Management of Positive Surgical Margins During Thulium Laser-Assisted Laparoscopic Partial Nephrectomy at Same Session: Case Report

Thulium Lazer Yardımıyla Yapılan Laparoskopik Parsiyel Nefrektomide Pozitif Cerrahi Sınırların Aynı Seansta Tedavisi

Yıldırım BAYAZIT,[a]
Deniz ABAT,[a]
Arkun AYTUTULDU,[a]
Şeyda ERDOĞAN,[b]
Şaban DORAN[a]

Departments of
[a]Urology,
[b]Pathology,
Çukurova University Faculty of Medicine, Adana

Geliş Tarihi/*Received:* 13.03.2014
Kabul Tarihi/*Accepted:* 29.11.2014

Yazışma Adresi/*Correspondence:*
Deniz ABAT
Çukurova University Faculty of Medicine, Department of Urology, Adana, TÜRKİYE/TURKEY
abatdeniz@yahoo.com

ABSTRACT We present a case of Thulium laser-assisted clamp-off laparoscopic partial nephrectomy (LPN) in which an immediate secondary excision was performed under warm ischemia because of positive surgical margins determined by intraoperative frozen section examination. A 37 year old male patient with a right renal mass underwent LPN. Excision was performed with a Thulium-YAG laser, leaving a 3-5 mm safety margin around the tumor without hilar clamping. Frozen section examination revealed a tumor thrombus in the surgical margin. A secondary excision of the surgical margin was performed by a cold scissors under warm ischemia in the same session. Histopathologic examination revealed Fuhrman grade II papillary renal cell carcinoma, and the surgical margins were negative on both sides of the second specimen. The use of laser cutting in LPN without hilar clamping is advantageous, because it provides the opportunity to complete secondary excision with or without warm ischemia, when indicated.

Key Words: Laparoscopy; laser therapy; nephrectomy; warm ischemia

ÖZET Burada ilk eksizyonu Thulium lazerle pediküle klemp koymadan yapılan, ancak operasyon sırasındaki frozın incelemede cerrahi sınırı pozitif gelen ve bunun üzerine sıcak iskemi altında ikinci eksizyonu yapılan bir laparoskopik parsiyel nefrektomi (LPN) olgusunu sunduk. Otuz yedi yaşındaki erkek hastaya sağ renal kitlesi nedeniyle LPN uygulandı. Eksizyon Thulium-YAG lazerle pediküle klemp konulmaksızın tümörün etrafında 3-5 mm güvenli mesafe bırakılarak yapıldı. Frozın incelemede cerrahi sınırda tümör trombüsü görüldü. Aynı seansta sıcak iskemi altında soğuk makas ile ikinci insizyon gerçekleştirildi. Patoloji sonucu; cerrahi sınırlar temiz, Fuhrman evre 2, papiller renal hücreli karsinom şeklinde rapor edildi. Pediküle klemp konulmadan yapılan LPN'de kesme işlemi için lazeri kullanmak, ikinci eksizyon gerekirse, sıcak iskemi altında yapılabilmesini sağlaması açısından avantajlıdır.

Anahtar Kelimeler: Laparoskopi; lazer tedavisi; nefrektomi; sıcak iskemisi

Turkiye Klinikleri J Urology 2014;5(3):77-82

Laparoscopic partial nephrectomy (LPN) remains a developing treatment modality for small renal tumors.[1] Positive surgical margin (PSM) rates of 0.7% to 4% have been reported in LPN, and there are still some controversial issues, such as the management of PSMs during LPN, whether frozen section examination (FSE) is necessary, and the best strategy if the FSEs are reported as PSMs or the final pathology reveals PSMs when an FSE has not been performed or has been reported as negative.[2]

Many alternative treatment methods are used for small renal masses such as cryotherapy, thermoablation, radiofrequency ablation, high intensity focused ultrasonography, ethanol ablation and microwave coagulation.[3] Laser-assisted laparoscopic partial nephrectomy (LA-LPN) has also been performed in humans by some authors.[3-7] Laser energy may contribute some advantages in laparoscopic surgery such as good hemostasis, decreased blood loss and safe oncologic results, but this issue is not clear.

Herein, we present a Thulium laser-assisted LPN case in which an immediate secondary excision was performed under warm ischemia because of PSMs determined by an intraoperative frozen section examination. To our knowledge, this is the first LA-LPN case in which a frozen section examination revealed a PSM and secondary excision was performed laparoscopically during the same session without conversion to open surgery.

CASE REPORT

LA-LPN was performed on May 1, 2008 via a transperitoneal approach using 4 trocars in a 37-year old male patient with a 2 cm exophytic mass in the mid-lateral part of the right kidney (Figures 1, 2). Patient signed an informed consent form. With the patient under general anesthesia and in lithotomy position, cystoscopy was performed and a ureteral catheter was inserted in the right ureter. The position of the patient was changed to a 60° left lateral decubitus position, and 4 trocars were placed for transperitoneal laparoscopy. The kidney was approached after mobilization of the ascending colon. The renal hilum was prepared, and vascular tape was placed loosely around the pedicle. No hilar clamping was performed. A home-made

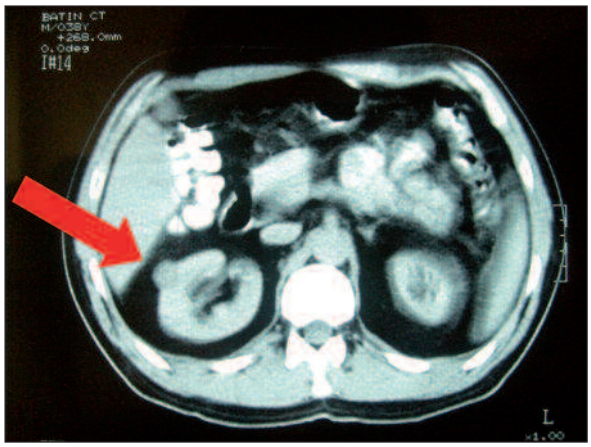

FIGURE 1: Abdominal CT confirming right exophytic renal tumor.

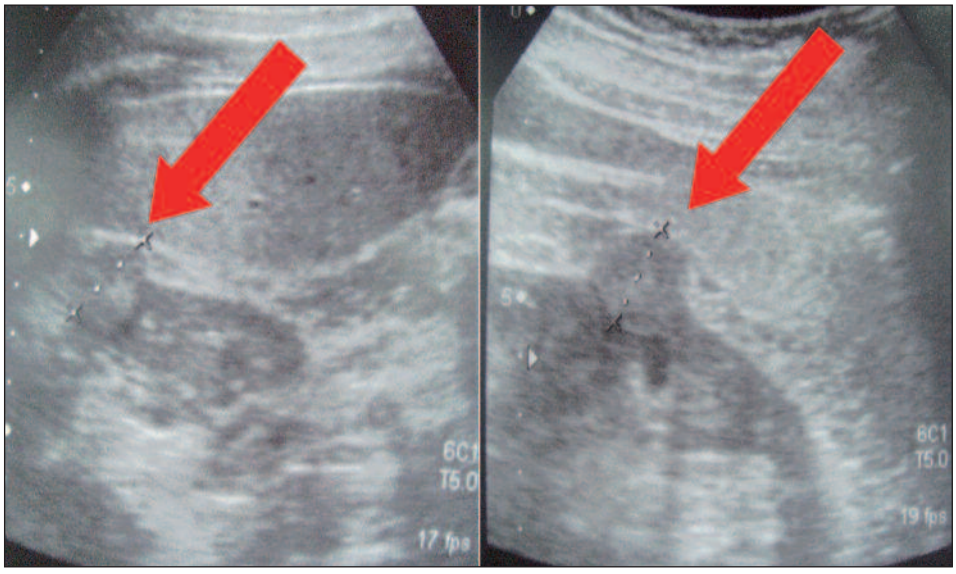

FIGURE 2: Ultrasonographic appearence of the tumor.

apparatus was developed for the laser fiber for use in laparoscopy (Figure 3). The apparatus consisted of an Amplatz dilator (18 F), an open-end ureteral catheter (6 F), a Foley catheter (16 F), and an IV (intra venous) infusion set. The distal end of the Foley catheter was cut, and the connecting hub of the IV infusion set was inserted into the Foley catheter. The distal end of the Amplatz dilator was connected to the proximal end of the Foley catheter. The ureteral catheter was inserted into the Amplatz dilator through a small puncture in the back of the Foley catheter until the tip of the catheter could be observed approximately 3-5 mm from the proximal end of the Amplatz dilator. The laser fiber was then inserted through the ureteral catheter. Saline infused through the lumen of the Amplatz dilator flowed around the ureteral catheter and provided cooling of the tip of the laser fiber and decreased the amount of smoke. The ureteral catheter provided stabilization and easy control of the laser fiber.

Excision was performed using a 550 µm Thulium-YAG laser (RevoLix DUO, LISA Laser Products OHG, Katlenburg-Lindau, Germany) fiber, leaving a 3-5 mm margin of safety around the tumor (Figure 4), and the specimen was extracted. Intraoperative FSE revealed a tumor thrombus in the surgical margin, and immediate secondary excision under warm ischemia was decided. The renal pedicle was clamped, and a parenchymal layer approximately 5 mm in thick-

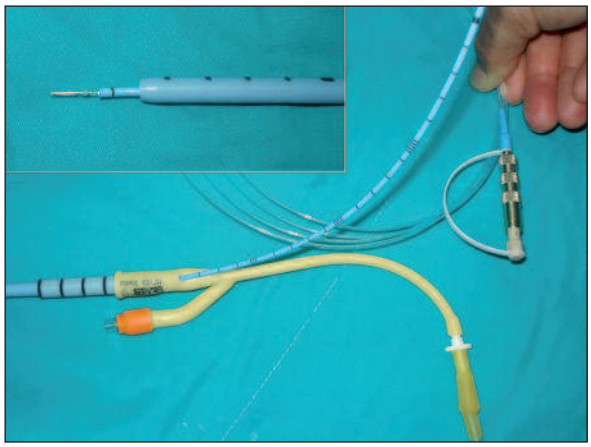

FIGURE 3: "Home-made" apparatus for laser use.

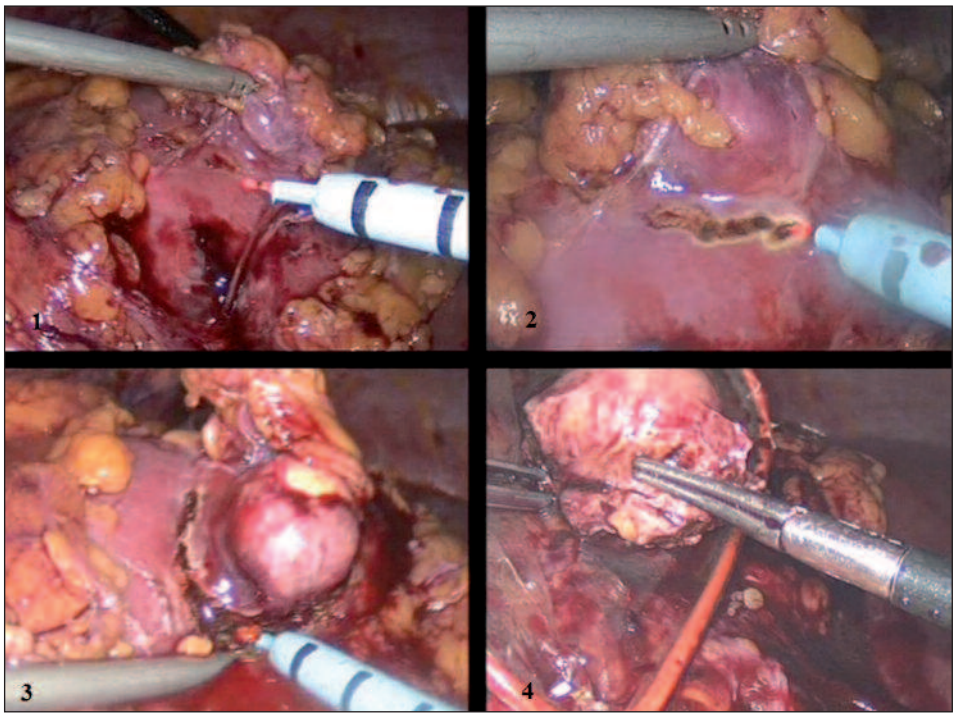

FIGURE 4: Tumor was resected with laser.

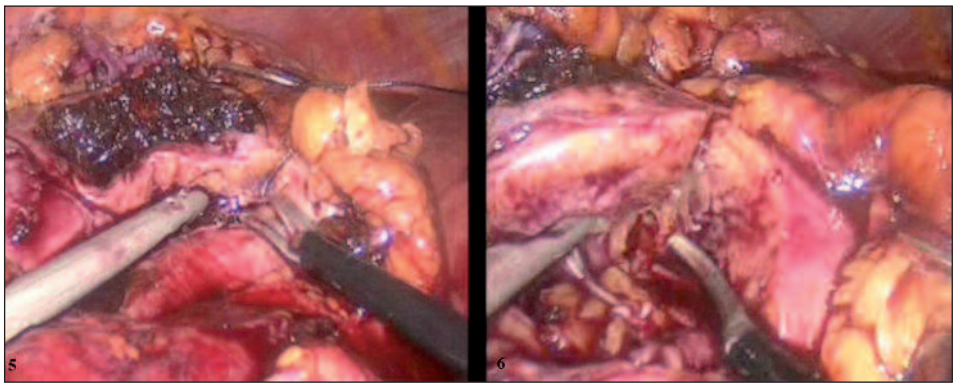

FIGURE 5: Deep resection with cold scissors.

ness was excised with cold scissors (Figure 5). After repairing the collecting system with continuous 3/0 polyglactin sutures, hemostatic agent, Floseal (Baxter Biosciences, Vienna, Austria) was applied, and the parenchyma was sutured over a Surgicel (Ethicon Endo-Surgery, Cincinnati, Ohio) bolster using 1/0 polyglactin sutures. The clamp placed on the renal pedicle was opened, and after bleeding was controlled, a drain was inserted. At the end of the operation, contrast medium was injected through the ureteral catheter under fluoroscopic control. There was no extravasation, and the ureteral catheter was drawn.

The operation and warm ischemia times were 200 and 25 minutes, respectively. The estimated blood loss was 350 mL. The urethral catheter and drain were removed at 7 and 18 hours, respectively, and the patient was discharged at 24 hours postoperatively. The final histopathologic examination revealed a papillary renal cell carcinoma (Fuhrman grade II), and the surgical margins were negative on both sides of the second specimen. The patient has been under follow-up for 70 months without any problem, and his right kidney is currently functioning well.

DISCUSSION

The pioneers of lasers using in clinical urology were Parsons in 1966 with studies in canine bladders, and Mulvany in 1968, with experiments in calculi fragmentation.[8] To date, lasers are widely used within urology, particularly in the treatment of benign prostatic hyperplasia, urolithiasis, stricture disease, and cancers of the bladder, kidney, and prostate.[8] There are many different types of lasers, and each has different features. The Thulium-YAG laser, which was used in this case, is a 2.0 μm continuous wave laser with a penetrating tissue depth of approximately 0.5 mm, and it concurrently cuts and coagulates. With this laser, efficient and safe vascular coagulation is possible up to a vessel diameter of 1.5-1.6 mm.[6,9] LPN without the need for hilar occlusion in three human cases using the Ho:YAG laser was first reported by Lotan et al. in 2002.[10] Gruswitch and colleagues reported Thulium laser-supported partial nephrectomy with an open technique for renal cell carcinoma in five patients in 2008.[6] Mattioli and colleagues published one LPN and eight open partial nephrectomies with a Thulium laser.[7] The present case was performed on May 1, 2008. At that time, it was one of the first cases performed with a laparoscopic approach. More recently, Thomas et al. evaluated the Thulium:YAG laser in LPN on fifteen patients. They concluded that the Thulium laser system offers excellent hemostasis and precise resection capability of the renal cortex .[5] Sciarra et al. presented the results of 10 high risk patients with ASA (American Society Anesthesiologists) grade III, who underwent open or laparoscopic Thulium laser- assisted nephron sparing surgery. They suggested that Thulium laser-assisted renal cell carcinoma (RCC) enucleation is a feasible and safe procedure particularly in elderly high risk pa-

tients.[11] In another study, authors performed laser supported LPN in 11 patients and concluded that laser supported LPN without clamping the renal vessels seem to be safe method for resection of peripheral and small renal tumors with few complications.[12]

In our initial cases of laparoscopic partial nephrectomy, we routinely inserted a ureteral catheter to detection of collecting system defect at the beginning of the operation irrespective of tumour size and location. After having gained experience, we are using this procedure only in selected cases.

A positive margin following LPN does not necessarily indicate residual disease, but close follow-up is necessary. In a review article, the authors concluded that close follow-up is more appropriate than surgical reintervention for the management of PSMs after PN.[2] However, the type of the treatment if frozen section examination during LPN for surgical margins positive is still controversial. In this case, frozen section examination was preferred by the surgeon because this was his first experience with laser-assisted LPN. During the learning curve of our laparoscopic partial nephrectomy program, we routinely used frozen examination of the tumour bed biopsy. Later, published data about frozen examination showed that it is invaluable in most cases. Now, we are using this procedure only in complex cases as needed. As mentioned above, there is no consensus regarding the management of PSMs during an operation.

It is debatable whether secondary excision with the laser is better compared to a cold-scissor excision under warm ischemia. As mentioned, our case was one of the first cases of Thulium laser-assisted LPN in the literature when it was performed. Therefore, there was no reliable information in the literature about laser excision. For that reason, the surgeon preferred a conventional method for the secondary incision.

Each laser system has a different effect on tissue regarding hemostasis, cutting, tissue penetration and carbonization, smoke generation, blood splattering, and other parameters.[9] During the procedure, smoke and blood splattering can cause loss of visibility and may disturb the surgeon during a cutting session. Additionally, severe tissue carbonization may have an unfavorable effect on histopathology. In this case, saline infusion during tissue cutting eliminated the smoke and provided clear visualization. The equipment that was used in the operation to stabilization of laser fiber and infusion of saline was homemade. Applicator for laparoscopic laser surgery is available as commercial product, but we had no this applicator during this procedure. The histopathologic appearance of the specimen was acceptable. To date, very little clinic data are available regarding LPN with either a Thulium laser or other laser types, and further studies are needed. In our opinion, although the effect of laser energy on surgical margins in LPN is debatable, the use of a laser has the advantage of not requiring hilar clamping, and when a PSM is encountered during LPN, the initial use of a laser provides the opportunity of secondary excision either with the laser again or with cold scissors under warm ischemia, when indicated.

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