



## Combination of holmium and thulium laser ablation in upper tract urothelial carcinoma

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Dear Editor

Thanks to the latest technological and technical advances in endourology, the management of upper tract urothelial cancer (UTUC) has changed over the last years, with expanding indications for a conservative approach.

The endourological management has been described by means of flexible ureteroscopes and of holmium:YAG fibre lasers [1]. A systematic review showed that oncologic outcomes at 5 and 10 years of follow-up were similar by comparing cohorts of low-risk UTUC patients undertaking either nephroureterectomy or endourological ablation [2].

Accordingly, since 2018 the European Association of Urology Guidelines on UTUC have recommended the elective conservative management of UTUC in selected patients with low-risk lesions, i.e., those 2 cm in size, solitary, low-grade, non-muscle-infiltrative and without upper urinary tract dilatation at CT scan [3].

More recently, the use of thulium laser (TL) has been described in the context of UTUC [4–6]: as far as it concerns the technical features, TL consists of a diode-pumped laser that provides a continuous wave and a lower tissue penetration, which allow for a more precise vaporization, excellent coagulation, and a lower risk of injury to normal tissue, making it the ideal laser to deal with soft tissue disease. In 2011, Defidio et al., in a series of 59 cases of UTUC, demonstrated that the thulium laser ablation was non-inferior to holmium:YAG laser ablation in terms of oncological outcomes [4]. More recently, Musi et al. [5] reported the outcomes of the largest published cohort of UTUC patients

( $n = 42$ ) undertaking thulium laser vaporization: the authors showed oncological outcomes comparable to those available in literature, with a recurrence-free survival of 81% at a median of 44 months of follow-up, and a very low rate of complications.

Drawbacks of TL is related to necrotic tissue adhering to the fiber tip, a drawback that may require multiple entries through the access sheath. On the other hand, owing to its pulsed nature, the energy released by the holmium laser (at the setting for tissue ablation) provides a more efficient cutting effect than electrocoagulation, but increases the risk of bleeding and impairs endoscopic vision.

Given the high volume of upper and lower urinary tract diseases to be managed conservatively, in our institution both holmium-YAG (Lumenis 120 W and Cook 30 W) and thulium-YAG (Revolix 120 W) lasers are available. A dedicated team performing endourological treatments of UTUC was established in 2017, in order to standardize techniques and optimize the use of technology; though no data are yet available in literature, we have started trialing the combination of holmium and thulium laser in this setting of patients since 2018, and up today 10 patients have been successfully treated with this approach.

The combined ablation technique starts with the thulium laser until the targeted tissues is fully necrotized on the surface: this step avoids the bleeding that usually occurs by using the holmium laser at this stage, especially in the cases of highly vascular lesions. The switch to the holmium laser allows for the removal of the necrotic layer to show up the eventual residual tumor tissue that needs to be further ablated; this step is facilitated by the pulsating property of the holmium laser. If further tissue needs to be ablated and/or vessels need to be coagulated, thulium laser is applied again (Figs. 1 and 2).

Although the oncologic outcomes are not yet mature to be published, our preliminary data are encouraging in terms of intra- and postoperative results, especially in terms of a better visibility and reduced bleeding. With the recent

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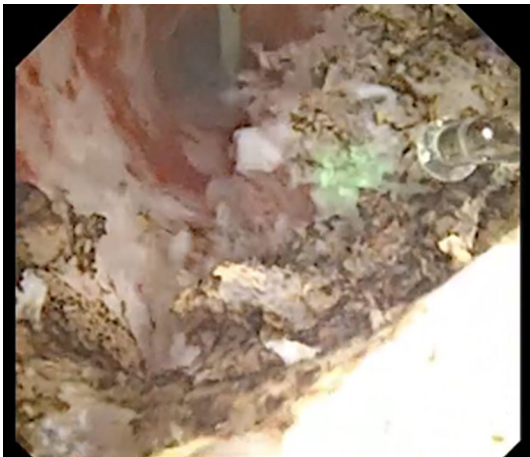
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**Fig. 1** Thulium + holmium



**Fig. 2** Thulium + holmium

introduction of the Revolix Duo, which combines the two lasers in the same machine with a single fiber to connect, we expect also to observe a reduction of surgical time compared to the conventional single-laser modality. Furthermore, in imperative cases with larger tumors, the combination of the two lasers might allow for a more complete tumor ablation without a second surgical session.

In conclusion, the combined use of holmium and thulium lasers for the endoscopic ablation of UTUC is a new promising technique that may allow for better surgical, oncological, and functional results compared to the conventional single-laser modality, as long as the ongoing study will confirm the preliminary results in the mid and long terms.

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