Outcomes of Open Cystolithotomy and Percutaneous Cystolithotripsy in the Management of Urinary Bladder Stone

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ABSTRACT

Introduction: Urinary bladder stone occupies only 5% of all urinary tract stone. Various techniques have been used for the management of bladder stone. Open Cystolithotomy is the traditional treatment but a percutaneous approach has been also in practice. **Aims:** To confirm the best options between open cystolithotomy and percutaneous cystolithotripsy for the treatment of bladder stone. **Methods**: It is a prospective hospital based study from May 2019 to January 2021 in Nepalgunj Medical College. Total 42 patients with inclusion criteria were divided into two groups. Group I was allocated to 21 patients who were treated with open cystolithotomy while Group II were allocated to 21 patients who were treated with percutaneous cystolithotripsy. Two groups were compared for stone free rate, mean hospital stay, mean postoperative scar, mean operation time and rate of post-operative complications. **Results:** The stone free rate in Group I was 100 % and in Group II was 90.47 %. Mean Operation time was in Group I and Group II were 40.09+ 2.48 minutes and 31.38+15.65 days, respectively with $p<0.05$. Mean hospital stay was significantly low in Group II (3.71$\pm$1.87 days) when compared to Group I (7.67$\pm$ 2.12 days) with $p<0.001$. Mean scar length of Group I (5.466$\pm$2.9 cm) with respect to Group II (1.04$\pm$0.09) was significantly long ($p<0.01$). Rate of complications were not significantly different between two groups ($p>0.5$). **Conclusion**: For management of urinary bladder stones sized up to 4 cm, both open cystolithotomy and percutaneous cystolithotripsyare effective, with a low incidence of complications. However, comparing the surgery time, hospital stay, length of scar between two procedures, percutaneous cystolithotripsy procedure is more beneficial for treatment of urinary bladder stone.

Keywords: Open cystolithotomy, Percutaneous cystolithototripsy, Urinary bladder

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INTRODUCTION

Bladder stones constitute approximately 5% of all urinary tract stones.[1] This disease is more prevalent in children, especially in developing countries due to poor nutrition and in adults it is commonly due to bladder outlet obstruction, chronic infection and the presence of an intravesical foreign body. The male femaleratio of bladder stones is 10:1 to 4:1. The incidence peaks at three years in children in developing countries, and 60 years in adulthood.[2-6] Bladder stones may be asymptomatic. However, symptoms such as suprapubic pain, irritative, obstructive features and renal failure may occur in over 50% of patients.[7,8] Various techniques have been used for the management of bladder stone. Open suprapubic cystolithotomy (OCL) has been the standard surgery.[9, 10] However, patients with bladder stone can have high chances of recurrence therefore second open surgery becomes technically difficult. Other newer endoscopic surgery are in practice such as, percutaneous cystolithotrypsy (PCCL), transurethral cystolithotrypsy (TUCL) and Extra corporeal shock wave lithotripsy (ESWL) in which no technical difficulty is found to remove the stone which is reoccurred. However, the efficacy of these procedures is depended on the size, and hardness of the stone. PCCL is well established technique with high efficacy and fewer complication than TUCL, specially treating larger stone.[11,12] Therefore our aim is to evaluate the best options between OCL and PCCL for the treatment of bladder stone.

METHODS

It is prospective hospital based study conducted at Department of Urology, Nepalgunj Medical College, Kohalpur, from May 2019 - January 2021. Approval of Institutional Review Committee was obtained. Written informed consent was taken with explanation of risks and benefits of the procedure to the patient and family.

Preoperative evaluation

Patients with single stone size up to 4cm with age 3- 60 years of any gender were included in this study. Patients with multiple stones, stone sized more than 4cm, stone with urinary bladder tumor and previous history of open cystolithotomy were excluded. Patients who fulfilled the inclusion criteria,

were randomly selected according to lottery system to form two groups. Each group consisted 21 patients. Group I was allocated to patients who were treated with OCL while Group II was allocated to patients who were treated with PCCL.

Patients were studied for clinical history, clinical examinations. Further ultrasonography, Kidney-ureter-bladder (KUB) x-ray done and cystoscopy were done to establish diagnosis. After establishing diagnosis, routine laboratory investigations were done to perform surgery.

Outcomes were observed in terms of stone free rate, mean hospital stay (days), mean postoperative scar (cm), mean operation time (minute) and rate of post - operative complications like intra peritoneal perforation, Surgical site infection and posterior bladder wall injury. Operative time is defined as total time taken (in minute) from starting of incision to closer of skin.

Hospital stay is defined as the period (day) from 1st post-operative day to the day that patient is discharged. Stone free rate is defined as complete absence of stone in bladder. Postoperative scar length is defined as length (cm) of wound made for the surgery. Complications rate is defined as unwanted result seen during and after surgery.

Operative Technique

OCL was performed under spinal anesthesia. Bladder was distended by filling with normal saline through Foley catheter. Pfanenstial incision was made, layer by layer reached up to urinary bladder. Peritoneum shifted to superiorly to prevent its injury. Bladder was opened, stone removed, perivesical drain was placed. Urinary bladder was closed in 2 layers. Catheter was removed in 6th days and in next day drain and stitches were removed when no urinary leakage found from drain and the patient was discharged.

PCCL- PCCL also was performed under spinal anesthesia. Urinary bladder got distended by filling with normal saline through Foleys catheter. 2 fingers above from upper edge of pubic symphysis, approximately 1 cm incision was made. Then urinary bladder was punctured with puncture needle, guide wire placed through the needle, removed puncture needle .Tract was dilated, amplatz sheath of 28 Fr placed. After removing all dilators, inserted 26 Fr Nephroscope. Under direct vision, stone got fragmented with pneumatic lithtriptor, all fragments removed. At last skin was closed with one stitch. In second post-operative day, removed catheter and in 3rd post-operative day discharged with advice to remove suture in 7thpost-operative day in their own nearby hospital or medical center.

Statistical analysis

Data analysis was performed with the program statistical package for social sciences (SPSS version 17.0). Quantitative variables such as age, surgery time, length of hospitalization, scar length and stone size were expressed as mean ± standard deviation (SD) whereas the qualitative variables such as stone clearance, gender, complication were presented as frequency and percentage. For analysis of quantitative variables, Independent sample t-test or Mann-Whitney U test was used and for qualitative variable chi-square test was used.[13] A p-value less than 0.05 was considered statistically significant.

RESULTS

Baseline characteristics of two categorized groups of patients with respect to age, stone size and gender were compared and found to be statistically non-significant (p >0.05) as shown in Table I.

Variables	Group I	Group II	P-value
Age SD	31.62 ± 20.607	24.90 ± 17.78	0.265
Size of stone SD	2.93 ± 0.63	2.83 ± 0.55	0.623
Gender male:female	16:5	14:7	0.495

Table I: Baseline characteristics of the patients in Group I (OCL) and Group II (PCCL)

In Group II the mean operation time, mean hospital stay and the length of post-operative scar were significantly difference (p<0.05) whereas stone free rate and rate of post-operative complications like surgical site infection, intraperitoneal rupture with gross extravasation of fluid and posterior bladder wall injury were statistically non-significant between two groups (p>0.05).

Variables	Group I	Group II	P- value
Surgery time (min)	40.09 ± 2	31.38	0.016*
Hospital stay(days)	7.67	3.71	0.000*
Scar length (cm)	5.466	1.104	0.001*
Complications (%)	9.52	14.28	0.634
Stone clearance (%)	100	90.47	0.147

***Statistically significantly**

Table II: Comparison of mean surgery time, mean hospital stay, mean scar length, complications rate and stone free rate between Group I (OCL) and Group II (PCCL)

Variables	Group I	Group II
Surgical site infection (%)	2 (9.52 %)	0 (0 %)
Intraperitoneal rupture with gross extravasation of fluid (%)	0 (%)	1 (4.76 %)
Mild posterior bladder wall injury (%)	0 (%)	2 (9.52 %)

Table III: Comparison of surgical complications in Group I and Group II

DISCUSSION

Various techniques have been used for the management of urinary bladder stone. For removal of larger sized urinary bladder stone OCL or PCCL can be followed. However, patients with bladder stone can have high chances of recurrence of stone. Therefore, second open surgery becomes technically difficult in patient who underwent OCL while PCCL there is no technical difficulty to remove the reoccurred stone. However, the efficacy of PCCL is depended on the size, and hardness of the stone and in such case the procedure may has to convert to OCL. Consequently, hospital stay, mean operation time and chances of complications increases in PCCL. Ourpresent study showed 100 % stone free rate in OCL group and 90.47 % in PCCL group however the difference was not significant. Similarly the study of Fabio et al[14] showed that open surgery was 100% effective for removal of bladder stone. However studies of Wollin et al[15], Demeriel et al[16] reported 100% patients were free of stone following PCCL.

In our study mean operation time was shorter in PCCL group than OCL group which is supported by the study of Liu G et al.[17] Meanwhile, two patients in PCCL group procedure was converted to OCL due to harder and big stone and mean operation time of those patients were 80 minutes and 75 minutes.Similarly, the study of J Babak et al[18] the surgery time in OCL is 26.06 minutes and PCCL is 30.54 minutes for harder and multiple stone. About hospital stay as reported by the

study of Donaldson et al[19] and Liu G et al[17] mean hospital stay in OCL group was found to be longer than PCCL group. These findings were consistent with the results of our studies. This outcomes of the present study with respect to scar length in patient treated form OCL was longer than in patient treated form PCCL. The study Milind et al[20] mentioned that the length of scar present in patients in PCCL was equal to diameter of amplatz sheath (20 fr) was 7mm which concluded another major cosmetic advantage of PCCL. The present study encountered 2(9.52 %) cases of surgical site infection in OCL group whereas no such infection was found in PCCL Group. While the study of Liu G et al[17] reported 5 out of 25 patients (20%) have surgical site infection in OCL. Our study further reported about 1 case of intraperitoneal bladder rupture with fluid leakage (4.76%) and 2 cases of mild posterior bladder wall injury (9.52 %) in PCCL group but such complications were not found in OCL group. Study of Al-marhoon et al Revealed small bowl injury in one child while intraperotenial bladder injury in 3 children in open surgery and further reported that one child had continuous urinary leakage from the site of operation in PCCL group.[18]

LIMITATIONS

There are different other modalities of endoscopic managements like transurethral cystolithitripsy, ESWL, however this study has considered only PCCL. Another limitation is the sample size which is very small.

CONCLUSION

For management of urinary bladder stones sized up to 4 cm, both open cystolithotomy and percutaneous cystolithotomy are effective, with a low incidence of complications. However, comparing the surgery time, hospital stay, length of scar between two procedures, percutaneous cystolithotomy procedure is more beneficial for treatment of urinary bladder stone.

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