

**Determining a minimal safe distance to prevent thermal injury to intrahepatic bile ducts in radiofrequency ablation of the liver: a study on dogs**

**Abstract**

**Purpose:** To determine a minimal safe distance between the radiofrequency ablation (RFA) electrode and the major intrahepatic bile ducts to prevent thermal injury during hepatic RFA in a canine model. **Materials and Methods:** Forty healthy mongrel dogs were equally randomized to 4 groups based on distance between electrode and large intrahepatic bile ducts during RFA of the liver as followed: 1.0-2.9 mm, 3.0-4.9 mm, 5.0-7.9 mm, or 8.0-10.0 mm. The RFA electrodes were opened uniformly at 2 cm. During RFA, energy was sequentially raised, starting at 5 W and increasing by 5 W increments every 1 min to a maximum of 95 W. Animals were monitored for a maximum of 14 days for complications prior to Doppler ultrasound imaging of liver and bile ducts and sacrifice followed by surgical removal of the liver for cholangiographic and pathologic examination. **Results:** When electrodes were less than 5.0 mm from the bile ducts during RFA, either full- or partial-thickness bile duct necrosis occurred, leading to a variety of serious complications. In contrast, when the distance was more than 5.0 mm between RFA electrode and bile ducts, serious complications occurred rarely, with pathology showing either normal bile ducts or vacuolar changes of biliary ductal epithelium. **Conclusion:** A minimum safe distance of 5.0 mm between the RFA electrode and intrahepatic bile ducts was effective in preventing serious complications secondary to bile duct injury in a canine model.

**Key words:** catheter ablation/adverse effects, catheter ablation/instrumentation,

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