European Clinical Attitudes and Experiences of a Thulium Fiber Laser System: A Cross-Sectional, Multi-National Survey

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Gibson S[1], Popham G[1], Spitzer M[1], Graydus J[2], Skodny P[2], Hackmann M[1]

[1]Olympus Europa SE & Co. KG, Hamburg, HH, Germany, [2]Olympus Corporation of the Americas, Center Valley, PA, USA

Objective

- This study investigated European clinical attitudes and experiences of a Thulium Fiber Laser (TFL), the SOLTIVE™ Premium, for stone management procedures.

Background

- Holmium:yttrium-aluminum-garnet (Ho:YAG) laser technology has long been established as the gold standard for endoscopic laser lithotripsy.[1,2]
- However, since the emergence of TFL technology in 2005 in an in vitro laser lithotripsy study,[3] interest in TFL technology in the field of urology has continued to grow thanks to procedure- and resource-related benefits compared to Ho:YAG.[2]
- The SuperPulsed Laser System SOLTIVE™ Premium (Olympus Corporation, Japan) is a regulatory cleared TFL designed for stone lithotripsy and soft tissue applications.
- Given the limited clinical evidence demonstrating TFL's superiority to Ho:YAG,[4,5] clinician and institutional preferences are key factors in influencing laser purchasing decisions.[1]

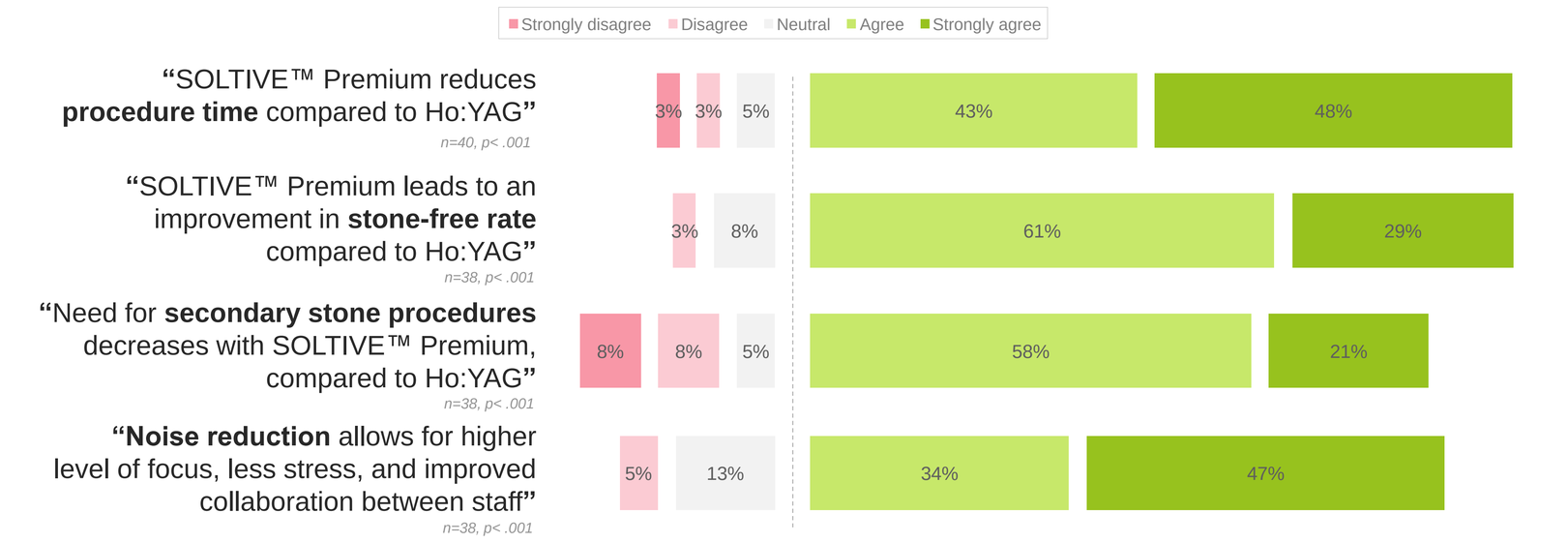
Methods

- An online, cross-sectional survey was administered to European physicians with prior SOLTIVE™ Premium experience in urology for stone management procedures, with a focus on ureteroscopy (URS) and percutaneous nephrolithotomy (PCNL) procedures.
- The survey was created in English and translated into French and German.
- A combination of open- and closed-ended, numeric response, and Likert scale questions were chosen to evaluate attitudes and experiences relative to Ho:YAG.
- The survey was completed between June 2022 and September 2022.
- Completed surveys were analyzed anonymously using descriptive statistics.
- T-tests and chi-squared tests were used where appropriate, with p-values <.001 considered significant.

Results

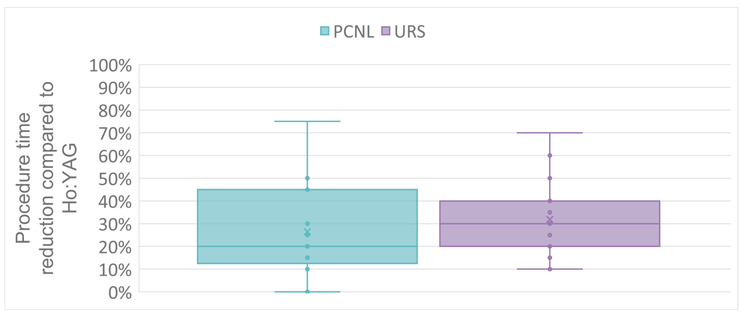
- 40 physicians from 12 European countries completed the survey.
- 88% of participating physicians had substantial experience with SOLTIVE™ Premium, defined as having previously performed over 20 procedures with the SOLTIVE™ Premium.
- In comparison to the use of Ho:YAG lasers for stone management procedures:
  - 90% of respondents agreed that SOLTIVE™ Premium facilitates reduced procedure times (**Figure 1** and **2**).
  - 89% agreed that use of SOLTIVE™ Premium improved stone-free rates (**Figure 1**).
  - 79% agreed that use of SOLTIVE™ Premium reduced the need for secondary stone procedures (**Figure 1** and **3**).
  - 82% agreed that the reduction in noise with SOLTIVE™ Premium improved the operating environment (**Figure 1**).
  - A significant proportion of respondents, 77%, expected use of SOLTIVE™ Premium to lead to a reduction in per-procedure consumable use (**Figure 4**).
    - Of those:
      - 96% believed that stone basket usage was reduced.
      - 35% believed that access sheath usage was reduced.
      - 19% believed that stent use was reduced.
- The choice of laser was not expected to significantly impact the need for an overnight stay following URS or PCNL (59% of all SOLTIVE™ Premium procedures, versus 61% with Ho:YAG, were expected to require overnight stays).
- Respondents who were involved in purchasing decisions suggested that time saving was the most important factor (**Figure 5**).
- Calculated economic impact:
  - In the UK setting, the results of this survey suggest that the economic benefit of utilizing SOLTIVE™ Premium rather than Ho:YAG for PCNL and URS procedures is £895 and £969, respectively (**Figure 6i**).

1 Respondent attitudes towards SOLTIVE™ Premium



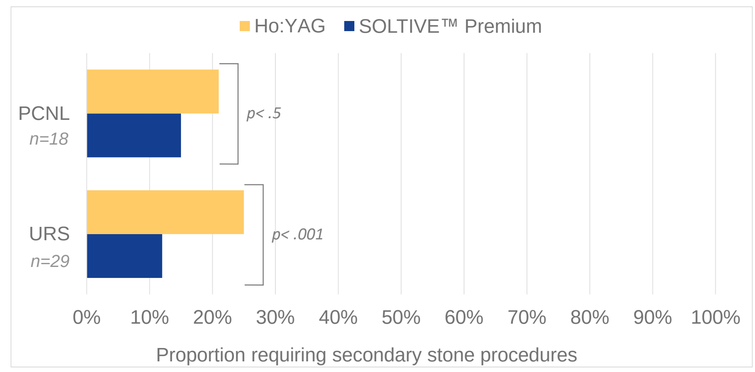
A chi-square test ($\chi 2$) was used to measure the likelihood that agreement (data combined into two nominal groups: strongly agree/agree and strongly disagree/disagree) each statement was due to random chance (assuming normally distributed, one degree of freedom). A lower p-value indicates that statistical significance (if any) is less likely to have been due to random chance. Note that percentages shown above are rounded to nearest whole number. ***Ho:YAG****: Holmium:yttrium-aluminum-garnet.*

2 Estimated procedure time reductions with SOLTIVE™ Premium



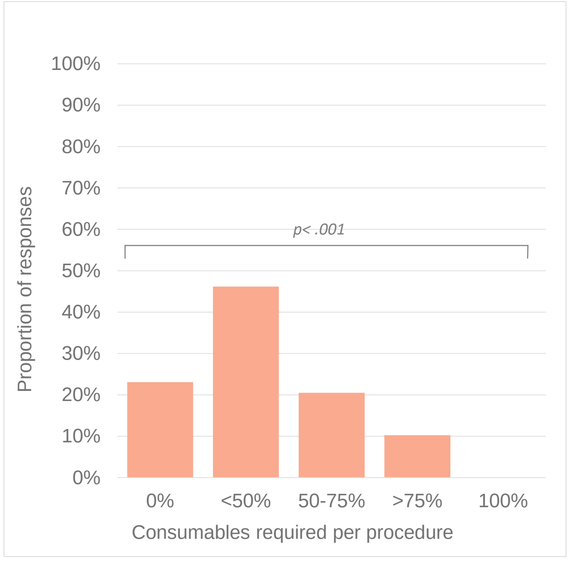
This figure shows box and whisker plots for the estimated reduction in procedure time using SOLTIVE™ Premium, compared to Ho:YAG, for PCNL and URS procedures. The darker line within each box represents the median estimate. The median line divides the box into a lower (1st quartile) and upper (3rd quartile) section. The x in each box represents the mean. The whiskers (vertical lines) extend from the ends of the box to the minimum estimated value and the maximum estimated value within the distance of 1.5 times the interquartile range. n=35 and n=21 for URS and PCNL, respectively. ***Ho:YAG****: Holmium:yttrium-aluminum-garnet;* ***PCNL****: percutaneous nephrolithotomy;* ***URS****: ureteroscopy.*

3 Secondary stone procedure estimates



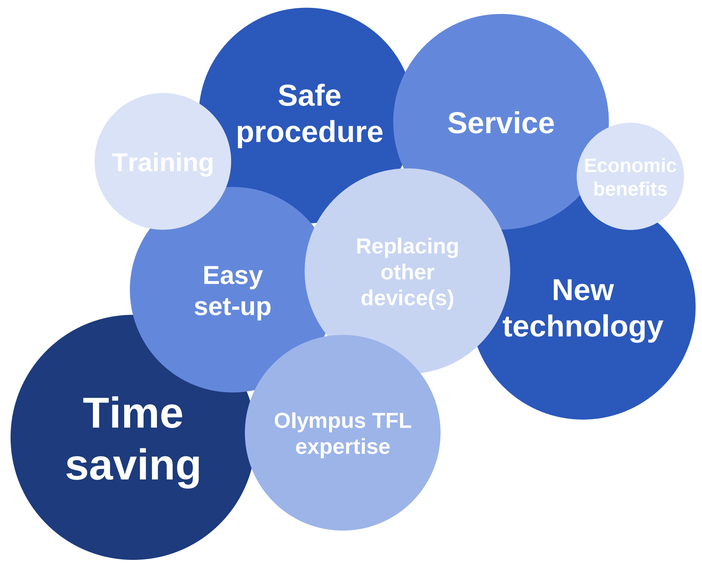
Two-tailed, t-test p-values were calculated to determine statistical significance. Responses where only either SOLTIVE™ Premium or Ho:YAG proportions were estimated were excluded from calculations for statistical significance. To be included, respondents had to estimate secondary stone procedure proportions for SOLTIVE™ Premium and Ho:YAG. n=18 for PCNL and n=29 for URS. ***Ho:YAG:*** *Holmium:yttrium-aluminum-garnet;* ***PCNL:*** *percutaneous nephrolithotomy;* ***URS:*** *ureteroscopy.*

4 Consumable utilization estimates



A chi square test ($\chi 2$) was used to measure the likelihood that agreement (data combined into two nominal groups: reduction and n o reduction) with each statement was due to random chance (assuming normally distributed, one degree of freedom). A lower p value indicates that statistical significance (if any) is less likely to have been due to random chance. n=39.

5 Reasons for purchasing SOLTIVE™ Premium



Bubble size was determined based on the frequency which each reason was referred to as a reason for purchasing SOLTIVE™ Premium (larger bubbles denote more agreement). Results are based on n=20 responses from respondents who were involved in hospital purchasing decisions. ***TFL****: Thulium Fiber Laser.*

Limitations

- All survey questions were optional and not all questions were answered by all respondents.
- Survey results reflect the opinions of a sample of European physicians and opinions and results may vary from case to case.

Conclusions

- Among surveyed physicians with SOLTIVE™ Premium experience, there was a high level of agreement that the SOLTIVE™ Premium improves resource-related outcomes compared to Ho:YAG for stone management procedures.
- Further research on clinical and economic benefits is required.

6i UK case study based on survey results: calculated economic impact of a hypothetical single patient treated with SOLTIVE™ Premium rather than Ho:YAG

PCNL		URS	
Calculated change in **procedure time**	£ 499	Calculated change in **procedure time**	£ 327
Calculated change in **secondary procedures**	£ 269	Calculated change in **secondary procedures**	£ 485
Calculated change in **overnight stays**	£ 10	Calculated change in **overnight stays**	£ 21
Calculated change in **consumables** required	£ 137	Calculated change in **consumables** required	£ 137
Total saving per URS procedure	**£ 895**	**Total saving per PCNL procedure**	**£ 969**

Note that these estimated per procedure savings were calculated based on varying levels of confidence and estimates as derived from the survey. URS and PCNL procedure times were based on published values and length of hospital stays based on UK expert opinion, as indicated in Figure 6ii.[5,6] ***Ho:YAG:*** *Holmium:yttrium-aluminum-garnet;* ***PCNL****: percutaneous nephrolithotomy;* ***URS****: ureteroscopy.*

6ii Notes to support Figure 6i results

Input	Value	Reference
Procedure time (minutes) (i) PCNL (ii) URS	(i) 126 (ii)63	*(i) Malik et al. 2007*[6] *(ii) Ryan et al. 2022*[5]
Minute of operating room time (£)	18	*Calculated based on Public Health Scotland National Statistics 2021 (R142X) and inflated with PSSRU*[7,8]
Cost of secondary procedure (£): (i) PCNL (ii) URS	(i) 6,140 (ii) 4,800	*National Schedule of NHS Costs 2020–2021, Elective:*[9] *(i) LB64C, LB64D, LB64E* *(ii) LB65C, LB65D, LB65E*
Length of stay (days) (i) PCNL (ii) URS	(i) 1.5 (ii)2.5	*Assumption based on expert input* *(i) 1–2 days* *(ii) 2–3 days*
Additional inpatient day (£): (i) PCNL (ii) URS	(i) 420 (ii) 370	*NHS Costs 2020–2021, Elective Inpatient Excess Bed Days:*[9] *(i) LB64C, LB64D, LB64E* *(ii) LB65C, LB65D, LB65E*
Consumables (£): (i) Stone basket (ii) Access sheath (iii) Stent	(i) 140 (ii) 100 (iii) 45	*(i)–(iii) Data on file*

NHS*: National Health Service;* ***PCNL****: percutaneous nephrolithotomy;* ***PSSRU****: Personal Social Services Research Unit;* ***URS****: ureteroscopy.*

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