

DOES THE LASER PULSE SHAPE INFLUENCE THE TREATMENT RATE OF STONES?

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INTRODUCTION & OBJECTIVES

Holmium lasers successfully treat nearly all urological stones. Laser pulse energy and frequency are known important factors; it has recently been investigated to determine if innovative laser pulse shapes improve stone fragmentation rate. This study was to evaluate the different modes of a holmium laser within the scope of the treatment of ureteral and intrarenal calculi.

MATERIALS & METHODS

Patients with a single ureteral or intrarenal calculi were prospectively included in the study. For diagnosis and to define the volume of the stone (mm^3), a low-dose CT-scan was performed before any operation. To treat the stone, the holmium laser Dornier Medilas® H Solvo® and a 275 μm or 600 μm fiber (SingleFlex®, Dornier MedTech Laser GmbH, Germany) was used. Depending on the stone size and the location of the stone a semi-rigid URS, a flexible URS or a PCNL was performed. Patients were randomized into the standard group (S) or into the laser modes group (A=Advanced, F=Fragmenting = AF). Both groups were treated with a frequency of 10 Hz and an energy of 1.5 J. The primary endpoint was the laser efficiency defined as mm^3 stone destruction per minute. Second endpoint was the number of stone recovery, the stone free rate and the full operating time. For categorical data, the Fisher exact test and chi-square test were used. For continuous data, the Mann-Whitney U and Kruskal Wallis test were performed whenever indicated ($p < 0.05$).

RESULTS

Altogether 127 patients (60 S vs. 67 A/F) were treated between 03/16 and 10/17. There were no differences in the gender, the age and the localization of the stones between the groups. Mean size (mm^3 ; MW \pm SD) of the stones was significantly higher in the AF-group compared to the S-group (1735 ± 3264 vs. 1319 ± 2693 ; $p = 0.036$), respectively. The number of stone recovery (S: 8.0 ± 7.7 vs. A/F: 5.6 ± 4.6 ; $p = 0.226$), the laser time (sec; MW \pm SD) (S: 188 ± 345 vs. A/F: 188 ± 452 ; $p = 0.246$) and the stone free rate was not significantly different between the groups. The overall operating time was significantly shorter in the AF-group compared to the S-group ($15.2 \text{min} \pm 17.1$ vs. $20.06 \text{min} \pm 20.05$; $p = 0.036$). Same was found for the laser efficiency: AF-group: $1516 \text{mm}^3/\text{min} \pm 2073$ vs. S-group: $858 \text{mm}^3/\text{min} \pm 1927$; $p < 0.001$, respectively. There were no differences regarding intra- or postoperative complications.

CONCLUSION

This study shows that the efficiency of the holmium laser can be influenced and improved by Advanced™ and Fragmenting Modes. Albeit the overall stone free rate and number of fragment recovery were not affected, different pulse shapes available on the Dornier Medilas® H Solvo laser might reduce the overall operating time of stone treatment.

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