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FUSVET (SEED/1221/0080)

Focused Ultrasound System for veterinary chemotherapeutic applications for oncology

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FUSVET

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Executive summary

This deliverable presents the sponsored Conference paper entitled «Ablation of dog and cat cancer using MRI guided focused ultrasound» that was presented by Dr. Christakis Damianou during the 2nd reporting period of the FUSVET project at the *39th World Veterinary Association Congress* (WVAC2024), which took place between 16-19 April 2024 in Cape Town, South Africa. The presentation aimed to disseminate the key outcomes of FUS ablation of veterinary tumors utilizing the FUSVET system, while also raising awareness about the potential benefits it offers for veterinary cancer treatment. Caution was given to avoid disclosing any key features and components of the FUSVET system prior to the relevant patent application. Conference participation was sponsored by the Cyprus University of Technology.

Submitted abstract

Ablation of dog and cat cancer using MRI guided focused ultrasound

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ABSTRACT

This paper explores the evaluation of an MRI- guided Focused Ultrasound (FUS) robotic system for the treatment of various cancer types in pets (cats and dogs). The system was designed to be Magnetic Resonance imaging (MRI) compatible using 3D printed plastics. It also includes MR compatible piezoelectric motors and encoders. The positioning device includes a single element spherically focused transducer operating at 2.6 MHz. The system is portable and can be easily transferred into the veterinary clinics. The system was evaluated in 8 pets (dogs and cats). This technology has potential as a therapeutic solution for veterinary cancer in pets.

KEYWORDS: MRI, ultrasound, positioning device, dogs, cats

ACKNOWLEDGMENTS: The study was co-funded by the European Structural & Investment Funds (ESIF) and the Republic of Cyprus through the Research and Innovation Foundation (RIF) under the project FUSVET (SEED/1221/0080).

Ablation of dog and cat cancer using MRI guided focused ultrasound

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OBJECTIVES

This paper concerns the evaluation of a **Magnetic Resonance Imaging (MRI)- guided Focused Ultrasound (FUS) robotic system for the treatment of various cancer types in pets** (cats and dogs).

METHODS

FUS robotic system

The system was designed to be **MRI compatible** using 3D printed plastics, MR compatible piezoelectric motors and encoders. The positioning device includes a **single element spherically focused transducer** operating at **2.6 MHz**. The system is portable and can be easily transferred into the veterinary clinics. The system was evaluated in 8 pets (dogs and cats).

Pet trials

The veterinary patients underwent FUS ablation followed by immediate surgical resection of the tumour. The ablation protocol was adjusted depending on the tumour size through a dedicated control software.

Following resection, tumours were sent for histological examination with Hematoxylin and eosin (H&E) staining.

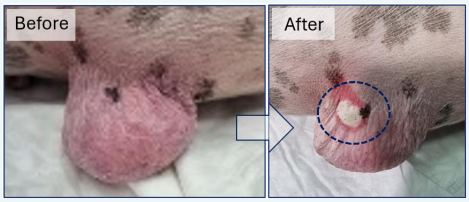
ACKNOWLEDGEMENTS

The study was co-funded by the European Structural & Investment Funds (ESIF) and the Republic of Cyprus through the Research and Innovation Foundation (RIF) under the project FUSVET (SEED/1221/0080).

RESULTS

Eight (8) dogs and cats with naturally occurring neoplasms were **recruited**, according to set safety criteria. All procedures were executed without any recorded adverse events. The system was **capable of accurately delivering FUS to ablate different types of tumours in pets**.

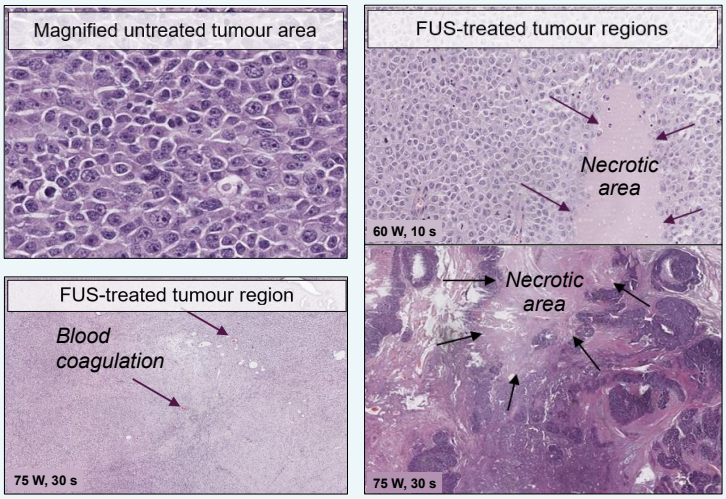
Some lesions were visible on the tumour surface.



Example of thermal lesion on dog tumour after exposure at 75 W acoustic power for 30 s.

Typical results of Histological examination

Thermal necrosis was observed on the H&E-stained slides as well delineated regions of disrupted cell architecture in 8/8 trials, occasionally accompanied by blood coagulation within the sonicated area.



H&E slides of excised dog tumours following thermal ablation with FUS.

While magnification revealed a few remaining intact tumour nuclei, from a histopathological viewpoint, the sonicated regions were deemed to be completely destroyed by FUS.

CONCLUSIONS

FUS ablation of veterinary tumours utilizing the developed MRI-compatible FUS robotic system has been demonstrated as safe and feasible. The system and its associated software facilitated a streamlined process. Additional research involving a larger patient cohort is necessary to fully explore the capabilities of the system. Overall, this **technology has potential as a therapeutic solution for veterinary cancer**.