LETTERS TO THE EDITOR

Re: Salvadó JA, Villena JM, Urrea F, et al. High-power holmium laser versus pulsed thulium laser for ureteroscopic lithotripsy: Results of a randomized prospective study. Cent European J Urol. 2026; 79: 30-35

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Dear Editor,

The randomized prospective trial by Salvadó et al. [1] comparing high-power holmium:YAG (Ho:YAG) with pulsed thulium:YAG (p-Tm:YAG) laser for ureteroscopic lithotripsy addresses a timely and clinically relevant question in contemporary endourology. With the rapid expansion of laser platforms and, at times, marketing-driven adoption, robust comparative clinical evidence is increasingly required to guide technology selection and to define safe and effective parameter “envelopes” in routine practice. The authors should be commended for providing randomized data and for using non-contrast computed tomography (NCCT) within 6 weeks to define stone-free status and estimate stone volume, two methodological choices that strengthen the credibility of the primary endpoint.

In this single-center study, 122 adult patients with a single renal or ureteral stone >5 mm underwent ureteroscopy (semi-rigid URS and/or RIRS) and were randomized to Ho:YAG or p-Tm:YAG between August 2023 and August 2024. Stone-free rate (SFR) at 6 weeks on NCCT (residual fragments ≤2 mm) was similar between groups: 65.1% with p-Tm:YAG vs 62.5% with Ho:YAG (p = 0.76). In the renal subgroup, SFR numerically favored p-Tm:YAG (60.9% vs 48.4%; p = 0.28), while ureteral stones showed no significant difference (72% vs 82%; p = 0.25). Median total energy was lower with p-Tm:YAG (4.71 vs 5.31 kJ; p = 0.28), and volumetric energy consumption among stone-free cases was comparable (20 vs 22 J/mm^3; p = 0.48). Postoperative stenting was more frequent in the Ho:YAG group (67.8% vs 50%; p = 0.04). Based on these findings, the authors conclude non-inferiority of p-Tm:YAG compared with high-power Ho:YAG.

Despite these strengths, several methodological and clinical aspects deserve closer examination, as they may limit interpretability and generalizability. Laser settings and thermal safety deserve a cautious interpretation. Although the authors appropriately respected commonly cited ureteral power thresholds (≤10–12 W), power alone is an incomplete surrogate for intraluminal thermal exposure. During ureteroscopic lithotripsy, temperature rise is strongly influenced by pulse frequency, cumulative activation patterns, and irrigation efficiency, particularly within the confined ureteral lumen. In this study, ureteral lithotripsy was frequently performed at relatively high pulse frequencies (15–30 Hz), a setting that, despite low pulse energy and controlled total power, has been associated with suboptimal energy delivery to the stone surface and an increased likelihood of inadvertent ureteral wall targeting rather than effective stone ablation [2–4]. As a consequence, the risk of thermal injury and subsequent ureteral stenosis cannot be excluded, especially considering the limited follow-up of 6 weeks, since ureteral strictures are well recognized as delayed complications [5, 6].

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Although continuous laser activation was restricted to 20 seconds and irrigation maintained at 10–20 ml/min, these measures may not fully mitigate thermal load in all anatomical or procedural scenarios, particularly when repeated lasing bursts are required because of impaired visibility. Moreover, they cannot entirely eliminate the risk of accidental ureteral wall targeting, especially in less experienced hands. Finally, the use of semirigid ureteroscopy, while effective and widely adopted, may increase mechanical stress on the distal ureter, potentially compounding tissue vulnerability when combined with high-frequency or aggressive lithotripsy strategies [7].

Second, the modest stone burden contrasts with surprisingly modest stone-free rates. Median renal stone volume was approximately 400 mm^3, and ureteral stone volumes ranged from about 110 to 140 mm^3, values generally associated with high SFR in contemporary ureteroscopy, particularly for ureteral stones [8, 9]. Nevertheless, the reported overall SFR of approximately 65% and a ureteral SFR of 72% with p-Tm:YAG appear lower than those reported in many modern series using NCCT-based definitions. This discrepancy raises questions regarding the lithotripsy strategy employed (dusting vs fragmentation), the chosen stone-free threshold ($\leq$2 mm), stone location distribution, and center-specific perioperative practices, including stone repositioning, basket use, access sheath utilization, and stenting philosophy. Importantly, when absolute outcomes are suboptimal in relatively favorable cases, extrapolating non-inferiority conclusions to larger or more complex stones becomes challenging, precisely the setting in which differences between laser technologies would be expected to be most clinically relevant.

Third, outcome reporting could be better aligned with contemporary efficiency frameworks. While SFR remains clinically meaningful, it is increasingly recognized as an incomplete descriptor of lithotripsy performance. As highlighted by Kwok et al., contemporary evaluation should incorporate standardized, volume-normalized metrics such as energy delivered per stone volume (J/mm^3), laser activity, and ablation efficiency, enabling more objective comparisons between technologies [10, 11]. In the present study, reporting is limited to total delivered energy and energy consumption, without estimation of ablation speed, a parameter that often represents the primary clinical interest when assessing laser efficacy from an endourologist's perspective. The absence of such metrics limits the ability to interpret whether similar SFRs truly reflect comparable laser performance.

These considerations directly connect to the choice of primary endpoint and the power analysis. In a study designed to assess non-inferiority of laser efficiency, SFR may not represent the most appropriate outcome, as it is influenced by numerous factors beyond the energy source itself [12]. Moreover, the adequacy of statistical power is difficult to assess. Although the authors describe their sample size rationale within a non-inferiority framework, the calculation appears to rely on anticipated differences in SFR than on a prespecified non-inferiority margin. As a result, it remains unclear whether the study was adequately powered to formally exclude clinically meaningful differences between treatments. Clear reporting of power assumptions is essential to allow readers to judge whether a trial is sufficiently powered. In studies evaluating incremental technological innovations, where large effect sizes are unlikely, rigorous power calculations are necessary to distinguish true equivalence from the absence of statistical power. Notably, ablation speed and laser efficiency, rather than SFR, would arguably represent more appropriate primary outcomes for powering such comparative trials [11].

Overall, this randomized study provides valuable comparative evidence and offers an important opportunity to discuss several practical aspects of laser use during ureteroscopic lithotripsy that endourologists should always keep in mind. Intraoperative laser settings, such as pulse frequency, activation patterns, and total delivered energy, remain fully under the surgeon's control and should always be selected with a strong focus on safety, in line with existing recommendations and experimental evidence. At the same time, the results presented should be interpreted with caution. The absence of differences in SFR does not necessarily imply equivalence in laser performance, as it remains unclear whether the study was adequately powered to exclude clinically meaningful differences. Moreover, SFR alone may not represent the most appropriate endpoint when the primary objective is to compare laser efficiency. Power analyses and trial design in this context should ideally be based on objective efficiency metrics, such as ablation speed and laser efficiency, which more directly reflect the intrinsic performance of the energy source and are less influenced by procedural variability.

CONFLICTS OF INTEREST

Olivier Traxer has declared as a consultant for Karl Storz, Coloplast, IPG Photonics, Quanta System, and Rocamed. Frédéric Panthier has declared as consultant for Dornier. All other authors have no conflict of interest.

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ETHICS APPROVAL STATEMENT

The ethical approval was not required.

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