

## Development Bipolar Radiofrequency with Automatic Temperature Control: An Experimental Study in Spinal cord of Pigs

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### Introduction

The bipolar electrocautery is effective to perform haemostasis, however the lack of temperature control can cause diffuse thermal lesions on the nervous system, including areas with normal tissue. We are studying the heat diffusion characteristics on the nervous tissue, as well the magnitude of the termic lesion induced on different temperatures and durations of the coagulation. As a secondary objective we aim to provide parameters for a safe and effective coagulation of lesions on the central nervous system.

### Methods

The study was developed on a porcine model, under general anesthesia, after exposure of the spinal cord. We proceed with multiple coagulation lesions on the dorsal portion of the spinal cord. The measurement of temperature during the process was obtained with a termocouple sensor on the tip of the electrocautry and also with a termographic camera. Then the animal was killed and samples of the spinal cord underwent histological analysis of hematoxylin-eosin to quantify the magnitude of the thermal lesion.

### Results

We have performed the procedure on 5 animal, 5 lesions on each one. The temperature varied between 38 to 50 ° C. The lesions obtained were progressive bigger, involving deeper portions of spinal cord. The termographic camera showed that the isothermal curves around the coagulation site were also larger with the increase of coagulation temperature, indicating a more diffuse lesion.

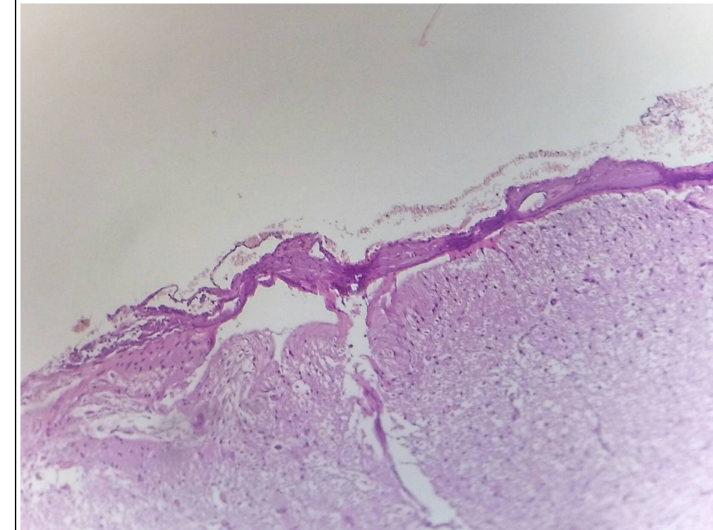
### Learning Objectives

By the conclusion of this session, participants should be able to describe the importance of understanding the thermal lesions associated with the use of the bipolar coagulator.

### Conclusions

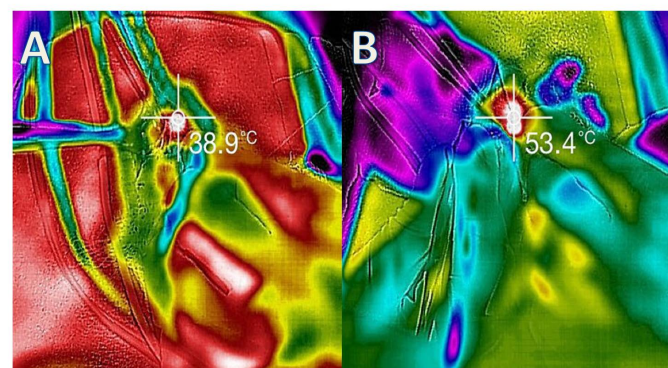
The results showed that the bipolar coagulation, without proper temperature control, implies in a diffuse tissue lesion, beyond the effect desired by the surgeon, which can be extremely harmful for the nervous system, especially when the surgeon is looking for haemostasis near eloquent areas. It is necessary further studies to develop a more precise way to deliver the desired heat to the tissue, achieving a better haemostatic effect with as little damage as possible to the surrounding structures.

### Histology



Histological analysis of the thermal lesion with bipolar coagulator

### Thermal evaluation



A: device off, control

B: bipolar coagulation analyzed with thermal camera