the extensive chondrocyte death created by this treatment. If the subchondral bone is affected, avascular necrosis may result. Based on these results, the use of RF to perform chondroplasty in diseased cartilage cannot be recommended at the currently recommended settings. Further investigation concerning whether RF treatment should be used for chondroplasty is recommended.