

Holmium-YAG Laser Safety Data on Bile Duct Epithelium in the Porcine Model

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INTRODUCTION

Holmium:YAG laser lithotripsy has been shown to be an effective therapy for difficult to manage bile duct stones. Despite its increasing application, there is limited data on the safety parameters of this technology.

The aim of this study was to establish safety data for holmium:YAG laser lithotripsy within the bile duct in the porcine model.

METHODS

6 female 50 kg domestic pigs underwent necropsy and the bile ducts were explanted. The bile ducts were excised longitudinally exposing the epithelial surface and submerged under tension in liquid media (Fig 1). A SlimLine holmium YAG laser probe (Lumenis, Sunnyvale, CA) was placed in perpendicular contact with the bile duct epithelium and activated at various energy density settings to evaluate perforation rates. The power density settings ranged from 8 to 15 watts (W) and were accomplished using various combinations of frequencies (Hz) and joules (J). The laser was activated until perforation of the bile duct occurred or for a maximum of 60 seconds. For each setting the probe was placed in similar locations on both the proximal and distal aspects of the duct. Both location and wattage were randomized to avoid physiologic differences that may affect outcomes. The median perforation times at each power setting were then compared using the Kruskal-Wallis One Analysis of Variance.

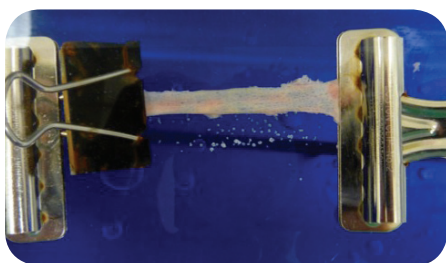


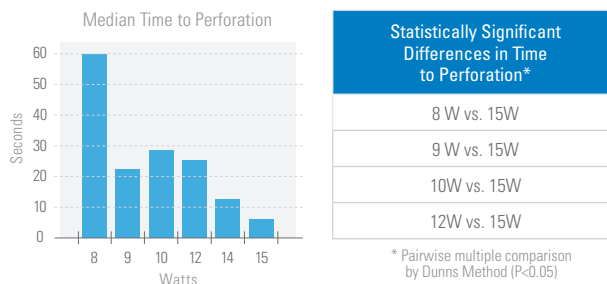
Figure 1
 Excised bile duct
 under tension in
 liquid media

RESULTS

104 data points were collected from 6 porcine bile ducts using 6 different power settings:

8 W (n=22); 9 W (n=22); 10 W (n=16); 12 W (n=20); 14 W (n=8); 15 W (n=16).

Median perforation times and statistically significant differences between the times are shown below.



CONCLUSIONS

- Holmium:YAG laser appears to be safe when used in short bursts (< 5 sec) at power settings ranging from 8 W to 12 W.
- Further studies are required to determine the ideal power settings balancing effective stone fragmentation and perforation risk.

REFERENCES

Holmium:YAG Laser Lithotripsy in the Treatment of Difficult Biliary Stones Utilizing Peroral Single Operator Cholangioscopy (SpyGlass): A Multi-Center Experience. Sandeep Patel, Laura Rosenkranz, Paul R. Tarnasky, Isaac Raijman, Douglas S. Fishman, Paul Yeaton, Bryan Sauer, Michel Kahaleh. Gastrointestinal Endoscopy. Volume 69, Issue 5. S1320.

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