



# The Outcome of Laparoscopic Ureterolithotomy-the Initial Experience in a Divisional Level Tertiary Hospital

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## Abstract:

**Objectives :** To see the outcome of laparoscopic ureterolithotomy as a beginner

**Methodology:** This was an observational study that was conducted in the Department of Urology, Rangpur medical college from the period from January 2019 to June 2021. The patient's ages range from 20 years to 60 years. The patients were selected from those with urinary stone disease and were admitted in the urology department. Those with large impacted stones in the ureter with good renal and cardiac functional status were selected. Laparoscopic ureterolithotomy via transperitoneal approach was performed in every case under general anesthesia. DJ stent was given in every case, and the ureterotomy wound was closed with 4-0 round body vicryl. All patients were mobilized and returned to oral feeding on the morning of 1<sup>st</sup> postoperative day. The catheter was removed on 2<sup>nd</sup> postoperative day, and the drain was removed on the third postoperative day if the drainage level fell below 50 mL. The D-J catheter was removed under local anesthesia between the second and fourth postoperative weeks. Complications were classified according to the modified Clavien classification system [12]. All patients were given follow-up for 3 months. IVU was done in every case to evaluate stricture at 3<sup>rd</sup> month of follow-up. The data were recorded and analyzed with Microsoft excel software 2021.

**Result :** Total 25 cases were recorded. The mean patient age was  $39.3 \pm 5.9$  years. There were 16 male (63.3%) male and 9 (26.7%) female patients in the study.

Stones were located on the right side in 17 (62.9%) patients and on the left side in 8 (37.1%) patients. The size of the stones varied from 12 to 19 mm, and the mean stone size was  $15 \pm 2.5$  mm. The mean operative time was  $125 \pm 8.9$  minutes. Intraoperative insertion of the D-J stent was performed in all patients. The D-J catheter was removed under local anesthesia between the second and fourth postoperative weeks. Complications were classified according to the modified Clavien classification system [12].

**Conclusion :** Laparoscopic ureterolithotomy can be considered an intermediate step in gaining experience and developing the necessary skills in utilizing the laparoscopic approach in more complicated reconstructive or radical urological surgery. As a beginner in laparoscopic procedure, the outcome of this laparoscopic ureterolithotomy in our unit is satisfactory, and patient compliance is very good.

**Keywords:** Laproscopy, stone surgery, ureterolithotomy, Initial outcome.

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### Introduction :

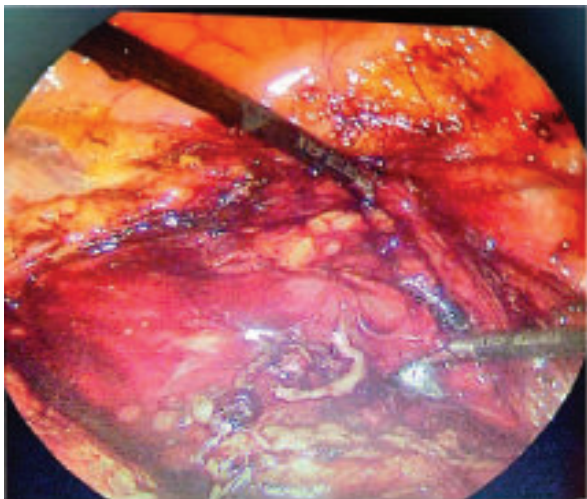
In this modern era, open stone surgery incidence is infrequent, ranging from 1 to 5.4%.<sup>1-4</sup> The invention and use of lasers have further increased urologists' interest in endoscopic stone disease management.<sup>5</sup> Despite the drawbacks of ureterolithotomy, it still holds ground in stones that are inaccessible and difficult to fragment by endourologic procedures.<sup>6</sup> Laparoscopic ureterolithotomy bridges the gap between open and endourologic approaches as it is minimally invasive and overcomes a few of the disadvantages of open ureterolithotomy.<sup>7</sup> Laparoscopic ureterolithotomy by transperitoneal route is a versatile technique for ureteric stones in all locations.<sup>8,9</sup> The advantages of laparoscopic ureterolithotomy using the transperitoneal route are large peritoneal space for instrument handling and intra-corporal suturing, making the procedure comparatively easy. Laparoscopic surgery provides more patient satisfaction than open surgery from a cosmetic perspective. It also effectively reduces postoperative pain, operative wound complications, blood loss, and the length of hospital stay. Accordingly, it has been remarkably developed in urology over the past 20 years. Laparoscopy as a

minimally invasive treatment is continuously gaining a place in treating urinary stones, mainly replacing open surgery.<sup>10</sup> It is recommended chiefly (grade B) for large impacted stones or when endoscopic ureterolithotripsy or shock wave lithotripsy have failed.<sup>11</sup> The urology department of Rangpur medical college has started routine laparoscopic procedures since 2019, and the study was executed to see the outcome of laparoscopic ureterolithotomy and share our experience .

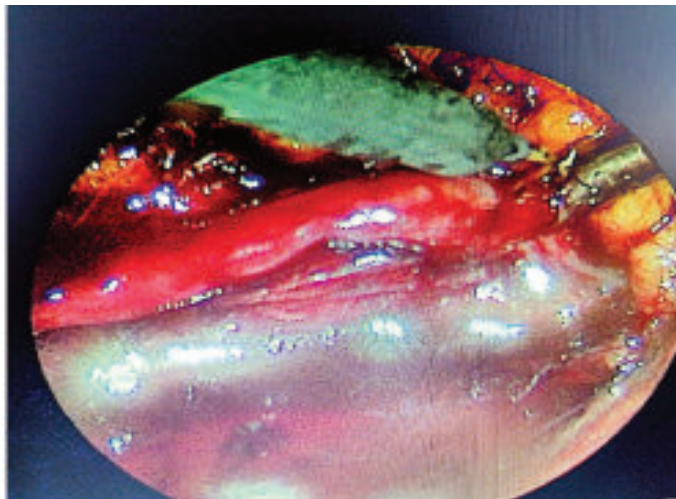
### Methodology :

This was an observational study that was conducted in the Department of Urology, Rangpur medical college from the period from January 2019 to June 2021. The patient's ages range from 20 years to 60 years. The patients were selected from those with urinary stone disease and were admitted to the urology department. Those with large impacted stones in the ureter with good renal and cardiac functional status were selected. The preoperative evaluation included a detailed history, urinalysis, urine culture, complete blood count, biochemical analysis of serum, and intravenous pyelography, computed tomography, or both.

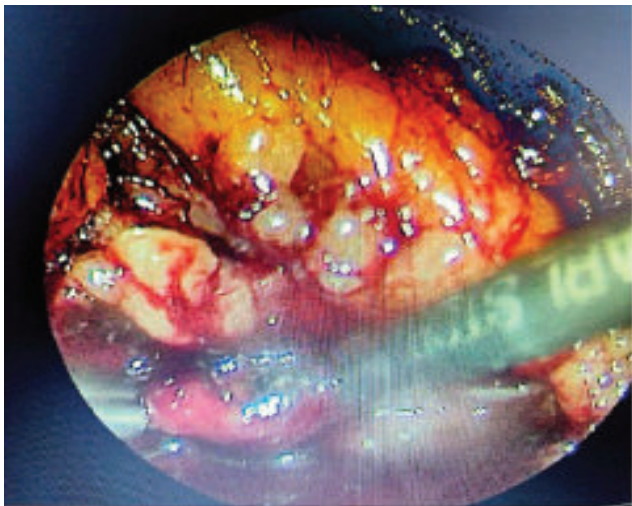




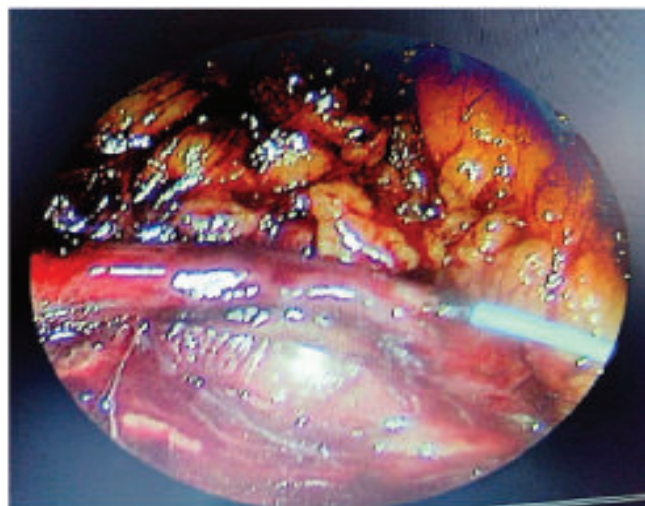
Identification of ureter



Hook electrode for ureterotomy



Stone retrieval from ureter



DJ stent placement

Stone size was measured by using the longest axis of stone viewed on preoperative imaging. Positive urine cultures were adequately treated with appropriate antibiotics before surgery. Laparoscopic ureterolithotomy via transperitoneal approach was performed in every case under general anesthesia.

Ureterotomy was done by giving an incision with a hook electrode in cutting mood followed by extending the incision by scissor. Laparoscopic bapcop is used proximal to the stone to prevent the upward migration of stones. DJ stent was given in every case, and the ureterotomy wound was closed with 4-0 round body vicryl. All patients were mobilized and returned to oral feeding on the morning of 1<sup>st</sup> postoperative day. The catheter was removed on 2<sup>nd</sup> postoperative day, and the drain was removed on the third postoperative day if the drainage level fell below 50 mL. The D-J catheter

was removed under local anesthesia between the second and fourth postoperative weeks. Serum creatinine and urine tests were carried out in the first postoperative month. Demographic data, stone characteristics, and intraoperative and postoperative data were recorded. Complications were classified according to the modified Clavien classification system [12]. All patients were given follow-up for 3 months. IVU was done in every case to evaluate stricture at 3<sup>rd</sup> month of follow-up. The data were recorded and analyzed with Microsoft excel software 2021.

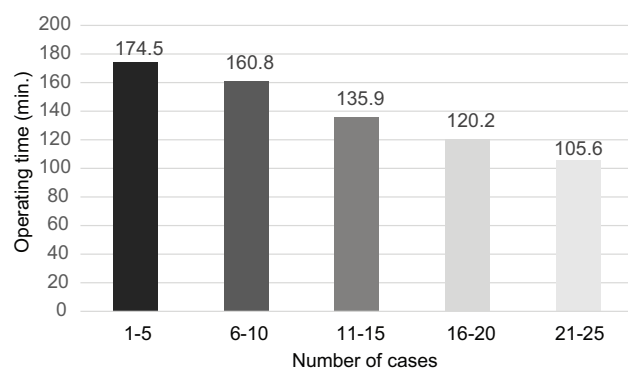
### Results :

A total of 28 patients were included in the study, but 3 patients didn't come for follow up. So, total of 25 cases were recorded. The mean patient age was  $39.3 \pm 5.9$  years, with a range between 20 years to 67 years. There were 16 male (63.3%) male and 9 (26.7%) female patients in the study.

Stones were located on the right side in 17 (62.9%) patients and on the left side in 8 (37.1%) patients. Of the 25 patients, 17 (83.5%) had upper ureteral stones, and 8 (16.%) had mid ureteric stones. The ureteric stones size were large and impacted, and LU was performed in every case. The size of the stones varied from 12 to 19 mm, and the mean stone size was 15 ± 2.5 mm. The demographic and clinical characteristics of the patients are presented in Table I.

**Table I :** Demographic data

Mean Age[ in years]	39.3 ± 5.9 years
Sex ( Male/Female)	16/9
Stone side	Right/left Upper/mid
	17/8 17/8
Stone size [in cm]	14.1 ± 2.6



**Figure 1** Operative case and duration of operation

The mean operative time was 125± 8.9 minutes. The first laparoscopic ureterolithotomy needed 190 minutes, and the initial few cases took more time, and gradually, the procedure time decreased. Intra-operative insertion of the D-J stent was performed in all patients.

**Table II** Presents detailed information regarding the intraoperative and postoperative data.

Anesthesia	General anesthesia
Operative time	125 ± 8.9 minutes
DJ stenting	All of the patients
Stone free rate	23 (92%)
Catheter removal	2 <sup>nd</sup> POD
Drain tube removal	3 <sup>rd</sup> POD
Discharge from hospital	4 <sup>th</sup> POD
Stent removal	3 <sup>rd</sup> to 4 <sup>th</sup> week

All of the patients except 2 needed blood transfusions. Gonadal vein injury was controlled with an endocarp in 3 patients. In 2 cases, conversion to open was needed due to accidental injury of an aberrant renal vessel in one and IVC injury in another.

**Table III:** Complications of surgery

Calvien grading	Complications	Number of patients
I	Surgical emphysema	1
II	Fever	4
II	Paralytic ileus	2
II	Prolonged urinary drainage	3
II	Wound infection	2

Subcutaneous emphysema developed in 2 patients and recovered spontaneously within 24 hours. 4 patients developed postoperative fever, and 2 patients had a port-site infection. 2 patients developed Ileus, which was resolved with conservative treatment. Prolonged urine drainage was observed in 3 patients after surgery. However, the drainage stopped on the seventh postoperative day in all cases. Recatheterization is needed in these 3 cases. No ureteral stricture was encountered during the follow-up.

**Discussion :**

In modern times, using different power sources like a laser, shock pulse, and flexible URS has made stone surgery easy. But they are costly and only possible to manage in some places. Fragmentation of large ureteric stones is problematic using a ureteroscope with a relatively narrow working channel with an old pneumatic lithotripter device. The procedure can be prolonged, while spontaneous removal of fragments is usually incomplete, and there may be a chance of urosepsis. Several publications have shown promising outcomes using holmium: YAG laser for the management of impacted ureteric calculi.<sup>13-18</sup> Mucosal edema may sometimes develop around the stone, and the resulting stone bulk obliterates visualization during ureteroscopy.<sup>14</sup> In some others. Ureteric kinking can block the proper localization of the ureteroscope. If this situation persists, then stone push-back or antegrade stone basket removal is impossible in most cases. We have no laser or flexible URS to treat urinary stone disease.

Skrepetis et al. mentioned that laparoscopic ureterolithotomy could be a method of choice for managing the ureteric stone disease that is large, dense, and, impacted, longstanding.<sup>19</sup> Laparoscopic ureterolithotomy can be performed retroperitoneal or transperitoneal. In our studies, we chose transperitoneal ureterolithotomy in all patients because we are familiar with this approach which gives adequate working space and identification of anatomical landmarks that are very easy to recognize. The main difficulty with this approach is the intraperitoneal adhesions in previous abdominal surgeries. Several publications recommend the transperitoneal route for large ureteric stones.<sup>1,6,20</sup> The blood loss was minimum, and no need for blood transfusion in any patients. Though we didn't measure the blood loss. The study done by Manish Garg et al. revealed a mean blood loss of  $50.67 \pm 18.43$  ml. El Feel et al.<sup>6</sup>, in their study, showed that the mean blood loss of 62 ml. Another study conducted by Kongchareonsombat et al. showed minimal blood loss, only 51 ml.<sup>22</sup> The blood loss was minimum and found to be similar to others.

The laparoscopic procedure has a definite advantage over the open procedure. Usually, the open ureterolithotomy needs a large muscle-cutting incision, which results in pain, causing delayed recovery and, therefore requires a long convalescence period.<sup>23,24</sup> Whereas in case of laparoscopic surgery requires 3–4 small 1–1.5 cm incisions for port insertion. This is why there is very less pain and postoperative analgesic requirement in laparoscopic procedures. Besides, the site of incision in open ureterolithotomy should always be according to the location of the ureteric.

Sometimes the stone location may change or migrate upwards due to a proximal dilated ureter before surgery or intraoperatively. In such cases, retrieving the calculus through the same incision is challenging; it may also need another incision or abandon the procedure for the time being. In the case of a Laparoscopic procedure, such an incidence can be easily avoided, and by further dissection of the ureter without much-increased morbidity, the stone can be retrieved. Additional advantages are in cases when there are more than 1 calculi present in different locations of the same ureter or in cases of

bilateral ureteric stones in which both the stones could be retrieved in the same sitting with only slight changing maneuverability or inserting an additional

port, which is not possible in case of open ureterolithotomy.<sup>24</sup>

The success rate depends upon proper patient selection and surgical experience of laparoscopic technique. Historically success rates of transperitoneal ureterolithotomy range from 86 to 100%.<sup>8,25-27</sup> Further studies showed that with an increase in experience, the overall success rate is above 90%.<sup>25,26,28,29</sup> Basiri et al.<sup>9</sup> compared URS, PNL, and TPLU and reported 56, 64, and 88% stone-free rates, respectively. Better overall success rates in a single sitting are the sheer advantage of laparoscopic ureterolithotomies over endoscopic techniques.<sup>6,30</sup> [CURRENT URO 356254]. Our study's success rate was 92%. 2 among 25 needed conversion due to unintentional injury of the inferior vena cava in one case and aberrant renal vessel injury in another case.

In the present study, the mean operative time was 139.5 minutes. The survey done by Manish Garg et al. showed mean operative time was  $60 \pm 10.3$  minutes. El-Feel et al. showed<sup>6</sup> a mean operative time of 145 minutes (55–180 minutes). Skrepetis et al. [20] showed operation time was significantly longer in the laparoscopic group.

Stone confirmed by seeing noticeable bulges or pinching by Maryland forceps. Upward migration of the stone was prevented by applying a laparoscopic Babcock forceps on the ureter above the stone bulge. We used hook electrocautery for ureterotomy. The study done by Gaur DD et al. (current uro) showed that diathermy for ureterotomy does not produce adverse effects on ureteric tissue healing [31]. We had given DJ stent over guidewire antegradely in every case.

A study by Karami et al.<sup>32</sup> showed that stenting the ureter during surgery didn't significantly increase the time of surgery and may play an essential role in preventing urinary extravasation.

Multiple published articles showed that the success rate in lower ureteric stones is relatively less as compared to middle and upper ureteric calculi<sup>6,33</sup> but Manish Garg et al. found an equal success rate with lower ureteric stones. In lower ureter stones, dissection of the ureter was done with extra caution is needed during ureter dissection as space is less. As the ureter crosses the iliac vessels, there are more chances of vascular injury. Compared to other locations, the overall procedure time was more for stones located in

the lower ureter. As we are a beginner to do lap ureterolithotomy, we didn't do lap ureterolithotomy in lower ureteric stone.

In the present study, complications were recorded and graded according to the Dindo-modified Clavien classification of surgical complications. Surgical emphysema developed in a patient who was managed conservatively. Postoperative fever developed in 4 patients, and temporary Ileus was observed in 2 managed conservatively. One patient had a port site infection, which was also addressed by regular surgical dressing. In our study, we didn't notice ureteral stricture in any patient during follow-up after 3 months. Ureteral stricture is a major complication of LU. In their study, Noura et al.<sup>34</sup> found a ureteral stricture in 2.5% of cases. The etiology of postoperative ureteral stricture is not known. The correlation of the development of ureteral stricture with dilation-closure of the ureter is questionable. Noura et al.<sup>34</sup> commented on using a cold knife to make an incision in the ureter to prevent ureteral stricture. In their series, Gaur et al.<sup>31</sup> showed that an electric hook in the cutting mode for ureter incision is safer to perform. Harewood et al.<sup>18</sup> claimed that a diathermy hook electrode is a reliable method for opening the ureter. We used a monopolar hook for incision in light of the data the series mentioned above provided.

The reported complications of laparoscopic transperitoneal urological surgeries vary from 14.1% to 19%<sup>35,36</sup>, whereas for transperitoneal, ureterolithotomy, it was 4 to 18% in different series<sup>6,29,37</sup>. Feyaerts et al.<sup>38</sup> mentioned overall, 8.3% of complications of TPLU. El-Feel et al.<sup>20</sup> showed 4% and Simforoosh et al.<sup>27</sup> reported 12.2% of complications, respectively. Basiri et al.<sup>6,8</sup> reported 18% complications in the form of leakage of urine for more than 3 days. In our study, 3 patients (12%) had prolonged urinary drainage through a drain tube after removal of the catheter on 2<sup>nd</sup> POD, and then catheterization was done, and patients were managed. In the study, patients were discharged on the 4<sup>th</sup> POD except for the patients who developed complications. Feyaerts et al.<sup>38</sup> reported an average hospital stay of 3.8 days, El-Feel et al.<sup>6</sup> reported 4.1 days, and Basiri et al.<sup>8</sup> reported a mean hospital stay of  $5.8 \pm 2.3$  days, respectively. Manish Garg et al.<sup>24</sup> showed hospital stays about  $3.1 \pm 0.49$  days. Laparoscopic procedures allow early ambulation and the start of oral intake. Thereby early discharge is possible.

### Conclusion :

Laparoscopic ureterolithotomy is a safe, minimally invasive, and maximally effective treatment for large ureteric stones. Difficult situations such as previously operated cases, obese patients, and lower ureteral stones can be overcome by experience. Laparoscopic ureterolithotomy is an intermediate step in gaining knowledge and developing the necessary skills in utilizing the laparoscopic approach in more complicated reconstructive or radical urological surgery. Though lots of studies were conducted as an initial start of the laparoscopic procedure, we are eagerly waiting to share our experience as beginners with others.

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