UAB Universitat Autònoma de Barcelona

FACULTAT DE VETERINÀRIA

FINAL DEGREE PROJECT

RADIOFREQUENCY AND MICROWAVE TUMOUR ABLATION IN SMALL ANIMALS

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INTRODUCTION

Cancer is the leading cause of mortality in companion animals.

Traditional treatment consists of → Surgery, Chemotherapy, Radiotherapy

→ **LIMITATIONS** !
Invasiveness
Systemic side effects
Damage to healthy tissues
etc.

Radiofrequency ablation (RFA)
Microwave ablation (MWA)

- Minimally invasive alternatives for tumour ablation
- Already well-established in human oncology.

OBJECTIVES

Literature review on the use of RFA and MWA in small animal oncology:

- Mechanism of action of ablation techniques: RFA and MWA
- Current use in human and veterinary oncology
- Potential applications in the veterinary field

BIBLIOGRAPHIC RESEARCH

Tissue ablation techniques are classified by their mechanism of action (*Figure 1*).

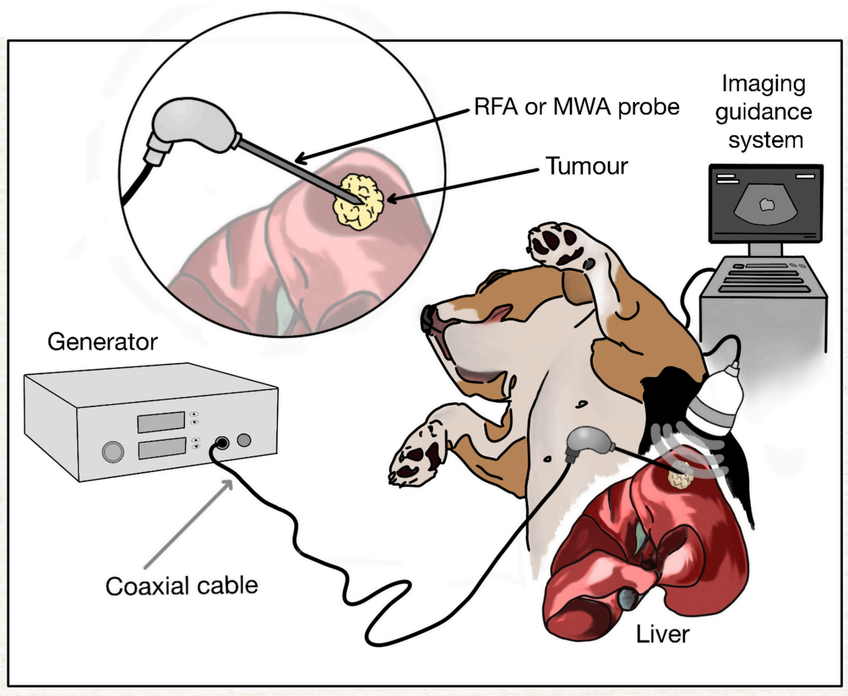

Figure 2. Example of a basic RFA or MWA for a hepatic tumour in a dog.

BASIC RFA/MWA SETUP

- Electromagnetic **generator**.
- Antenna or **probe** that is inserted into the tumour and delivers the thermal energy performing the ablation.
- Coaxial cable.
- **Imaging guidance** system (usually ultrasounds or computed tomography) to guide the procedure.

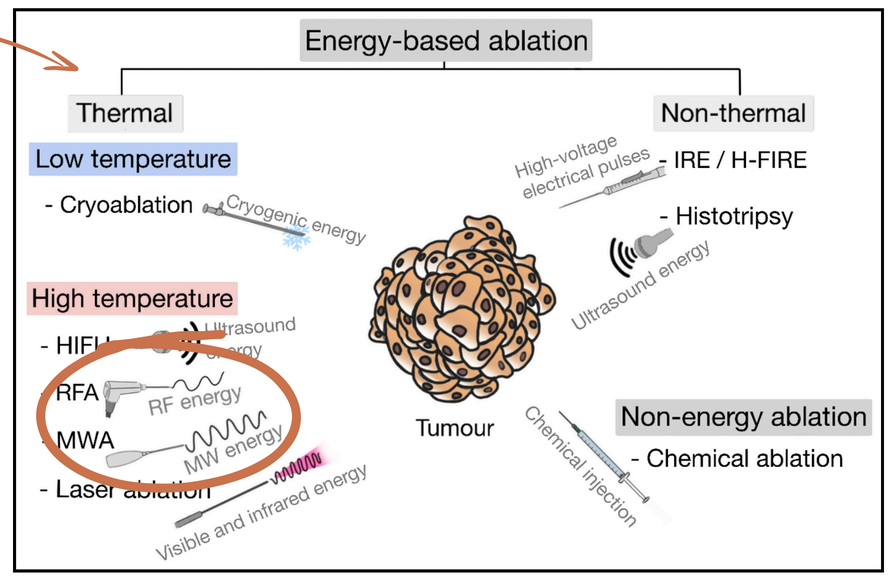

Figure 1. Ablative techniques and the mechanism they use for ablation.
IRE: Irreversible electroporation. H-FIRE: High-frequency irreversible electroporation. HIFU: High-intensity focused ultrasound. RF: Radiofrequency. RFA: Radiofrequency ablation. MW: Microwave. MWA: Microwave ablation.

Probe reaches temperatures > 45ºC → Protein denaturation and dysfunction of cellular membranes → Irreversible coagulative necrosis of the tissue (tumour)

RFA AND MWA IN VETERINARY ONCOLOGY:

Studies on RFA or MWA are scarce, but there's been a notable rise in publications in the past 5 years. Most studies are clinical reports with limited patients (*Table 1*), but show promising results.

Table 1. Summary of studies published on RFA and MWA in veterinary oncology.

Reference	Species	Nº of animals	Tumour location	Technique
Oramas *et al.* 2019	Dog	2	Liver	MWA
Yang *et al.* 2017	Dog	5	Liver	MWA
Locatelli *et al.* 2022	Dog	4	Liver	MWA
Culp *et al.* 2021	Dog	3	Retroperitoneal	MWA
Salyer *et al.* 2020	Dog	6	Bone (radius)	MWA
Kalamaras *et al.* 2020	Dog	16	Bone (radius)	MWA
Dornbusch *et al.* 2020	Dog	2	Lung	MWA
Gómez Ochoa *et al.* 2021	Dog	5	Aorta or carotid arteries	RFA
Pollard *et al.* 2001	Dog	11	Parathyroid	RFA
Rasor *et al.* 2007	Dog	48	Parathyroid	RFA
Mallery *et al.* 2003	Cat	9	Thyroid	RFA
Liu *et al.* 2020	Dog	4	Prostate	RFA and MWA
Verpaalen *et al.* 2020	Dog	22	Ovaries	MWA

RFA and MWA present advantages over surgical oncology:

- less invasiveness and lower risk of complications
- faster recovery times
- shorter procedure times
- potentially more affordable

Particularly useful in patients unfit for surgery (comorbidities, geriatrics) or when surgery is declined.

CONCLUSIONS

- RFA and MWA provide reduced invasiveness, shorter procedures and recovery times, lower complication risks, and potentially lower costs compared to surgical oncology.
- They are ideal for animals unfit for surgery and can be performed on an outpatient basis.
- These techniques show promising potential in veterinary oncology.