

## LAPAROSCOPIC URETEROLITHOTOMY VERSUS LASER LITHOTRIPSY IN MANAGEMENT OF UPPER URETERIC STONES

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### ABSTRACT:

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**Background:** *The optimal treatment for ureteral calculi must consider many factors, including stone composition, location and size, patient characteristics, technical skills of the surgeon, and instrument availability.*

**Aim of the Work:** *To assess the result of ureteroscopic lithotripsy using holmium laser with laproscopic ureterolithotomy in the management of proximal ureteral stones larger than 10mm.*

**Patients and Methods:** *80 patients with unilateral upper ureteral stones were randomly divided into two groups: one group underwent ureteroscopic holmium laser lithotripsy (n=40), and another group underwent laparoscopic ureterolithotomy (n=40). Operating time, postoperative hospitalization time, stone clearance rate and perioperative complications were compared.*

**Results:** *Operation was successfully performed in all 80 cases, and no open surgery was converted in any case. In the ureteroscopy and laparoscopy groups, the mean operating time was  $33.83 \pm 6.39$  min and  $107.25 \pm 20.13$  min, respectively, their hospitalization time was  $1.65 \pm 0.48$  days vs.  $3.90 \pm 0.63$ days, and stone clearance rate was 880.0% (32/40) vs. 95% (38/40), and residual stones were removed by extracorporeal shock-wave lithotripsy (ESWL). All patients were followed up for more than three months, and no serious complications such as ureterostenosis occurred.*

**Conclusion:** *Laparoscopic ureterolithotomy and Ureteroscopy are both effective and reliable for the treatment of proximal ureteral stones. However, considering the shorter operation and hospitalization times we suggest that ureteroscopy, as a minimally invasive method, may be the first choice in the treatment of proximal ureteral stones.*

**Keywords:** *Laparoscopic Ureterolithotomy, Ureteroscopy Management, Lithotripsy, Ureteral Stone.*

### INTRODUCTION:

The optimal treatment for ureteral calculi must consider many factors, including stone composition, location and size, patient characteristics, technical skills of the surgeon, and instrument availability.<sup>1</sup>

Ureteroscopy has already become amajor technique for the diagnosis and

treatment of ureteric lesions. For upper urinary tract lithiasis, the use of ureteroscopic approach has been increasing continuously<sup>1</sup>.

The development of smaller-caliber semirigid and flexible ureteroscopes and the introduction of improved instrumentation, including deflectable-tip endoscopes, ureteral access sheaths, superior optics, and

stone-retrieval devices, have led to the development of ureteroscopy as a safe and effective treatment option for ureteral stones in all locations.<sup>2</sup>

Meanwhile, laparoscopy as a minimally invasive treatment is gradually gaining place in the treatment of urinary stones.<sup>3</sup>

The highest level of evidence was IIa for laparoscopic ureterolithotomy and recommended (grade B) for large impacted ureteral stones or when endoscopic ureterolithotripsy or shock wave lithotripsy (SWL) has failed.<sup>4</sup>

An impacted stone is defined as a stone that cannot be bypassed either by a wire, or a catheter, or a stone remaining at the same site in the ureter for over 2 months.<sup>5</sup>

Ureteroscopic lithotripsy (URSL) using holmium laser has good results with low complications, while stone migration or complications still existed.<sup>6</sup>

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#### **AIM OF THE WORK:**

To assess the result of ureteroscopic lithotripsy using holmium laser with laproscopic ureterolithotomy in the management of proximal ureteral stones larger than 10mm.

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#### **PATIENTS AND METHODS:**

This study was conducted on 80 patients with upper ureteric stone over a period of 2 years from January 2017 to January 2019. The study protocol was approved by the Urology Department of Ain Shams University review board and Faculty of Medicine Ain Shams University Research Ethics Committee (FMASU REC). Informed consents were obtained from all participants.

**Patients were allocated into two groups (A) and (B);**

- Group (A) includes 40 patients managed by laser lithotripsy either by flexible ureteroscopy, rigid ureteroscopy.
- Group (B) includes 40 patients managed by laparoscopic ureterolithotomy.

#### **Preoperative Evaluation:**

All patients underwent detailed history taking about medical, sexual, family and surgical history. Demographic features and medical history included age, occupation, body mass index (BMI), parity, and past history of previous stone surgeries.

All patients underwent a complete blood count, serum urea and creatinine measurement, bleeding and coagulation profile analysis, urinalysis and urine culture, KUB, intravenous urography, and computed tomography without contrast.

#### **Surgical technique:**

##### **Anesthesia:**

General or spinal anesthesia in case of ureteroscope.

##### **Position:**

Lithotomy position in case of ureteroscopy for laser lithotripsy.

##### **Ureteroscope Procedure:**

In this procedure, 7.5- or 8.5-F semi-rigid ureteroscopy (R. Wolf TM) was used for URS and flexible URS (Karl Storz Flex-X 2TM) was used secondarily when necessary.<sup>7</sup>

##### **Laparoscopic ureterolithotomy:**

Three trocars (10–12 mm) were used for laparoscopic ureterolithotomy. The initial port was placed by the open method at the junction of the 12th rib and posterior axillary line. In the open method, a 1.5 cm incision was made in the fascia of the external oblique muscle.

The retroperitoneal space was accessed by puncturing the fascia of the transversus abdominis muscle with a blunt clamp. First,

an 800-mL space was created with a finger and then with a balloon dissector while the peritoneum was shifted medially at the same time.

The second port was placed 1 cm anterior to the 11th rib. The third port was placed at the anterior axillary line, 2 cm superior and 2 cm medial to the spina iliaca anterior superior.

After expansion of the retroperitoneum and opening of Gerota’s fascia, the ureter was identified over the psoas muscle. Protuberance of the stone was noted, and the stone was grasped with a Babcock clamp. After stabilization of the stone, the ureter was incised vertically with a wedge-tipped endoscopic scalpel.

The stone was extracted with right-angle forceps. It was placed in an endobag, and a 26 cm antegrade DJ ureteral catheter was inserted.

The ureteral incision was closed using 4/0 Vicryl suture. A Hemovac drainage catheter was placed in the periureteric area near the second port site. The DJ catheter was left in place for 7 days.<sup>8</sup>

**Postoperative care and follow up:**

The stone-free rate after the first attempt was assessed with X-ray, KUB on the first postoperative day.

The first attempt was considered successful in patients who had residual fragments smaller than 2 mm and no conversion of the primary procedure to another.

Stone status was assessed with physical examination, urinalysis, X-ray, KUB, and urinary ultrasound.

When there was any suspicion, non-contrast computed tomography was used to assess the stone status.

All statistical analyses were performed with SPSS version 20.0 statistical software. Means were compared with group t test, and rates were compared with Chi-square test.

P < 0.05 was considered statistically significant.

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**RESULTS**

80 patients were included in this study, there was no significant statistical difference among the studied groups regarding age, sex, BMI and stone site, which means that patients were homogenously distributed between both groups as shown in table (1).

Table (1): Demographic data of patients

		Group I	Group II	P-value	Sig.
		No. = 40	No. = 40		
Age	Mean ± SD	42.12 ± 11.91 years	46.80 ± 10.99 years	0.155	NS
	Range	(22 – 65)	(33 – 65)		
Gender	Male	25 (62.5%)	27 (67.5%)	0.639	NS
	Female	15 (37.5%)	13 (32.5%)		
BMI	Mean ± SD	27.60 ± 3.45	28.18 ± 3.34	0.451	NS
	Range	23 – 33	23 – 33		

Operative time was significantly shorter at ureteroscopy group, mean operative time was 33.83 ± 6.39 minutes, while at laparoscopy group the mean operative time was 107.25 ± 20.13 minutes, which was

highly significant shorter in ureteroscopy group (p-value: 0.000).

At ureteroscopy group the mean duration of hospital stay was 1.65 ± 0.48days which was shorter than that in laparoscopy group the median duration was

3.90 ± 0.63 days and the difference was statistically significant (P-value: 0.000).

Residual stone occurred in 8 cases (20%) in ureteroscopy group, while in laparoscopy group occurred in 2 cases (5%) and the difference was statistically significant. (P-value: 0.043).

At ureteroscopy group 12 patient(30%) needed postoperative analgesic, while at laparoscopy group 28 patient(70%) needed postoperative analgesic (p-value:0.000), in ureteroscopy group 5 patient(12.5%) had ureteral false passage, while at laparoscopy group no patient (0%) had ureteral false passage (p-value:0.021).

In our study; ureteral false passage was significantly more in the ureteroscopy group more than laparoscopy group (12.5% and 0%, respectively), which is significant (p-value:0.021), while Yuan Shao et al. found in 2015 that ureteral false passage was significantly more in the ureteroscopy group more than laparoscopy group (3.6% and 0%, respectively).

Urine leakage was more in laproscopic ureter lithotomy occurred in 2 cases (5%) while no cases of urine leakage occurred in ureteroscope group, while Yuan Shao et al. found that urine leakage occur in 5 cases (3.7%) of laproscopic ureterolithotomy and no cases of urine leakage occurred in ureteroscope group.

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## **DISCUSSION:**

Ureteral stones are usually treated with SWL and URS. Various studies reported that SWL has lower stone-free rates and a higher number of procedures for large proximal and mid-ureter stones.<sup>9 10 11</sup>

Although URS is the first option for ureteral stones, its success rate is decreased in large mid or upper-ureter stones.<sup>12</sup>

Laparoscopic surgery developed markedly in recent years, and the indications

for open surgery have thus significantly decreased in patients with renal and ureteric stones, shorter convalescence period, less analgesic requirement, early mobilization and early oral feeding are advantages of laparoscopic surgery.<sup>13</sup>

In our study; the operative time was significantly shorter in ureteroscopy group using laser lithotripsy than in the laparoscopic ureterolithotomy group 33.83 ± 6.39 min and 107.25 ± 20.13 min, respectively(p-value:0.000).

*Basiri and his collages* in their randomized controlled study on total of 100 patients found that mean operative time in ureteroscopy group was 42.7 ±17.9 min, while in laparoscopic ureterolithotomy was 127.8±41.8 min.<sup>14</sup>

The shorter operative time with URS was reported in various studies which can reflect the regular practice and the familiarity of most urologists with this procedure.<sup>15 16 17</sup>

In our study; the hospital stay was significantly shorter in ureteroscopy group using laser lithotripsy than in the laproscopic ureter lithotomy group 1.65 ± 0.48 days and 3.9 ± 0.63 days, respectively (p-value:0.000).

*Liu and his colleagues* found in their randomized controlled study on 90 patients that mean hospital stay in ureteroscopy group was 5.1 ± 0.6 days while in laparoscopy group was 4.5 ± 0.48 days.<sup>16</sup>

The stone free rate was significantly more in the laparoscopy group than ureteroscopy group using laser lithotripsy 95% and 80%, respectively(p-value: 0.043).

These results were consistent with *Neto and his colleagues* who compared laparoscopic ureterolithotomy and ureteroscope in 48 patients with large proximal ureteral stones >1 cm, The stone clearance rate was significantly higher in the laparoscopy group (93.3 %) as compared to

the ureteroscopy group (62.5 %) and SWL (35.7 %) group.<sup>18</sup>

The postoperative analgesic demand was significantly more in the laparoscopy group than ureteroscopy group 70% and 30%, respectively (p-value:0.000).

**Yuan Shao and his colleagues** found in there study held on total of 275 patients that postoperative analgesic demand in laparoscopy group and in ureteroscopy group (59.6% and 25.9%, respectively).<sup>19</sup>

In our study; ureteral false passage was significantly more in the ureteroscopy group more than laparoscopy group (12.5% and 0%, respectively), which is significant (p-value:0.021), while **Yuan Shao et al.** found in 2015 that ureteral false passage was significantly more in the ureteroscopy group more than laparoscopy group (3.6% and 0%, respectively).<sup>19</sup>

Urine leakage was more in laproscopic ureter lithotomy ocured in 2 cases (5%) while no cases of urine leakage occurred in ureteroscope group, while **Yuan Shao et al.** found that urine leakage occur in 5 cases (3.7%) of laproscopic ureterolithotomy and no cases of urine leakage occurred in ureteroscope group.<sup>19</sup>

There were no significant difference between ureteroscopy group and laproscopy group as regard postoperative temporary fever (25% and 1 0%, respectively), urinary tract infection (12.5% and 5%, respectively), urine leakage (0% and 5%, respectively), and ureteral perforation (5% and 0%, respectively).

### **Conclusion:**

Laparoscopic ureterolithotomy and FURS are both effective and reliable for the treatment of proximal ureteral stones. However, considering the shorter operation and hospitalization times we suggest that ureteroscopy, as a minimally invasive method, may be the first choice in the treatment of proximal ureteral stones.

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مقارنة بين تفتيت الحصوات بالليزر واستخراج الحصوات عن طريق منظار البطن في علاج حصوات اعلى الحالب

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### المستخلص

**الخلفية:** واحدة من المشاكل الطبية الشائعة في عامة السكان هي حصوات المسالك البولية, يختلف حدوث حصوات الجهاز المسالك البولية وفقا للعمر والجنس والسلالة, في الوقت الحاضر, انخفض استخراج حصوات المسالك البولية جراحيا بسبب التطور الكبير في تقنيات المناظير.

**الهدف من الدراسة:** مقارنة بين تفتيت الحصوات بالليزر واستخراج الحصوات عن طريق منظار البطن في علاج حصوات اعلى الحالب.

**المرضى والأساليب:** شملت هذه الدراسة ٨٠ مريضة تعاني من حصوة اعلى الحالب. تم حجز المرضى من العيادة الخارجية الخاصه بقسم المسالك جامعه عين شمس في الفترة من يناير ٢٠١٧ الي يناير ٢٠١٩. تمت محادثة جميع المرضى حول نتائج العملية, وبعد الفحص الاكلينيكي العام والموضعي واخذ التاريخ الطبي والجراحي المفصل لكل منهم, تم شرح جميع تفاصيل العملية ومضاعفاتها واخذ الموافقة المسبقة لاجراء العملية وتم توزيع المرضى عشوائيا الى جزئين متساويين, الجزء الاول تم اجراء منظار الحالب لتفتيت واستخراج الحصوة والجزء الثاني تم اجراء استخراج للحصوة عن طريق منظار البطن.

**النتائج:** وجدنا عند تحليل نتائج العملية ان نسبة التخلص من الحصوة في عملية منظار البطن وصلت الى ٩٥% بينما وصلت في عملية منظار الحالب الى ٨٠%. متوسط مدة التدخل الجراحي في عملية منظار البطن  $20.13 \pm 107.25$  دقيقة بينما كان متوسط مدة التدخل الجراحي في حالة منظار الحالب اقصر وكان  $6.39 \pm 33.83$  دقيقة. متوسط مدة الإقامة بالمستشفى في عملية منظار البطن  $0.63 \pm 3.90$  يوم بينما كان متوسط مدة الإقامة بالمستشفى في حالة منظار الحالب اقصر وكان  $0.48 \pm 1.65$  يوم.

**الاستنتاج:** تؤكد هذه الدراسة علي ان معدل التخلص الكامل من حصوات اعلى الحالب اعلى في حالة اجراء منظار البطن لاستخراج الحصوة عن استخدام منظار الحالب والليزر ولكن يتميز استخدام منظار الحالب والليزر بمدة تدخل جراحي اقل ومدة اقامة بالمستشفى بعد العملية اقل.