



Open Versus Retroperitoneal Laparoscopic Ureterolithotomy: A Propective Study from a Rural Center

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Abstract

Introduction- *Laparoscopic ureterolithotomy has emerged as an important tool in management of ureteric calculi however open ureterolithotomy still being practiced.*

Aim- *To compare the results of laparoscopic versus open ureterolithotomy.*

Material and Method- *90 patients of ureteric calculi especially upper and mid third ureteric calculi, 56 underwent retroperitoneal laparoscopic ureterolithotomy(Group A) and 36 open ureterolithotomy (Group B). Various parameters were assessed to compare the outcome in two groups.*

Results- *Mean age of patients in group A was 46.5 years and in group B was 43.2 years. The mean operating time was 72.5 minutes in group A while it was 77.18 minutes in group B. We observed a statistically significant difference ($p < 0.05$) in between two groups while comparing mean blood loss, mean of the doses of post operative analgesic (doses) required, incidence of post operative wound infection and mean of post operative days required for resumption of food, diet and normal activity.*

Conclusion- *Laparoscopic ureterolithotomy is associated with significantly less blood loss, less requirement of post operative analgesic and less incidence of post operative wound infection as compared to open ureterolithotomy. As this study belongs to a rural centre with a very high patient load of nephrolithiasis; our work has an objective to increase the acceptance of laparoscopic surgery in rural population.*

Key Word- *Laparoscopic, Ureterolithotomy, Retroperitoneal, Ureteric Calculus*

Introduction-

The invention of laparoscopic surgery has definitely brought a paradigm shift in the traditional surgical practice. This is rather a new way of thinking and has motivated surgeons to think of doing possibly ever operation by a minimally invasive way. The first documented use of laparoscopy in urology was to diagnose a cryptorchid testis by Cortesi et al in 1976^[1] and since then there have been various developments in laparoscopic urology in both diagnostic and therapeutic purposes. The first laparoscopic ureterolithotomy was done by Wickham in 1979 by transperitoneal approach^[2] Laparoscopic approach is excellent for large, hard, long standing, impacted ureteric calculi especially in upper and middle 1/3rd of ureter above pelvic brim. Laparoscopic ureterolithotomy can be performed, both as a salvage procedure for the patients who fail the endoscopic procedures and ESWL and electively as an alternative to ureteroscopy and/ or SWL with large ureteric stone. As compared to open approach, laparoscopic ureterolithotomy bears the advantages of any laparoscopic surgery as less hospital stay, early resumption of work and activity and better cosmesis. Laparoscopic ureterolithotomy has been performed via retroperitoneal or transperitoneal approach via various workers and it has also been compared with open surgery.

The current study has been performed in a rural medical institution where the overall acceptance of laparoscopic procedures is still low in patient population. Hence this study aims to do a prospective analysis of the open versus

laparoscopic ureterolithotomy so that the results may be utilized further.

Objectives-

The aim of this study was to compare the results of laparoscopic versus open ureterolithotomy, in terms of complications, convalescence, wound infections, time to resumption of fluid and normal diet, time to resumption of normal activities and overall length of hospital stay.

Material and Methods-

The study was conducted in a single surgical unit of a Rural Postgraduate Medical Institution over a period of 2 years; July 2012 to June 2014. This study included total 90 patients of ureteric calculi especially upper and mid third ureteric calculi. The ethical clearance was taken from Institutional Ethical Committee and informed as well as written consent was taken from all the patients included in the study. Inclusion criteria were the patients with proven ureteric calculi in which endoscopic procedure has either failed or was not possible to be done. We excluded patients who have denied for consent and also those in whom preplanned laparoscopic procedure had to be converted to open surgery because of any reason. All the operations were performed under general anesthesia with endotracheal intubation by any of the surgeons from same surgical unit. The procedure (open or laparoscopic ureterolithotomy) was decided more on the basis of patient's preference once he/she was explained regarding both of the procedure and it was tried to keep

comparable number of patients in the two groups at the end of study.

The two groups were compared on basis of various criteria (Table 1) like post operative pain, dose of post op analgesia required, functional status, operating time, time to resumption fluid, diet and normal activity, surgical site infections, length of hospital stay, post operative urinary leakage and cosmetic results.

A detailed history was taken and thorough clinical examination was done at the admission to hospital. Preoperative antibiotic prophylaxis was given to every patient in both the groups in form of Injection Cefuroxime 1.5 gm intravenous after sensitivity testing. Patients having risk factors were also given prophylaxis for deep vein thrombosis. Per urethral catheterization was done in every patient pre operatively.

Details of the procedure-

Laparoscopic Ureterolithotomy-

With the standard operating room set up patient was placed in lateral decubitus position with the side to be operated facing upward. We used retroperitoneal approach in all patients undergoing laparoscopic ureterolithotomy. Creation of retroperitoneal space was done using Modified Gaur's Device consisting of middle finger of no. 8 standard gloves at the one end of a 10 mm trocar and on the other side connected with blood pressure bulb insufflators. Pneumoretroperitoneum was created using CO₂ and pressure was kept around 10-14 mm of Hg. Two more 5 mm ports were created under vision and a 30 degree telescope was used. Ureter was dissected and

position of stone was confirmed and stone was removed by a longitudinal ureterotomy. Distal patency was confirmed with a ureteric catheter and ureterotomy was sutured. A periureteric drain of 10-12 French size was put in all the cases.

Open Ureterolithotomy -

For open surgery the different approaches were used depending upon the position of stone inside ureter i.e. upper or middle third of ureter. For the ureteric stones in upper third we used lumbar subcostal approach and for stone in middle third of ureter we used the Gibson incision centered on Mc Burney's point. In any of these approaches we have put a 10-12 French drain after completing the procedure in all the cases.

The mean and the standard deviation were calculated and the statistical correlation was done using unpaired t test and z test. P value less than 0.05 was taken as statistically significant.

Observations and Results-

This study included total 90 patients which were divide in two groups; group A consisted 54 patients in which laparoscopic ureterolithotomy was done and group B consisted 36 patients in which open ureterolithotomy was done.

Table 1 shows the comparison of various parameters between the two groups A and B. The mean age of patients in group A was 46.5 years and in group B was 43.2 years. If we observe the position of stone, 42 patients in group A and 21 patients in group B were having upper third ureteric calculi while 12 patients in group A and 15 patients in group B had mid third ureteric

calculi. When we compared the mean operating time in both the groups, we found that it was 72.5 minutes in laparoscopic group while it was 77.18 minutes in open ureterolithotomy group. In both the groups, we have put periureteric drain in all of the patients. On comparing the mean blood loss in the two groups, we observed a statistically significant difference as mean blood loss in group A was only 56.4 ml while it was 122.3 ml in group B.

On comparing post operative complications in between the two groups, we found that only 2 out of 54 patients (3.7%) in group A had surgical site infection while 8 out of 36 patients (22.2%) in group B suffered surgical site infection and this difference was statistically significant. The incidence of post operative fever and hematoma or seroma formation was respectively 6% and 12% in group A and 11.1% and 16.6% in group B; both being not significant statistically. The mean post operative urinary leakage in group A was 2.8 days while in group B it was 1.4 days and this difference was statistically significant. The open surgery group B patients required significantly higher doses of post operative analgesics than laparoscopic surgery group A patients. The total doses of post operative analgesic required by parenteral and oral route in group A was 1.19 and 1.3 while in group B it was 2.3 and 4.1 respectively. On comparing the time required for resumption of fluid and diet; it was 0.55 days and 0.72 days in group A patients while it was 1.2 days and 1.6 days respectively in group B patients. It clearly confirms significantly early resumption of fluid and diet in laparoscopic

group. However there was no significant difference in the length of hospital stay between the two groups. The mean length of hospital stay in group A was 49.6 hours while it was 57 hours in group B. There was significant difference in resumption of normal activities in between two groups. The mean of time required in resumption of normal activities in group A was 15.2 days while it was 31.6 days in group B.

We observed a statistically significant difference ($p < 0.05$) in between the two groups while comparing mean blood loss, mean of the doses of post operative analgesic (doses) required, incidence of post operative wound infection and mean of post operative days required for resumption of food, diet and normal activity.

Table 1- Comparison of Various Parameters in between Groups A and B

		Group A	Group B	p value
Mean Age (Years)		46.5	43.2	0.5776
Mean Operating Time(minutes)		72.5	77.18	0.7171
Mean Blood Loss(ml)		56.4	122.3	0.0006
Mean Post Operative Urinary Leakage (days)		2.8	1.4	0.7569
Mean Post Operative Analgesia Required (doses)	Parentral	1.19	2.3	0.0014
	Oral	1.3	4.1	0.0001
Post Operative Wound Infection(%)		3.7	22.2	0.0123
Post Operative Fever (%)		6	11.1	0.4072
Hematoma/ Seroma Formation		12	16.6	0.5459
Mean Post Operative Resumption of (days)	Fluids	0.55	1.2	0.0001
	Diet	0.72	1.6	0.0001
Mean Post Operative Resumption of Normal Activity(days)		15.5	31.6	0.00011
Mean Length of Hospital Stay(hours)		49.6	57	0.485

Discussion-

Currently shock wave lithotripsy (SWL), Ureteroscopy and Percutaneous Nephrolithotomy have become the major modalities for treatment of ureteric calculi. [3]The ureteroscopy combined with endoscopic lithotripsy can virtually attain almost 100% cure rates for distal ureteric calculi whereas its success rate varies between 44-95% for the stones located in upper or mid third of ureter. The use of miniscope together with laser lithotripsy or lithocast has potentially eliminated open surgical lithotripsy in some centers. [4] Nonetheless in most of reported series, 1-10% patients still require open surgery for removal of

ureteric stones which affirms the role of open surgery in the modern era of minimally invasive surgery. [5]Most of the published series on ureteric stones have shown very limited role of ESWL for hard, impacted upper ureteric calculi, which are rather better to be handled surgically.[5] Laparoscopic ureterolithotomy in experienced hands is a good procedure for these patients having the virtues of minimally invasive surgery.[6,7] In addition to the benefits like having less morbidity, reduced convalescence, less complications, less post operative pain and early return to the normal activity; laparoscopic ureterolithotomy has got benefit of having high

probability of removing entire stone in one procedure only. Stones located in the part of ureter between the lower border of kidney and common iliac vessels, are ideally suited for the laparoscopic ureterolithotomy.

The access to ureter during laparoscopic ureterolithotomy can be achieved via transperitoneal or retroperitoneal approach. Though there is literature in support of both of these accesses but various authors have found the retroperitoneal route being the better one. [8,9] We in our study used retroperitoneal approach in all the patients of laparoscopic group not just because of above fact but also we were more comfortable in doing so.

The result of various parameters in our study in the two groups has been summarized in Table 1. We have tried best to make both the groups matching and hence there is hardly any significant difference ($p>0.05$) in the mean age in the two groups. In our study there was hardly any significant difference in the mean operating time in between the two groups which is similar to the work of Garg M et al. [10]

In our study ureterotomy was made with endoknife or endiscissor in 24 patients and with diathermy in 30 patients of laparoscopic surgery group. Ureterotomies were done by fine scissors or scalpel in all the patients undergoing open surgery. The use of diathermy for ureterotomy in laparoscopic ureterolithotomy is reported in studies by Nualyong C et al and Harewood LM et al. [6,11] In the present study, ureterotomy was left open in 30 patients of laparoscopic surgery group and 6 patients of open surgery group. The ureterotomy was closed by interrupted sutures in

24 patients of laparoscopic surgery group and 30 patients of open surgery group. Gaur et al and Bellman GC et al have also reported that closure of ureterotomy is not necessary if the drainage of ureter is well established. [12,13] Most of the studies in the literature have reported the placement of periureteric drain and we also have done that in all our patients in both the groups.

In laparoscopic ureterolithotomy group postoperative urinary leakage ranged from 1-10 days (mean 2.8 days) and in open ureterolithotomy group it ranged from 1-4 days (mean 1.4 days) which was statistically significant. Our results are comparable with that of Keeley FX et al. [14]

Two points concerning urinary leakage are stenting of the ureter and suturing of ureterotomy after the stone is removed. There is no doubt that the ureteral stent will provide the drainage of urine across the ureterotomy and will allow the proper healing around it. This was confirmed in many series' in which stent was always placed and no problem of prolonged urinary leakage was reported even though some ureterotomies were not sutured. This was observed in our study. During which in laparoscopy group 18 patients have ureteric stent or catheter, in which ureterotomy was not closed. In 24 patients with no stenting or catheter, ureterotomy was closed. In rest 12 patients neither ureteric stenting was done, nor was the ureterotomy closed. Of these 6 patients have longest duration of urinary leakage (6-10 days). In open ureterolithotomy group ureteric catheterization was done in 6 patients and ureterotomy was closed in the remaining 30 patients with no stenting or catheterization. In all

these patients, urinary leakage ranged from 1-4 days only. Thus the single most important factor regarding post operative urinary leakage may be effective drainage of ureter either by stenting or catheterization or spontaneously.

This study has observed a significantly higher blood loss in open surgery group as compared to laparoscopic surgery group. The mean blood loss in laparoscopic ureterolithotomy group was 56.4 ml while it was 122.3 ml in open ureterolithotomy group. El- Feel et al. ^[15] reported a mean blood loss of 62 ml and Kongchareonsombat et al reported it to be 51 ml. ^[16]. The mean operating time in this study was 72.5 minutes. El-Feel et al. ^[15] reported the mean operative time of 145 minutes (range 55 –180 minutes). Hareward LM et al ^[6] and Keelay FX et al ^[14] have reported mean operating time 158 and 105 minutes respectively. The mean operating time however in the current study was also comparable to laparoscopic surgery group and it was 77.18 minutes.

We observed in our study that post operative analgesic requirement both parenteral as well as oral was less in laparoscopic surgery group. The difference between the two groups in the requirement of parenteral as well as oral analgesic doses was statistically significant. This finding is concurrent with the study of Gaur et al and Nualyong C et al. ^[11, 12]

Our study has observed lesser incidence of post operative wound infection, fever and hematoma or seroma formation in laparoscopic surgery group as compared to open surgery group. Although statistically this difference was significant only in case of incidence of post operative wound

infection. Our study has also observed a statistically significant difference when comparing the two groups in term of the mean of the days required for post operative resumption of fluid, diet and normal activities. The laparoscopic surgery group has shown a significantly early resumption of fluid, diet and normal activities. The laparoscopic surgery group also had a shorter mean length of hospital stay, though this difference was not statistically significant.

Conclusion-

The laparoscopic ureterolithotomy is a well accepted procedure especially for the ureteric stones not amenable to endoscopic management. It is associated with significantly less blood loss, less requirement of post operative analgesic and less incidence of post operative wound infection as compared to open ureterolithotomy. We due to our personal choice, preferred retroperitoneal route for laparoscopic ureterolithotomy; however there are studies in the literature to prove that transperitoneal route is equally good. As this study belongs to a rural centre with a very high patient load of nephrolithiasis; our work has an objective to increase the acceptance of laparoscopic surgery in rural population.

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Author's contribution-

- 1) Dr. Prashant Gupta- Concept and design of study, acquisition of data and analysis and interpretation of data; revision of final manuscript
- 2) Dr. Somendra Pal Singh- Concept and design of study, acquisition of data with analysis and interpretation of data; Drafting the article
- 3) Dr. Shashi Prakash Mishra- Concept and design of study, acquisition of data with analysis and interpretation of data; Drafting the article
- 4) Dr. Anil Kumar Sharma- Concept and design of study and acquisition of data
- 5) Dr. S D Maurya- Concept and design of study, analysis and interpretation of data; Final approval of the version to be published.
- 6) Dr. Mohan Singh- Concept and design of study, analysis and interpretation of data; Final approval of the version to be published.

References-

1. Cortesi N, Ferrari P, Zambarda E, Manenti A, Baldini A, Morano FP. Diagnosis of bilateral abdominal cryptorchidism by laparoscopy, endoscopy 1976; 8(1): 33-4.
2. Wickham JE: The surgical treatment of renal lithiasis; in Wickham JE (ed): Urinary Calculous Disease. Churchill Livingstone, New York, 1979,145–198.
3. Preminger GM, Tiselius HG, Assimos DG, Alken P, Buck AC, Gallucci M, Knoll T,

- Lingeman JE, Nakada SY, Pearle MS, Sarica K, Türk C, Wolf JS Jr: 2007 guideline for the management of ureteral calculi. Eur Urol 2007;52:1610–1631.
4. Mcdermott JP, Grove J, Clark PB. Laser Lithotripsy with the Candela MDL-2000 Laser trypter. Br. J. Urol. 1993; 71: 512-15.
5. Singh V, Sinha RJ, Gupta DK, Kumar M, Akhtar A: Transperitoneal versus retroperitoneal laparoscopies ureterolithotomy: a prospective randomized comparison study. J Urol 2013;189:940–945.
6. Harewood LM, Webb DR, Pope AJ: Laparoscopic ureterolithotomy: the results of an initial series, and an evaluation of its role in the management of ureteric calculi. Br J Urol 1994;74:170–176.
7. Coptcoat MJ. Laparoscopy in Urology: Perspectives and practice. Br. J. Urol. 1992; 69(6):561-67.
8. Gaur DD, Agarwal CK, Purohit KC, Darshane AS, Shah BC. Retroperitoneal Laparoscopic Ureterolithotomy for multiple upper mid ureteral calculi. J Urol 1994; 151:1001-2.
9. Gaur DD. Laparoscopic Operative Retroperitoneoscopy: use of a new device. J. Urol. 1992; 148: 1137-39.
10. Garg M, Singh V, Sinha RJ, Sankhwar SN, Kumar M, Kumar A, Prakasj J, Kumar P, Pandey M. Prospective Randomized Comparison of Open versus Transperitoneal Laparoscopic Ureterolithotomy:

Experience of a Single Center from Northern India. *Curr Urol* 2013;7:83–89.

11. Nualyong C, Taweemonkongsap T. Laparoscopic Ureterolithotomy for upper ureteric calculi. *J. Med. Assoc. Thai* 1999; 82(10): 1028-33.
12. Gaur DD, Agrawal DK, Darshane AS, Purohit KC et al. Laparoscopic Ureterolithotomy: our experience in 17 patients. *Bombay Hosp Jour* 1993; 35: 65-8.
13. Bellman GC, Smith AD. Special considerations in the technique of laparoscopic ureterolithotomy. *J. Urol.* 1994; 151: 146-49.
14. Keeley FX, Gialas I, Pillai M, Chrisofos M, Tolley DA: Laparoscopic ureterolithotomy: the Edinburgh experience. *BJU Int* 1999;84: 765–769.
15. El-Feel A, Abouel-Fettouh H, Abdel-Hakim AM: Laparoscopic transperitoneal ureterolithotomy. *J Endourol* 2007;21 :50–54.
16. Kongchareonsombat W, Atichoksakun S, Kitvikai K, Patcharatrakul S, Chaimuengraj S: Extraperitoneal versus transperitoneal approach of laparoscopy ureterolithotomy in selected patients. *J Med Assoc Thai* 2010;93: 794–798.