Surgical Technology & Simulation: Instrumentation & Technology II

Moderated Poster 68

Sunday, April 30, 2023 3:30 PM-5:30 PM

MP68-01
PATTERN ANALYSIS OF LASER FIBER DEGRADATION ACCORDING TO THE LASER SETTING: IN VITRO STUDY OF THE DOUBLE-FIRING PHENOMENON

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INTRODUCTION AND OBJECTIVE: It is essential to understand the mechanism of the various causes of laser fiber damage and an ideal method of reducing endoscope damage induced by laser emission in multiple sites. This study classified the different patterns of laser fiber degradation according to laser settings and analyzed the role of cavitation bubbles to find a desirable way of minimizing endoscope damage.

METHODS: A total of 118 laser fibers were analyzed after 1-, 3-, and 5-min laser emission to artificial stones under the settings of 1J-10Hz, 1J-20Hz, 1J-30Hz, and 2J-10Hz. Every 3 cm from the fiber tip was marked and examined with a digital microscope and a high-speed camera. The images of the fibers and the movement of cavitation bubbles were taken with a distance of 1 to 5 mm from the gel.

RESULTS: Seven types of fiber damage (charring, limited and extensive peeled-off, bumpy, whitish plaque, crack, and break-off) coincided during laser emission. Damages rapidly increased with emission time >3 min regardless of the laser settings. The damaged lengths covered 5 mm on average, and the fibers at 5-min emission were significantly shorter than others. The fiber durability of 1J-10Hz setting was better than other settings after 3-min laser emission. Backward movement of the cavitation bubbles was found at the 1-mm distance from the gel, and the damaged lengths were longer than the diameters of the cavitation bubbles because of their proximal movement.

CONCLUSIONS: The damage patterns of the laser fiber tips were classified into seven types. The heat damage around the surface of the laser fiber can be increased according to the high-energy or high-frequency laser setting, a short distance to the stone, a short distance from the tips of flexible ureteroscopes, no cutting laser fiber procedures, and the inappropriate use of irrigation fluid or laser fiber jacket.

MP68-02
WHAT ARE THE OPTIMAL LASER SETTINGS FOR STONE DUSTING USING THE POPCORN TECHNIQUE

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INTRODUCTION AND OBJECTIVE: When evoking stones with a laser (Dusting) it is common to use the "popcorn" technique to complete the dusting. Today there are advanced and much more powerful laser machines, which allows the use of a variety of intensities, rates, and modulations. The purpose of the study is to check what are the most effective holmium laser settings while performing the popcorn technique.

METHODS: Stones were brewed from gypsum mixtures in three density levels. Their density was measured by CT imaging. 5 stones of size 2.8-3.3 mm were filtered and put into test tubes, and their weight was measured. Under continuous washing, "popcorn" stone dusting was performed with a holmium laser using a 272 micron fiber, using the popcorn technique for 2 minutes at intensities 0.3J/80Hz, 0.5J/40Hz, 1J/20Hz, 1J/30Hz, 1.5J/20Hz. With/without Moses modulation (distance). 3 repetitions were performed for each intensity. The mass of the remaining stone was weighed, and the stones larger than 1 and 2 mm were counted. The efficacy and evaporation rates of the stones were compared.

RESULTS: The density of the hard, medium and soft stones was 2095, 995, 548 HU respectively. The average rate of evaporation in soft, medium and hard stones was 68%, 50%, 47%. In soft stones it was found that the rate of vaporisation was the greatest in the laser settings of 1J/30Hz without Moses (93%). There were no stones >2 mm left, and the number of crumbs between 1-2 mm was 2. In medium density stones, the rate of vaporisation was the greatest in the settings 1.5J/20Hz with Moses (71%). No stones >2 mm remained, and the number of stones between 1-2 mm was 3. In hard stones, it was found that the rate of vaporisation was the greatest in the laser settings of 1J/30Hz with Moses (76%). There were no stones >2 mm left, and the number of stones between 1-2 mm was 7. Moses modulation did not change the total vaporisation rate (p=0.256).

CONCLUSIONS: When using the "popcorn" technique for laser dusting of kidney stones, we found different efficiency rates between the different laser settings. The most effective laser settings were in soft stones 1J/30Hz without Moses, in medium 1.5J/20Hz with Moses, and in hard stones 1J/30Hz with Moses.

Source of Funding: Sheba Medical Center