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Comparing Pediatric Ureteroscopy Outcomes with SuperPulsed Thulium Fiber Laser and Low-Power Holmium:YAG Laser

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Study Need and Importance: The thulium fiber laser has emerged as an alternative laser lithotripsy technology to the gold standard, holmium:yttrium-aluminum-garnet (Ho:YAG) laser. The SOLTIVE™ SuperPulsed thulium fiber laser (SPTF) was the first platform released in North America and has shown promising clinical results in an adult cohort. No center has reported outcomes in a pediatric cohort. In this single-institution, retrospective cohort study, we aimed to compare the clinical performance of low-power Ho:YAG lasers to the SPTF in matched, unilateral ureteroscopies performed in pediatric patients.

What We Found: Over 5 years, 93 cases were performed with Ho:YAG lasers compared to 32 cases with the SPTF. The observed stone-free rate (SFR) with Ho:YAG lasers was 59% compared to 70% with the SPTF (see Table). Use of the SPTF was associated with 61% lower odds of having a residual stone after ureteroscopy (95% CI: 0.19−0.77, p=0.01). Despite a significantly longer median laser time of 11 minutes with the SPTF compared to 2 minutes with the Ho:YAG lasers, use of the SPTF was not associated with a significant increase in total operative time (p=0.8). The postoperative complication rate was not associated with use of the SPTF (p=0.64).

Limitations: Our study is limited by its single-institution retrospective design, small sample size, loss to followup within a 90-day imaging window and use of multiple imaging modalities to assess stone-free status. Our study abided by the strictest definition of stone-free status and should only be compared to other studies with similar definitions.

Interpretation for Patient Care: Technological evolution should seek to advance patient care outcomes. The SPTF was associated with a higher SFR without compromising safety or operative time when compared to low-power Ho:YAG lasers. Urologists providing care to pediatric patients should consider adopting the SPTF to advance the care of pediatric patients with surgical stone disease.

Table. *SFR by stone location, complications and operative time with results from weighted regression analyses*

	Overall		Ho:YAG		SPTF		p Value
No. location stone-free/total No. (%):	57/92	(62)	41/69	(59)	16/23	(70)	0.01*
Ureteral only	32/34	(94)	28/30	(93)	4/4	(100)	
Renal only, no lower pole stone	5/14	(36)	2/9	(22)	3/5	(60)	
Renal only, lower pole stone	7/24	(29)	5/19	(26)	2/5	(40)	
Ureteral+renal, no lower pole stone	3/5	(60)	1/2	(50)	2/3	(67)	
Ureteral+renal, lower pole stone	10/15	(67)	5/9	(56)	5/6	(83)	
No. complications/total No. (%)	26/114	(23)	19/86	(22)	7/28	(25)	0.64*
No. Clavien-Dindo grade/total No. (%):							
I	15/114	(13)	11/86	(13)	4/28	(14)	
II	9/114	(8)	7/86	(8)	2/28	(7)	
≥III	2/114	(2)	1/86	(2)	1/28	(4)	
Median mins operative time (IQR)	83.5 (67.0, 104.5)		84.0 (67.3, 102.8)		78.0 (65.8, 109.8)		0.77†

* Weighted logistic regression model.
† Weighted linear regression model.

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Comparing Pediatric Ureteroscopy Outcomes with SuperPulsed Thulium Fiber Laser and Low-Power Holmium:YAG Laser

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Purpose: The thulium fiber laser is a promising new lithoptripsy technology never before studied in the pediatric population. Our center adopted the first platform in North America, the SuperPulsed thulium fiber laser (SPTF). We aimed to compare outcomes in pediatric ureteroscopy using the SPTF to those using the gold standard, low-power holmium:yttrium-aluminum-garnet (Ho:YAG) laser.

Materials and Methods: This is a retrospective, consecutive cohort study of unilateral ureteroscopy with laser lithotripsy performed in pediatric patients from 2016 to 2021 as an early adopter of the SPTF. Thirty-day complications and stone-free status, defined as the absence of a stone fragment on followup imaging within 90 days, were analyzed using logistic regression. Operative times were compared using linear regression. Propensity scores for use of SPTF were used in regression analyses to account for potential cohort imbalance.

Results: A total of 125 cases were performed in 109 pediatric patients: 93 with Ho:YAG and 32 with SPTF. No significant difference was noted in age ($p=0.2$), gender ($p=0.6$), stone burden ($p>0.9$) or stone location ($p=0.1$). The overall stone-free rate was 62%; 70% with SPTF and 59% with Ho:YAG. The odds of having a residual stone fragment were significantly lower with SPTF than with Ho:YAG (OR=0.39, 95% CI: 0.19–0.77, $p=0.01$). There was no significant difference in operative time ($p=0.8$). Seven (25%) complications were noted with SPTF and 19 (22%) with Ho:YAG ($p=0.6$).

Conclusions: The SPTF laser was associated with a higher stone-free rate than the low-power Ho:YAG laser without compromising operative time and safety.

Key Words: lasers, solid-state; lithotripsy, laser; ureteroscopy; urolithiasis; pediatrics

THE holmium:yttrium-aluminum-garnet (Ho:YAG) laser is the lithotripsy gold standard for endoscopic treatment of pediatric urolithiasis due to its clinical efficacy, safety and durability.[1,2] The thulium fiber laser (TFL) is an alternative laser lithotripsy option now available and may represent a turning point in endourology.[3]

TFL has a number of theoretical advantages over the Ho:YAG laser. The emitted beam from the TFL has a wavelength of 1,940 nm, leading to a 4-fold higher water absorption coefficient and superior stone ablation efficiency than the Ho:YAG laser beam with a wavelength of 2,120 nm.[4] The TFL beam can be delivered in continuous or pulsed modes with an exceptionally wide range of energy (0.025–6 J) and frequency (5–2,400 Hz) settings. This contrasts with Ho:YAG lasers that can offer various pulsed modes but comparatively narrower energy (0.2–6 J) and frequency (3–80 Hz) ranges.

Abbreviations and Acronyms

CT = computerized tomography

Ho:YAG = holmium:yttrium-aluminum-garnet

RBUS = renal/bladder ultrasound

SFR = stone-free rate

SPTF = SuperPulsed thulium fiber laser

TFL = thulium fiber laser

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Ethics Statement: Study received Institutional Review Board Approval (IRB No. P00039325).

Author Contributions: Christopher Jaeger, MD—substantially contributed to the study design, data collection and drafting of the article. Caleb Nelson, MD, MPH—substantially contributed to the study design, critical revisions of the article and supervision. Bartley Cilento, MD, MPH—substantially contributed to the study design, critical revisions of the article and supervision. Tanya Logvinenko, PhD—substantially contributed to the study design, statistical analyses, drafting of the article and the critical revisions of the article. Michael Kurtz, MD, MPH—substantially contributed to the study design, drafting of the article, critical revisions of the article and supervision

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Distinct from the thulium:YAG laser used for tissue ablation, TFL uses a laser diode system that is more energy efficient than Ho:YAG lasers, which require a single flash-lamp (low-power) or a series of flash-lamps (high-power) to produce a laser beam. Heat dissipation within the TFL unit involves a fan rather than a complex refrigeration system used by Ho:YAG lasers.[4] This leads to a smaller form factor and a quieter machine. These technical advantages of the TFL have led to its early adoption with series in adults validating its safety and efficacy in stone lithotripsy.[3] To date, no study has been performed evaluating the safety and efficacy of the TFL in a pediatric cohort.

The SOLTIVE™ Premium SuperPulsed TFL (SPTF) was the first TFL platform to receive U.S. Food and Drug Administration approval in 2019. Carrera et al showed the SPTF laser was promising for the treatment of urolithiasis in adults.[5] In September 2020, our center became an early adopter of the SPTF laser among pediatric providers. We sought to compare the clinical performance of our low-power Ho:YAG lasers to that of the SPTF laser in ureteroscopies performed in pediatric patients. We hypothesized that the SPTF laser was more effective, efficient and safer than the low-power Ho:YAG laser.

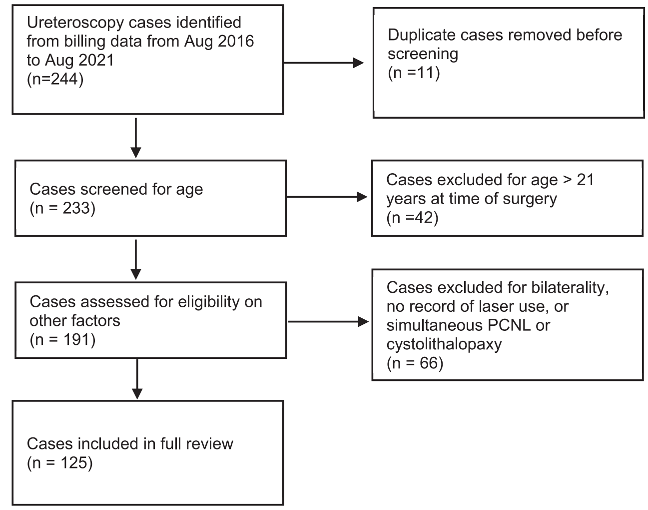

Figure. Flow diagram for inclusion/exclusion criteria. *PCNL*, percutaneous nephrolithotomy.

MATERIALS AND METHODS

This is a retrospective, single-institution cohort study. All patients who underwent a ureteroscopy with laser lithotripsy at our center between August 2016 and August 2021 were identified through hospital billing data. Three fellowship-trained pediatric urologists (MK, CN, BC) performed 244 ureteroscopies at our center during this period. Patient records were reviewed to include patients aged 21 years or younger at surgery who received unilateral ureteroscopic treatment of ureteral and/or renal calculi with laser lithotripsy. Excluded from the study were cases involving patients older than 21 years, bilateral stone treatment, ureteroscopy without laser lithotripsy or other simultaneous endoscopic treatment (see Figure).

For patients meeting inclusion criteria, we captured demographics, stone burden and stone location. If there were multiple stones present on the preoperative imaging study, the stone burden was reported as the sum of each stone's maximal diameter. If a patient received a preoperative computerized tomography (CT) and renal/bladder ultrasound (RBUS), measurements from the CT were used. Stone location was classified as ureteral, renal or combined. Renal stone location was further classified as lower pole or nonlower pole.

Stones were treated with a variety of endoscopes including reusable (Storz Flex-Xc, Karl Storz SE & Co. KG, Tuttlingen, Germany) and disposable flexible ureteroscopes (LithoVue™) or a 4.5Fr Wolf semirigid ureteroscope (Richard Wolf Medical Instruments, Vernon Hills, Illinois). Laser lithotripsy was performed with the SPTF laser or one of 2 low-power Ho:YAG lasers featuring an energy range of 0.2 to 3.5 J and frequency range of 3 to 25 Hz (Medilas® H 20 W and Medilas H Solvo 35 W).

Stone-free status was defined using the strictest definition: the absence of any stone fragments on the first postoperative imaging study (CT or RBUS) following surgery. Only cases with followup imaging within 90 days of surgery were included. Cases followed by a staged ipsilateral procedure without postoperative imaging prior to the second procedure were excluded from the stone-free status reporting. Complications within the 30-day postoperative period were categorized according to the Clavien-Dindo classification system.[6]

Demographics and procedure characteristics were compared between laser groups using Fisher's exact and Mann-Whitney U tests for categorical and continuous variables, respectively. Propensity scores estimating the odds of treatment with the SPTF laser were calculated based on patient age, stone burden, stone location and surgeon to account for covariates with substantial influence on clinical outcomes following ureteroscopy. Inverse probability of treatment weighting using the propensity scores was used in all regression analyses to ensure balanced groups.[7] Standardized mean differences were calculated to assess balance among covariates. Logistic regression was used to compare effects of the laser system on stone-free status and complications. To compare the operating time between laser systems, linear regression was used. Analyses and verification of assumptions were performed using packages *base* and *tableone* of statistical software R.[8,9] This study received Institutional Review Board approval (IRB No. P00039325).

RESULTS

A total of 125 eligible ureteroscopies with laser lithotripsy were performed over a 5 year-period on 109 patients at our center. Ninety-three ureteroscopies were completed with a low-power Ho:YAG laser, whereas 32 ureteroscopies were performed

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with the SPTF laser. The cohort was predominantly female (59%) with a median age of 15.6 years (IQR 12.1, 17.7) encompassing all pediatric age groups (Table 1). Age (p=0.2) and gender (p >0.9) did not significantly differ according to the laser used.

CT was used to assess preoperative stone characteristics in 59/125 cases (47%), and its use was equally shared between laser groups. Eighty-eight percent of cases had total stone burden prior to ureteroscopy less than 20 mm (Table 1). The proportion of stone burden that was less than 10 mm, 10–20 mm or greater than 20 mm was closely matched between the 2 groups (p >0.9).

There was no statistically significant difference in the proportion of cases completed by any surgeon in the 2 laser groups (p=0.7). Median settings of 0.2 J and 100 Hz, consistent with a dusting approach, were used in SPTF cases, in contrast to median settings of 0.45 J and 8 Hz, roughly consistent with a fragmentation approach, used in Ho:YAG cases. The median laser time in the SPTF group was 11 minutes (IQR 2, 30), which was significantly higher than median laser time of 2 minutes (IQR 1, 7) in the Ho:YAG group (p <0.001).

After propensity score weighting, balance was achieved for stone location and surgeon (SMD <0.1) baseline covariates. However, patient age (SMD=0.3) and stone burden (SMD=0.2) covariates were moderately unbalanced[10] and thus were included in the weighted regression models.[11]

Initial followup imaging was obtained a median of 39 days (IQR 25, 74) following surgery: 34 days (IQR 10, 58.5) in the SPTF group and 40.5 days (IQR 27, 80) in the Ho:YAG group. Thirty-two cases were without followup imaging within 90 days and 1 case was missing preoperative imaging. Therefore, 92 cases were included in the outcome analysis of stone-free status. This subsample differed from the original cohort only in the proportion of cases between surgeons (p <0.01). RBUS was used in 85/92 (92%) cases; however, the 7/92 (8%) cases assessed with a CT were in the Ho:YAG group. The stone-free rate (SFR) for the overall cohort was 62%. The SFR was highest in ureter-only cases (94%) and lowest in renal-only cases with a lower pole stone (29%). The SFR was 59% in Ho:YAG cases compared to 70% in SPTF cases (Table 2). On weighted logistic regression analysis controlling for patient age and stone burden, the odds of having a residual fragment after ureteroscopy were significantly lower with the use of the SPTF laser (OR=0.39, 95% CI: 0.19–0.77, p=0.01).

When comparing operative times, 5 cases from our original cohort (125) were missing recorded operative time and 1 case was missing preoperative imaging. These cases were excluded from the analysis, resulting in a subsample with 119 cases (Table 2). The median operative time was slightly shorter in SPTF cases, at 78.0 minutes (IQR 65.8, 109.8) versus 84.0 minutes (IQR 67.3, 102.8). On weighted linear regression analysis controlling for patient age and stone burden, use of the SPTF laser resulted in an average 1.5-minute increase in operative time, but this was not statistically significant (p=0.8).

Table 1. *Demographics and cohort characteristics*

	Overall	Ho:YAG	SPTF	p Value
No. pts	125	93	32	
No. female (%)	74 (59)	57 (61)	17 (53)	0.5*
No. age group (%):				0.2*
<6 yrs	8 (6)	4 (4)	4 (13)	
6–<12 yrs	22 (18)	19 (20)	3 (9)	
12–<16 yrs	36 (29)	28 (30)	8 (25)	
16–21 yrs	59 (47)	42 (45)	17 (53)	
No. stone burden (%):				>0.9*
<10 mm	53 (42)	40 (44)	13 (41)	
10–<20 mm	56 (45)	41 (45)	15 (47)	
≥20 mm	15 (12)	11 (12)	4 (13)	
No. stone location (%):				0.1*
Ureteral only	45 (36)	37 (40)	8 (25)	
Renal only, no lower pole stone	22 (18)	14 (15)	8 (25)	
Renal only, lower pole stone	29 (23)	23 (25)	6 (19)	
Ureteral+renal, no lower pole stone	7 (6)	3 (3)	4 (13)	
Ureteral+renal, lower pole stone	21 (17)	15 (16)	6 (19)	
No. surgeon (%):				0.7*
A	59 (47)	45 (48)	14 (44)	
B	15 (12)	12 (13)	3 (9)	
C	51 (41)	36 (39)	15 (47)	
No. postop ureteral stent (%)	113 (90)	84 (90)	29 (91)	1*
No. ureteral access sheath (%)	57 (46)	45 (48)	12 (38)	0.4*
Median mins laser time (IQR)	3 (1, 7)	2 (1, 5)	11 (2, 30)	<0.001†

* Fisher's exact test.
† Mann-Whitney U-test.

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Table 2. *SFR by stone location, complications and operative time with results from weighted regression analyses*

	Overall		Ho:YAG		SPTF		p Value
No. location stone-free/total No. (%):	57/92	(62)	41/69	(59)	16/23	(70)	0.01*
Ureteral only	32/34	(94)	28/30	(93)	4/4	(100)	
Renal only, no lower pole stone	5/14	(36)	2/9	(22)	3/5	(60)	
Renal only, lower pole stone	7/24	(29)	5/19	(26)	2/5	(40)	
Ureteral+renal, no lower pole stone	3/5	(60)	1/2	(50)	2/3	(67)	
Ureteral+renal, lower pole stone	10/15	(67)	5/9	(56)	5/6	(83)	
No. complications/total No. (%)	26/114	(23)	19/86	(22)	7/28	(25)	0.64*
No. Clavien-Dindo grade/total No. (%):							
I	15/114	(13)	11/86	(13)	4/28	(14)	
II	9/114	(8)	7/86	(8)	2/28	(7)	
≥III	2/114	(2)	1/86	(2)	1/28	(4)	
Median mins operative time (IQR)	83.5 (67.0, 104.5)		84.0 (67.3, 102.8)		78.0 (65.8, 109.8)		0.77†

* Weighted logistic regression model.
† Weighted linear regression model.

No intraoperative complications were noted. Excluded from analysis of complications were 10 cases lost to followup (8%) and 1 case with missing preoperative imaging from the original cohort. For the included cases (114), 26 complications (23%) occurred within 30 days of surgery, including 7 (25%) with SPTF and 19 (22%) with Ho:YAG. The majority of complications (Table 2) were low grade, classified as Clavien-Dindo I and II. These included urinary tract infection requiring antibiotics and flank pain prompting emergency care or hospitalization. Two complications were high-grade and categorized as Clavien-Dindo ≥III. One high-grade complication was flank pain secondary to an obstructing stone fragment requiring surgical intervention (grade III) and the other was urosepsis requiring an intensive care unit stay (grade IV). Neither of these high-grade complications was directly attributed to the laser used during the case. The SPTF laser was not associated with postoperative complications (OR=1.16, 95% CI: 0.63–2.12, p=0.64) on weighted logistic regression controlling for patient age and stone burden. On further analysis, this held true when controlling for ureteral access sheath use.

DISCUSSION

Our center desired to offer modern laser technology for the care of our pediatric patients. We considered high-power Ho:YAG lasers (up to 120 W) featuring high frequency settings and pulse modulation to limit stone retropulsion and efficiently ablate stones.[12,13] We ultimately chose the SPTF laser and noted its short learning curve, an option for small fiber (150 μm) enabling easier maneuverability, a small form factor generator compatible with a 110 V outlet, and a wide range of energy and frequency settings. Intraoperatively, the SPTF laser seemingly melted stones away with minimal retropulsion effect.

In our cohort study, we reported an overall SFR of 62% for all upper tract stones. Predictably, the SFR varied substantially by stone location. Ureteral stones had a high SFR, whereas renal stones had a lower SFR, with lower pole stones having the lowest SFR. A similar association between SFR and stone location is reflected in prominent pediatric series.[14,15] Our series does report a lower SFR for intrarenal stones than any other pediatric series, but we note this is likely impacted by a strict definition of stone-free status, loss to followup, exclusion of basket-only ureteroscopies and other patient-related factors.

We also noted the SFR differed depending on the type of laser used during the case. Compared to the low-power Ho:YAG laser, use of the SPTF laser was associated with a higher SFR for stones of all locations and a cumulative 11% improvement in SFR. We believe this finding to be clinically significant for the care of pediatric stone patients. Residual stone fragments of any size can become clinically significant over time.[16] We posit that the SPTF laser can reduce the odds of having residual fragments after a ureteroscopy. This could ultimately reduce followup, repeat procedures and associated morbidity for patients; however, these outcomes were not included in our analysis.

Operative time remains an important outcome for ureteroscopies as longer operative times are associated with increased complication rates.[17] Limiting procedure time to 90 minutes is known to reduce infectious complications and unplanned returns to the hospital. Our cohort had a median operative time of 83.5 minutes with no significant difference between laser groups. However, our operative times were substantially longer than the first adult SPTF case series, with a mean of 59.4 minutes.[5] This could be due in part to the relative complexities of pediatric ureteroscopy compared to adult ureteroscopy.[18]

Despite no significant difference in operative time between laser groups, there was a large difference in laser time. The longer laser time in the SPTF group could indicate a low ablation efficiency, contradicting preclinical studies. It could also be a reflection of the

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settings used in our SPTF cases clearly favoring a dusting approach known to require more time on treatment. Thorough basket extraction was perhaps less critical in SPTF cases, accounting for the lack of difference in operative times between groups. Based on our experience with the SPTF laser, users could reasonably expect longer laser times.

We reported a complication rate of 23% with no significant difference observed between the 2 laser groups and no intraoperative complications. Relative to many other series with complication rates around 10% or less, our rate is high. However, unlike many other series, we included flank pain prompting urgent medical attention as a complication. Of the 26 total complications in our cohort, 17 were for symptomatic flank pain requiring emergency department evaluation, but only 1 of these patients required surgical intervention. The only other major complication was urosepsis requiring an intensive care unit stay (Clavien-Dindo grade IV). This complication occurred after a case with the SPTF laser, but was not deemed to have been caused by the laser itself.

Concerns have been raised regarding high temperatures within the collecting system during ureteroscopy with TFL technology.[19] Ho:YAG lasers and TFL cause similar temperature rises at high-power settings that are exacerbated by reduced irrigation.[20,21] Our group strives to maintain safe temperatures by using ambient temperature saline irrigant, low-power settings, especially in the ureter, and continuous irrigation. In our experience, continuous irrigation can be accomplished without a ureteral access sheath in properly selected cases. Yet evidence in a porcine model suggests that ureteral access sheaths mitigate high temperatures seen with the SPTF.[22] We await further human studies to determine the exact role of ureteral access sheaths for temperature safety when using the SPTF.

This study has limitations. Its retrospective design lacks randomization, which limits the ability to make causative statements about the influence of the SPTF. We tried to address this by introducing propensity scores into the analyses. The sample size was small due to the recent adoption of the SPTF laser and low incidence of surgical stone disease in pediatrics. However, our sample size exceeds that featured in many other contemporary pediatric series. Nearly a quarter of patients were excluded from the SFR analysis due to lack of 90-day imaging followup, despite this being standard of care at our center. Also, given our SPTF laser was only available at our main hospital and not at satellite surgical locations treating less complex cases, it is possible that unmeasured confounding underestimates the positive effect of the SPTF laser. Assessing stone-free status using multiple imaging modalities could introduce bias. Lastly, there are known limitations generalizing SFR findings given the variety of definitions of "stone-free" in the literature. Our study abided by the strict definition of stone-free status and should only be compared to other studies with similar definitions.

CONCLUSIONS

The SPTF laser using TFL technology is an effective alternative to the low-power Ho:YAG laser for treatment of urolithiasis in pediatric patients. After a single ureteroscopic procedure, SPTF use was associated with a higher SFR. Meanwhile, operative times and complication rates observed after ureteroscopy were not worse with this technology. Further studies are needed to determine optimal SPTF settings and to compare it to high-power Ho:YAG lasers.

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EDITORIAL COMMENTS

Within the endourology community, the thulium fiber laser (THF) is, to borrow from modern parlance, "so hot right now." Jaeger and colleagues present the first comparative report of THF versus standard holmium laser in children. By showing greater stone clearance with THF, this study will likely only stoke the brimming enthusiasm for this technology within pediatric urology. The question of just how hot THF is remains unanswered. In recent years, assessments of the thermal energy distribution during laser lithotripsy have demonstrated the potential for tissue injury. The mechanism of this insult is not direct laser damage, but rather heating of the fluid within the collecting system. These findings appear to be more significant with higher-power laser applications, and smaller pediatric kidneys may be at higher risk for injury.[1] One attractive feature of THF, as compared to standard holmium laser technology, is the higher absorption coefficient in water. This property translates to a greater amount of fluid heated past boiling near the laser-calculus interface and results in a more efficient energy delivery to the stone itself.[2] However, by definition, this effect results in greater energy absorption within the collecting system fluid. Thus, THF may pose a greater risk of thermal injury, which could be further compounded by longer continuous intervals of laser activation. As noted in the present study, laser time was significantly longer using THF as compared to holmium. The authors note several strategies to mitigate these effects, such as use of pressurized irrigant and ureteral access sheaths. Until laser fibers allow for real-time assessment of intrarenal temperature, I would add that attention to the operator duty cycle, by increasing the ratio of laser off/laser on, would also be advisable in such cases, especially when minimal retropulsion and improved visibility invite a more continuous application of the laser.[3]

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Jaeger and colleagues provide compelling preliminary evidence about the effectiveness of the thulium fiber laser compared to low-power holmium:YAG (Ho:YAG) lasers, which have long been the standard of care for ureteroscopic laser lithotripsy for pediatric patients with renal and ureteral stones. In a well-conceived, -analyzed and -reported retrospective cohort study of consecutive patients <21 years of age, the Boston group reported that thulium fiber was associated with higher stone clearance and had similar postoperative complications compared to low-power Ho:YAG lasers. The

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reporting of the heterogeneity of treatment effect by stone location (29% clearance of lower pole stones) was refreshingly honest and necessary to appropriately counsel patients and families making decisions about surgery. These results have the strengths and limitations of many retrospective studies of surgical interventions. Importantly, these real-world results provide evidence about the processes of and equipment for ureteroscopy that might improve outcomes. If confirmed, ideally in prospective trials, these results might have more implications for health systems, which make decisions about purchasing major equipment such as lasers, than for urologists, who are often keen to adopt new technology even without strong evidence supporting its effectiveness. However, as stated by the authors, nearly 25% of patients did not have postoperative ultrasound within 3 months of surgery, and the thulium laser was not available at ambulatory surgery facilities. The potential for ascertainment and selection bias reinforces the need for more comparative effectiveness studies that measure patient, surgeon and health system factors that influence the utilization of an intervention and its outcomes. The ongoing prospective PKIDS (Pediatric KIDney Stone) trial comparing the effectiveness of ureteroscopy, shock wave lithotripsy and percutaneous nephrolithotomy as well as the ways each procedure is performed (eg thulium fiber vs low-power Ho:YAG) should provide this evidence.[1]

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