Comparison of a Novel Thermal Surgical Technology with Monopolar and Carbon Dioxide Laser in a Rat Glioma Model.
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Introduction
Commonly used electrosurgical devices pass electricity through the patient hence often causing injury to surrounding tissues and organs. In this study, we compared cutting and coagulation of a novel ferromagnetic tool (FMwand) with modalities currently used in the clinical setting.

Materials
The 9L Rat Gliosarcoma Cell Line. The 9L rat gliosarcoma cell line was maintained in DMEM supplemented with 10% fetal bovine serum and 100 µg/ml penicillin-streptomycin.

Animals. F344 female rats, approximately 150gms, were used for this experiment. They were obtained from Harlan Bioproduct Laboratories, Indianapolis, Indiana.

Methods
Surgeries. 48 F344 rats who had received a flank implantation of a 9L tumor piece 18 days before were divided into 4 groups of 12 animals each. The animals were either placed in a parallel cut study design (24 rats total) or a loop debulkment study design (24 rats total). tumor site was shaved and prepped.

Parallel Cuts. In the parallel study design, five 2 cm length guides separated by 1cm were drawn onto the tumor of each animal (24 rats). The skin was incised along the line and were made by the 5 investigated instruments into the tumor (CO2-laser, MES Cut, MES Coag, FMwand and Cold Scalpel). These cuts were made in a recorded but randomized sequence. The time it took for each instrument to cut was measured by an independent observer.

Loop debulkment. This study included 24 rats- 12 for each neurosurgeon. the loop debulkment study design, skin was dissected and a retractor was placed to expose the tumor. Two loop debulkments of 2 cm length were made by 2 of the investigated instruments (MES loop and the FMwand loop). The time was independently recorded by an observer for each debulkment.

Results
Average scores for FMwand were higher compared to the other modalities in ease of tissue dissection 3.58, 3.67 for distortion upon tissues and 2.87 for smoke production. CO2 laser led with 4.32 in effectiveness of hemostasis. MES Cut Mode had the highest scores with 3.17 for ease of cleaning of tip and 3.92 for speed of dissection. The FMwand loop device had higher scores than MES loop in all attributes except for ease of cleaning the tip.

Conclusions
FMwand outperformed CO2 laser significantly in ease of tissue dissection(p<0.01) and speed of dissection(p<0.0001). It also showed superior effectiveness of hemostasis when compared to MES Cut Mode(p<0.0001). FMwand obtained statistically significant results against MES Coag Mode in ease of tissue dissection, distortion upon tissues(p<0.0001) and smoke production was significantly less (p<0.01). The FMwand loop showed statistically significant results compared to MES loop in effectiveness of hemostasis(p<0.05) and ease of tissue dissection, distortion upon tissues and speed of dissection(p<0.0001). The FMwand is safe and effective for hemostatic soft tissue cutting and coagulation.

Learning Objectives
The reader should gain insight regarding a feromagnetic tool as compared to other modalities currently used in the clinical setting.

References

