



A Users Guide to Holmium Laser Lithotripsy Settings in the Modern Era

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INTRODUCTION

Endoscopic stone surgery has gone through rapid technological advances in the last decade with the development of next-generation holmium lasers. These systems allow the user to adjust multiple parameters that can optimize fragmentation efficiency during ureteroscopy (URS). Parameters include an increased range in pulse energy (PE), frequency (Fr), and manipulation of the pulse duration (PD). More recently, introduction of pulse modulation with the Moses Technology™ provides pulse modulation with energy delivered over two pulses. In light of these developments, it may be difficult for the urologist to understand how to best utilize laser settings in the modern era. We provide an overview of how PE, Fr, and PD affect three different aspects of laser lithotripsy performance: (A) Fragmentation, (B) Stone retropulsion, and (C) Laser fiber-tip degradation (Table 1).

PULSE ENERGY

PE is the optical energy emitted from the laser fiber-tip during one pulse and is measured in joules (J). The PE can vary from 0.2 to 6.0 J and is dependent on the power of the holmium system. Low-power systems (e.g., 20 W) have traditionally had more limited PE power ranges than high-power systems. Factors that influence the selection of PE include stone density, location, and desired fragment size, with commonly utilized settings during URS ranging from 0.2 to 2 J. (A) Fragmentation: Increasing the PE leads to more fragmentation, with hard stones like calcium oxalate monohydrate usually requiring greater PE (1). Higher PE settings such as 1.0 J are ideal for lithotripsy followed by active basket retrieval. Low PE (LoPE) is employed when utilizing a dusting technique to create very small fragments that are left *in situ* for spontaneous passage. An *in-vitro* study found that using a LoPE setting of 0.2 J leads to the smallest fragment sizes (1) but harder stones such as calcium oxalate monohydrate may require higher PE. In our practice we start dusting settings at 0.2 or 0.3 J and increase the energy accordingly based on how much powder is coming off the stone. (B) Stone retropulsion: On activation of pulsed laser energy, the surrounding fluid evaporates and expands, leading to the formation of a vapor bubble. Collapse of this bubble leads to unwanted movement of stone debris, known as retropulsion. PE has a considerable effect on retropulsion, with higher PEs leading to a proportional increase in retropulsion (1). This decreases fragmentation efficiency and increases procedure time by requiring repositioning of the fiber-tip to maintain contact with the stone, and in the worst-case scenario, a ureteral stone may migrate

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Holmium Laser User Manual

Robert R. Redfield



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In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is actually astonishing. Within the pages of "**Holmium Laser User Manual**," an enthralling opus penned by a highly acclaimed wordsmith, readers embark on an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve into the book's central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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