

Thulium™: YAG Laser Partial Nephrectomy: A Successful Approach for Small Renal Masses

Sanjay Garg^{1*}, Vijayant Govind Gupta², Ashvamedh Singh³ and Rachana Garg^{1,4}

¹*Helios Stone and Urology Center, Indirapuram, Ghaziabad, India*

²*Govind Healthcare Superspeciality Clinic, New Delhi, India*

³*Maulana Azad Medical College, New Delhi, India*

⁴*National Institute of Pharmaceutical Education and Research, Ahmedabad, Gujarat, India*

***Corresponding Author:** Sanjay Garg, Helios Stone and Urology Center, Indirapuram, Ghaziabad, India.

Received: April 09, 2019; **Published:** May 31, 2019

Abstract

Partial nephrectomy (PN) is now accepted as an appropriate treatment for small renal masses. Laser technology has been utilized for PN, however the procedure of Thulium laser for this treatment option is rare, thus far.

We report here a case of a 75-year-old gentleman who underwent thulium laser partial nephrectomy. The patient had a single T1 endophytic complex renal cyst (R.E.N.A.L. Nephrectomy score 9). He undertook thulium laser open PN with no obvious complications, both preoperative and post-operative. We have subsequently successfully carried out thulium laser PN with almost around 100 similar cases. Thus, thulium laser partial nephrectomy is an efficient intervention for small renal masses.

Keywords: *Partial Nephrectomy; Thulium Laser; Nephron Sparing Surgery; Surgical Lasers*

Introduction

The treatment strategy for small renal masses has changed: a shift has occurred from the usage of radical nephrectomy towards a frequent use of partial nephrectomy (PN) [1]. For patients having T1 renal tumors of size < 7 cm, PN is now being considered as the chosen treatment plan and practice for proper management [1]. PN provides comparable oncologic outcomes, with conservation of renal parenchyma. Reducing ischemia time and avoiding blood loss are the cornerstone for a successful partial nephrectomy and various techniques have been devised for this [2]. Laser technology (for example Nd Yag, CO₂ laser and Holmium laser) has been implemented in selected strings for both open PN and Laparoscopic PN (LPN) [3]. Thulium (Tm:YAG) laser technology has been recently initiated in case of urological soft tissue surgery; it has shown promise in prostate surgery. Literature on use of Thulium laser for partial nephrectomy is scarce. We have carried out nearly 100 cases thus far using Thulium laser at our clinical centre.

Case Report

A 75-year old male patient presented to us with history of a single episode of gross painless hematuria with passage of clots. He was evaluated biochemically and radiologically. His preoperative haemoglobin was 13.5 mg/dl, serum creatinine was 0.9 mg/dl. Liver function tests as well as chest skiagram were within normal limits. Contrast enhanced CT scan showed a Bosniak Type 5 cyst of 3 x 3.5 cm in mid-polar region of the patient's left kidney, which showed enhancement by 20 HU on contrast imaging (Figure 1). The cyst was completely endophytic with a R.E.N.A.L nephrometry score of 9 (high) [4]. He was taken up for open partial nephrectomy under general anaesthesia.



Figure 1: CECT image of the renal cyst (Red circle marks the tumor).

The tumor was approached through subcostal incision by transperitoneal approach. The colon was dropped and the kidney was completely mobilized along with the gerotas fascia. Hilar dissection was done and hilar control was achieved. Gerotas fascia was opened and the cyst was approached (Figure 2). Thulium laser system manufactured by the Quanta laser was used. We used a 365 micrometre fibre which was delivered through the ureteric catheter. All OT personnel wore supplied safety glasses. An ablation wattage of 80 watts and coagulation wattage of 40 watts was used to resect the cyst with oncological margins without renal hilar clamping. Blood loss was minimal. After resection, the bed was coagulated using thulium laser. No bleeding or urine leak was noticed. No capsular repair or omental wrapping performed (Figure 3).

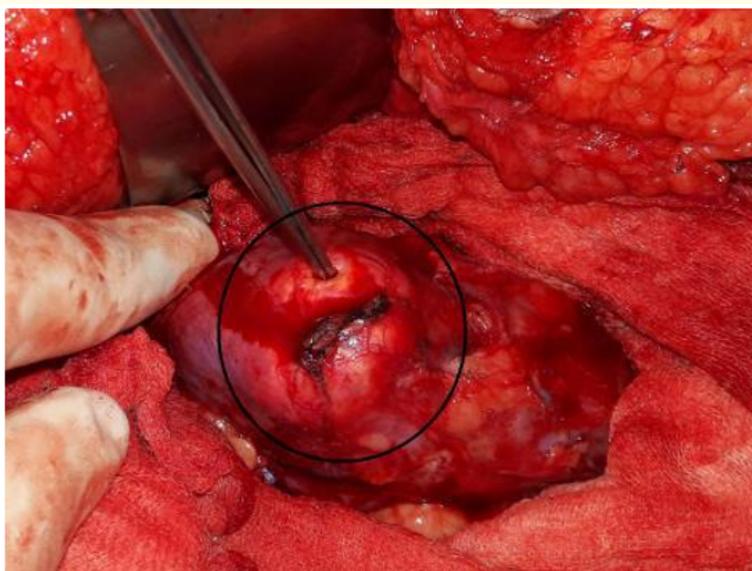


Figure 2: Renal cyst exposed with intact overlying parenchyma (Circle marks the cyst).



Figure 3: Post-operative appearance (Blood in the cavity was left to clot as there was no active pooling of blood on waiting).

Post operatively patient had an uneventful recovery. Drain output was minimal. Drain was detached on day 2 post-operation and the patient was discharged after 48 hrs of observation. The histopathology report showed clear cell renal cell carcinoma (Fuhrman grade 3) with no extracapsular extension. Patient was called for follow up and no complications were noted at 3 and 6 months of follow up.

Discussion

Partial nephrectomy is now accepted as the appropriate modality for the treatment and care management for patients having small renal masses [2]. The detrimental outcomes of chronic renal insufficiency in addition to the benign nature of small renal masses dictate highest renal preservation, wherever attainable. Ischemia time is an important modifiable risk factor for preservation of renal function. It has directed the development of selective renal hilar clamping, hypotensive surgery and non-clamping techniques [5]. Thulium laser is known to emanates at a wavelength of 2013 nm [6], which is closer to the absorption peak of water. Tm:YAG laser thus establishes a narrow tissue penetration and coagulation sector, thereby providing an extreme surgical protection. Besides, Tm:YAG possess a very good haemostatic and vaporization proficiency, making it an attractive source of energy for soft tissue surgery [5]. This excellent coagulation and ablation properties of Thulium allow PN to be performed without hilar clamping with minimal blood loss and excellent haemostasis [7]. Recently, Sciarra, *et al.* [7] reported implementing thulium laser enucleation technology for the management of small peripheral renal cell carcinoma. Our case was significantly more difficult as the tumor was completely endophytic and required resection as opposed to enucleation. No significant blood loss was seen in our case and dissection field remained dry throughout. Loertzer, *et al.* [8] used thulium laser approach to perform laparoscopic partial nephrectomy on exophytic renal tumors. Their strategy didn't needed the renal vessels to be clamped. As in our case, avoiding capsular repair for haemostasis is an added advantage which can significantly shorten clamp time in laparoscopic surgery.

Conclusions

Thulium laser is an effective energy modality to resect renal tumors. We have already done ~ 100 such cases having high nephrometry score lesions, thus providing conclusive support to our findings mentioned here.

Bibliography

1. Campbell SC., *et al.* "Guideline for management of the clinical T1 renal mass". *Journal of Urology* 182.4 (2009): 1271-1279.
2. Kyriazis I., *et al.* "Current evidence on lasers in laparoscopy: partial nephrectomy". *World Journal of Urology* 33.4 (2014): 589-594.
3. Korhonen AK., *et al.* "ND: YAG laser and regional renal hypothermia in partial nephrectomy". *Annales Chirurgiae et Gynaecologiae. Supplementum* 206 (1993): 59-62.
4. Osawa T., *et al.* "Comparison of percutaneous renal mass biopsy and R.E.N.A.L. nephrometry score nomograms for determining benign vs malignant disease and low risk vs high risk renal tumors". *Urology* 96 (2016): 87-92.
5. Gill IS., *et al.* ""Zero ischemia" partial nephrectomy: novel laproscopic and robotic technique". *European Urology* 59.1 (2011): 128-134.
6. Guzzo T. "Small renal masses: The promise of thulium laser enucleation partial nephrectomy". *Nature Reviews Urology* 10.5 (2013): 259-260.
7. Sciarra A., *et al.* "Thulium laser supported nephron sparing surgery for renal cell carcinoma". *Journal of Urology* 190.2 (2013): 698-701.
8. Loertzer H., *et al.* "Laser supported partial laparoscopic nephrectomy for renal cell carcinoma without ischaemia time". *BMC Urology* 13 (2013): 31.

Volume 2 Issue 3 June 2019

©All rights reserved by Sanjay Garg., *et al.*