Utilization of a Calf Liver for Practice Simulation of Radiofrequency Ablation Technique for Trainees
Authors & Disclosures

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Introduction

- Education and the development of a skill set in interventional radiology is acquired primarily through “on the job training” and an apprenticeship model.

- The ability to technically perform invasive procedures successfully and to build a skill set with confidence is learned primarily during fellowship as procedures are performed on patients.

- This method, while helpful for trainees can unfortunately put the patient at unnecessary risk.

- As technology improves, the usage of phantom models and simulation can give trainees the opportunity to technically improve without transferring risk to the patient.
Introduction

- Radiofrequency Ablation (RFA) is a commonly used, minimally invasive technique for treating liver tumors using thermal energy.

- This technique is not without risk and can inadvertently cause harm to normal hepatic parenchyma or adjacent structures.

- Use of porcine\(^1,2\) and cadaveric\(^3\) models for RFA training has been described, however only a single study has been performed using a hepatic model\(^2\).

- No previous studies have discussed the use of an ex-vivo bovine model for RFA training with radiology trainees.
• Calf livers were purchased from a local Asian supermarket at a cost of approximately $1.50-2 per lb.

• A 17 cm internally-cooled unipolar RF probe (Covidien Cool-tip™ RF ablation system) designed for a 3 cm ablation zone and grounding pads were donated by a regional Covidien representative and utilized with an existing departmental RF ablation system

•Residents were given instruction on RF equipment setup and livers were sectioned and allowed to reach room temperature prior to ablation
Materials/Methods

- A grounding pad was placed under the liver, followed by probe placement into the liver parenchyma.

- 10 trials were performed with RF applied at full power for 3 minutes.

- Liver specimens were dissected along the RF probe tract, followed by measurement of the active ablation zone.
Results

- Dissection of the spherical active ablation zone allowed demonstration of both the size and shape of the ablation zone produced by the RF probe.

- The active ablation zone was visible as white or tan areas of color change in contrast to the marginal passive heating zone located between the active ablation zone and the normal parenchyma.
Hepatocellular carcinoma (HCC) is the third highest cause of cancer deaths worldwide.

RFA is a commonly used treatment for early stage HCC and may be an alternative to surgical resection.

RFA carries the advantage of increased safety and wound recovery, however concerns have been raised regarding the potential for high local tumor recurrence rates.

The success of a RFA procedure and thus minimization of tumor recurrence is highly dependent on operator skill and experience.

Recent literature has demonstrated an association between high cumulative operator volume and a decreased risk of HCC in patients following curative RFA. 

Discussion
Discussion

• This project provided residents with increased experience as the primary operator in hepatic RFA procedures while minimizing the risk of patient harm through simulation.

• Calf livers were used due to their large size, low cost, and easy accessibility.

• Ability to use a single probe and grounding pad for all ablation trials minimized overall costs.

• Similarities in texture between calf and human liver parenchyma allowed residents to become familiar with normal resistance during RF probe placement and allowed for ultrasound to be used for probe visualization.
Discussion

• Single calf livers were sectioned into 4 segments, allowing residents to perform multiple attempts at probe placement

• Placement of multiple probes in direct succession allowed for immediate feedback and the opportunity to refine technique and gain confidence

• Post-ablation dissection provided a deeper understanding of the effect of probe placement and RF equipment settings on ablation field behavior

• Limitations of the study include inability to model environmental factors such as the heat sink effect of nearby vasculature and possible alterations of the RFA field due to the proximity of the grounding pad placement
Conclusion

- Interventional radiologists utilize technically complex procedures that are highly dependent on operator skill to treat liver tumors.

- Gaining a wide skill set and becoming proficient can be a challenging experience for trainees.

- Utilization of a calf liver to simulate RF ablation of hepatic tumors is one proposed method that could be utilized in teaching programs to ensure patient safety and increase technical success for trainees learning to perform the procedure.

