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SAFETY AND EFFECTIVENESS OF ULTRASOUND-GUIDED SUPRAPUBIC CYSTOLITHOTRIPSY FOR VESICAL CALCULI – A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Lower urinary tract symptoms are the most typical side effects of a blocked bladder outlet (BOO). BOO can be caused by a variety of physiological and anatomical factors. For all age groups, including patients who had a laparotomy and had an abdominal scar, we evaluated the safety and effectiveness of a minimally invasive surgical technique involving ultrasound guided supra-pubic percutaneous access with desired size amplatz sheath placement under direct vision for managing bladder stones.

Aims & objectives: The purpose of this study is to see how safe and successful ultrasound-guided suprapubic cystolithotripsy is for vesical calculi.

Methods: This procedure was used on 64 individuals who had a single or multiple bladder stones measuring 10-30 mm in diameter. All of the patients were open surgery candidates. The procedure was performed under direct cystoscopic vision with a nephroscope inserted suprapubically into the bladder. The stones were shattered with a lithotripter, and stone clearance was measured with an ultrasonogram.

Results: There were six females and 58 men in the group. The patients ranged in age from 45.6 to 18.6 years. The stone's average size was 2.45 0.4 cm. The average number of stones was four, with the range being one to fifteen. The average surgical time was 36. 13 minutes, and the average hospital stay was 3. 1 days. 4 of the 64 patients (6.25 percent) had already had a laparotomy and had abdominal scars. Every single one of the 64 patients (100%) had a stone-free bladder. Two patients experienced a little urine leak at the suprapubic catheter site that went away within 24 hours. There were no intraoperative or postoperative problems. On the fifth postoperative day, all patients were discharged.

Conclusion: Percutaneous cystolithotripsy under ultrasound guidance is safe and comfortable, and it should be considered in patients with large or multiple bladder stones, as well as those who have had a laparotomy and have scars on their abdomen. It reduces the risk of urethral stricture and trocar-induced bowel or vascular injuries.

Keyword: Bladder stones, ultrasound guidance, minimally invasive, endoscopic bladder surgery

INTRODUCTION

Lower urinary tract symptoms are the most typical side effects of a blocked bladder outlet (BOO). BOO can be caused by a variety of physiological and anatomical factors[1]. BOO is most typically caused by detrusor sphincter dyssynergia (DSD), which can be both functional and anatomic in women, and benign

prostatic enlargement (BPH) or urethral stricture in men[2]. Bladder calculi affect roughly 10% of BPH patients and are considered one of the most common consequences of the disease. However, bladder calculi due to urine retention affect only 3% to 8% of patients with BPH-related BOO[3]. In patients with BPH, the presence of bladder calculi is a definite indication for surgery. Extracorporeal shock wave lithotripsy (SWL), transurethral lithotripsy (TUL), percutaneous cystolithotripsy (PCL), and open surgery have all been used to remove calculi[4]. Percutaneous lithotripsy has a reduced morbidity rate, but extracorporeal lithotripsy has the lowest rate of calculi removal. Extracorporeal shock wave lithotripsy (75-100%), transurethral cystolithotripsy (63-100%), percutaneous cystolithotripsy (89-100%), and open surgery all have calculus-free rates (100 percent)[5]. The inherent problems with open surgery are a long scar, prolonged catheterization, extended hospitalisation, and the risk of infection, whereas the typical complications with endoscopic transurethral cystolithotripsy are increased operative time, bleeding, and potential urethral injury with transurethral stone fragmentation[6]. Extracorporeal shock wave lithotripsy (ESWL) is a safe and effective alternative to open, suprapubic, or transurethral stone removal. Patients with penile prostheses, artificial urinary sphincters, and orthotropic neobladders will benefit the most from it[7]. Up to 17% of patients undergoing this operation will require adjunctive cystoscopy to ensure full fragment evacuation. Percutaneous cystolithotripsy reduces fragment removal time by avoiding urethral injuries and achieving good clearance rates for large or numerous stones. However, there are dangers connected with this blind percutaneous method, such as incision-related morbidity, intestinal and vascular injury[8]. Ultrasonography (US) is a regularly used diagnostic tool for bladder diseases include cystitis, calculi, clots, diverticula, trauma, and tumours. We can scan the calculus mobility in real time while rotating the patient through various degrees of obliquity using transabdominal ultrasonography. It also enables us to penetrate the bladder without inflicting intestinal harm. Ultrasound-guided PCCL is safer since it is easily available, enabling the treatment to be performed under complete vision, and can be used in patients who have had previous abdominal or pelvic surgery or who have had their bladders repaired[9]. Furthermore, the use of an amplatz sheath (14fr to 30fr) allows it to be used from juvenile to geriatric patients. It also saves time when it comes to stone removal. Here, we describe our experience with percutaneous cystolithotripsy under ultrasound guidance, which looks to be safe for patients of all ages with few problems, a shorter hospital stay, and the ability to execute the procedure safely in patients who have had a previous laparotomy[10].

METHODS

We looked at the data of 64 individuals who had USG-guided suprapubic CLT over the course of two years. Patients ranged in age from 18 months to 65 years old, with a bladder calculus ranging in size from 10 mm to 50 mm in diameter. The presence of stones, the length of the procedure, total hospital stays, and complications were all examined. The ellipsoid formula was used to compute the volume of the stone [height (mm) X width(mm) X depth(mm) X pi/6 X 1/1000]. During preoperative NCCT, the diameter of each stone was measured. Ultrasonography was used to determine whether or not the patient was stone-free after surgery.

Surgical technique: Patients were placed in the lithotomy position, and a cystoscopy with a standard 17Fr/30 scope was used to examine the anatomy of the urethra, bladder neck, and bladder, as well as the number and size of stones. The bladder was then filled under gravity with regular saline until it was fully distended. Furthermore, good intestinal preparation allowed for a visceral slip of more than one centimetre. Suprapubic puncture was performed under USG guidance with two pieces PCN needle (18Gz). Only the needle was removed through the outer sheath of the PCN needle after inspecting the needle hub and sheath using a cystoscope. Following that,

guidewire (0.032') was put into the track and dilated as needed with successive amplatz dilators starting at 14Fr. The entire dilatation of the tract was carried out under the supervision of a physician. The cystoscope was withdrawn, and 16fr Foleys were put and clamped per urethra. The calculus was fractured using a sheath and a regular 18Fr wolf nephroscope to ensure total clearance. Foley's catheters were put in the desired size supra pubic catheter (SPC) and per urethral catheter (PUC). After 48 hours, the PUC was removed, and the SPC was removed after the patient began to void.

Statistical analysis: Actual numbers, percentages, mean, and standard deviation were used to present the data. The relevant tests were the unpaired t-test and the chi-square test. For statistical significance, a p0.05 was used.

RESULTS

We looked at the charts of 64 patients, six of whom were female and 58 of whom were male. BOO was found in all 64 patients (64/64) who had Vesical calculi. Pelvic organ prolapse in two cases, detrusor sphincter dyssynergia in two cases, and primary bladder neck obstruction in two cases were the causes of vesical calculus in female patients. 4 of the 64 patients (6.25 percent) had already had a laparotomy and had abdominal scars. 16/58 (27.5%) of male patients had a stricture, while the remainder 42/58 (72.5%) had benign prostatic enlargement. The patients were 45.6 ±18.6 years old on average. The stone's average size was 2.45 ± 0.4 cm. The average number of stones was four, with the range being one to eight (1-15). The average surgical time was 36 ±13 minutes, and the average hospital stay was 3 ± 1 day. The urethral catheter was withdrawn 48 hours after the procedure, and the SPC catheter was removed once the patient started voiding. Eight patients (8/64, 12.5%) suffered complications: four developed minor dysuria, and two had irritative LUTS (lower urinary tract symptoms) that were treated conservatively with antibiotics and anticholinergic medications. Two individuals experienced a little urine leak at the SPC site that went away after 24 hours. No serious intraoperative or postoperative problems have occurred in any of our patients.

After the operation, all patients were discharged 48 to 72 hours later. Ultrasonography test on the fifth postoperative day revealed no collection, and all of the patients (100%) had stone-free bladders. Between individuals with a single calculus and those with numerous calculi, we found a statistically significant difference in stone size, surgical time, and hospital stay. (table-1)

Table 1: Demographic, clinical, operative details and complications of all patients undergoing PCCL for bladder stones

	All patients (n=64)	Patients with single calculus (n=32)	Patients with multiple calculus (n=32)	P value
Age (years)	45.6 ± 18.6	48.45 ± 13.45	41.35 ± 21.35	P<0.05
Gender (Male/Female)	58/6	32/0	26/6	P>0.05
Vesical calculus with BOO	64	32	32	
Stricture urethra	16	2	14	
Benign prostate hypertrophy	42	22	20	P>0.05
Pelvic organ prolapse	2	0	2	
Detrusor-sphincter dyssynergia	2	0	2	
Primary bladder neck obstruction	2	0	2	
No of calculi	4 ± 4	1 ± 0	7 ± 3	P<0.05
Size largest (cm)	2.45 ± 0.4	3.6 ± 0.4	2.10 ± 0.8	P<0.05
Surgery time (min)	36 ± 13	26 ± 7	47 ± 9	P<0.05

Hospital stay (days)	3 ± 1	2 ± 1	3 ± 1	P<0.05
PUC removal (days)	2 ± 0	2 ± 0	2 ± 1	P>0.05
SPC removal (days)	3 ± 0	3 ± 0	3 ± 0	P>0.05
Complications				
No leak	64	32	22	
Dysuria	2	0	4	P>0.05
Leak at the SPC site	2	0	2	

DISCUSSION

The considerable improvements in modern endourology have resulted in new management options for vesical calculi. Transurethral and percutaneous approaches are two of the most recent alternatives. Percutaneous treatment has a lower morbidity rate than transurethral treatment and produces equivalent effects[11]. Percutaneous lithotripsy is contraindicated in patients with bladder cancer or a history of abdominal surgery. A combination of cystoscope and ultrasound overcomes the limits of percutaneous lithotripsy, making it acceptable for patients with previous abdominal surgery or reconstructed bladders. Furthermore, PCCL under USG guidance visualises the entire process, beginning with cystoscopy, suprapubic puncture, guide wire and angiocatheter installation, serial dilatation of the suprapubic tract, and placement of the amplatz sheath[12]. PCCL was also found to be an effective and safe treatment for big bladder calculi by Woollen TA et al. It is non-invasive and does not cause urethral damage[13,14]. In this study, we looked at the outcomes of PCCL conducted under ultrasound guidance and discovered that on the fifth postoperative day, all of the patients (100%) had stone-free bladders. Patients with a single calculus had a statistically significant difference in stone size, surgical time, and hospital stay compared to those with numerous calculi. Torricelli et al. compared the percutaneous route to the transurethral route and concluded that the percutaneous approach is safer, faster, and more effective. Tugcu et al. and Aron M et al. made similar observations. We found that 8/64 (12.5%) of our patients had problems, 4 had minor dysuria, and two had irritative LUTS (lower urinary tract symptoms) that were treated conservatively with antibiotics and anticholinergic medications. Two individuals experienced a little urine leak at the SPC site that went away after 24 hours. No serious intraoperative or postoperative problems have occurred in any of our patients. Percutaneous lithotripsy guided by ultrasound can be used to treat a variety of stone configurations, including single and numerous stones. To reduce radiation exposure, ultrasound guidance is recommended even in specific populations such as children and pregnant women.

CONCLUSION

The use of ultrasound-guided percutaneous cystolithotripsy treatments has grown in popularity in recent years, notably as a way to limit radiation exposure and improve surgical knowledge. Additionally, the treatment is performed under direct vision, which makes this procedure more practical than the traditional PCCL in terms of reducing operating time and preventing intestinal and vascular damage. It should be considered in individuals with big or many bladder stones, as well as those who have had a laparotomy and have scars on their abdomen.

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