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Presentation Title: **ENDOSCOPIC CLEARANCE LITHOTRIPSY DEVICES: BENCH COMPARISON OF STONE ELIMINATION CAPACITY AND DRILLING SPEED**

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Introduction

Several endoscopic stone fragmentation and clearance lithotripsy systems are currently available. The Swiss LithoClast™ Master (EMS Switzerland) offers standalone ultrasonic lithotripsy and ultrasonic / pneumatic combination lithotripsy with 2 coaxially mounted probes to transmit ultrasonic vibration and impact generated compression waves. The ShockPulse-SE (Olympus Germany) transmits ultrasonic vibration and an ultrasonically generated shock through the same hollow probe. The latest development is the Swiss LithoClast Trilogy (EMS Switzerland) employing an electromagnetic impactor and an ultrasonic lithotripter to deliver ultrasonic vibration and ballistic impact compression waves through the same hollow probe.

Objective

The objective of this study was to compare stone elimination and drilling speed.

Materials and Methods

Cubical BegoStone (15:3) phantoms of 10mm size were used for clearance testing. Ten fragmentation and clearance tests were performed in an underwater hemisphere by 5 different operators (50 test runs per device). The average stone removal time per operator and per device was recorded and statistical analysis was performed. For the drilling speed test, a free-hand set-up was used. Stones of 15mm size were positioned on one side of an underwater balance and lithotripter probes were vertically mounted in direct contact. A weight of 450g was placed on the other side of the balance to ensure a constant contact pressure. Ten test runs per device were performed. The drilling time until breakthrough or, if no breakthrough occurred, the achieved drilling depth after 1 minute was measured and the resulting drilling speed was calculated.

Results

The Swiss LithoClast Trilogy was clearing the stone phantoms significantly faster than all other devices (Trilogy: 28 sec, ShockPulse: 39 sec, LithoClast Master ultrasound (US) only: 37 sec, LithoClast Master combined: 44 sec.). There was no significant difference between the ShockPulse and LithoClast Master with either ultrasound only or combined function. A significant difference ($p < 0.004$) was found between LithoClast Master used in combination mode vs. ultrasound standalone. A similar pattern was seen for the drilling speed, where the LithoClast Trilogy outperformed all other lithotripters (Trilogy: 0.65 mm/sec, ShockPulse: 0.46 mm/sec, LithoClast Master combined: 0.47 mm/sec and LithoClast Master US only: 0.18mm/sec). ($p < 0.05$).

Conclusions

The Swiss LithoClast Trilogy was significantly faster than the other lithotripters. Since the other devices use comparable probe sizes and lumen, it seems that the clearance and drill speed advantage of the LithoClast Trilogy is based on the better performance of the electromagnetic impactor.

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