

Association of Synchronous Transurethral Surgeries or Transrectal Prostate Biopsy with Early Postoperative Complications in the Endoscopic Treatment of Bladder Stones

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Abstract

Aim: To investigate the effect of synchronous transurethral surgeries or transrectal prostate biopsy on complications in endoscopic bladder stone treatment.

Methods: Between January 2016 and December 2021, 402 patient who aged 18 years and older, underwent endoscopic bladder stone surgery were retrospectively analyzed. 345 patients were included in the study, after the exclusion criteria were determined. Patients were divided into 2 groups according to the applied surgical treatments. Group 1(n=174) involved patients who underwent endoscopic bladder stone surgery alone and Group 2(n=171) who underwent TUR-P/TUIP/DVIU or TUR-BT or URS or TRUS-BX in the combination with endoscopic bladder stone treatment. Age, etiology, surgical treatments, operation times, hospitalization times and postoperative complications were compared.


Results: Mean age of the patients was 60 (SD=15, range=18-93) years. Mean (SD) stone size was measured as 3 (2.2) cm. There was no difference in patient age and stone size between the groups. Complications of both Clavien 2 and above, Clavien 3A and above were statistically significantly higher in Group 2 (p=0,019; p=0,030). There was no relationship between complications and comorbidities. Operation and hospitalization times were statistically significantly shorter in Group 1 (p= 0,033; p=0,020).

Conclusions: We observed an increase in early postoperative complications in TUR-BT or TRUS-BX surgeries performed synchronously with bladder stone treatment. Therefore, patients may need additional postoperative endoscopic procedures and may prolong hospitalization time.

Keywords: Image-Guided Biopsy, postoperative complications, transurethral resection of prostate, urinary bladder calculi

1. Introduction

Bladder stones contain 5% of all urinary tract stones¹. Peak age is 61 years in adulthood and incidence is higher in developing countries^{2,3}. In developed countries, bladder stones are responsible for 8% of deaths due to urolithiasis⁴. Removal of bladder stones by preferring invasive techniques has been widely adopted to reduce the risk of complications and shorten hospital stay.

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Therefore, transurethral cystolitripsy (TUCL) and percutaneous cystolitripsy are considered to be more preferred approaches than other methods. Although the main goal in the treatment process is the removal of stones; resolution of the predisposing disease is as important as preventing the formation of new stones in the bladder. Several procedures can be performed in a single session due to comorbidities, difficulties in anesthesia preparations, avoiding repetitive hospital stays and additional costs. However, doing several processes at the same time is not always innocent. In our study, we aimed to investigate the results of concomitant additional procedures performed with endoscopic surgical treatment of bladder stones.

2. Materials and methods

The study was started after the approval of the ethics committee (29/11/2021-125/04). Patients who underwent endoscopic bladder stone treatment were scanned between January 2016 and December 2021 retrospectively. Data from a total of 402 patients were accessed. The study was planned retrospectively and carried out in accordance with the Declaration of Helsinki. Patients who are younger than 18 years, who were not treated with TUCL and who used pneumatic lithotripter during cystolithotripsy were excluded from the study. At the conclusion, 345 patients were enrolled in the study. Etiology, comorbidities, demographic information, previous procedures, surgical techniques, bladder stone number and size, operation time, hospital stay, postoperative complications and laboratory results retrospectively reviewed from electronic medical records according to inpatient and outpatient history. Complications are classified as Clavien Dindo classification⁵.

Operations were started by entering the external meatus with 20F cystoscopy. Patients who have urethral strictures were undergo internal urethrotomy. After that procedure, the operation was kept on using 20F cystoscopy again. In all patients, undergo transurethral laser lithotripsy after the evaluation of prosthetic urethra, bladder neck, ureteral orifices and bladder walls. A second synchronous procedure was applied after completion of a bladder stone, who would undergo transurethral prostatectomy (TUR-P), transurethral prostate incision (TUIP), transurethral resection of bladder tumor (TUR-BT), and retrograde intrarenal surgery (RIRS)/urethrorenoscopy (URS).

Patients who undergo ultrasound guided transrectal prostate biopsy (TRUS-BX) were positioned in a lateral fetal position after TUCL was performed under general anesthesia. After the operation,

all patients received a urethral catheter insertion. Additionally, patients who underwent synchronous RIRS/URS had a double J stent inserted. According to the treatments administered, the patients were partitioned into 2 groups. Group 1 includes patients who had undergone only TUCL (n=174) and group 2 included patients who had undergone synchronous endoscopic treatment with TUCL (Table-1.). Groups were compared for both Clavien 2 and above, Clavien 3A and the above complications. Operation times and hospital stay for groups and complications of the endoscopic treatment procedures were compared.

Statistical Analysis

Statistical analysis was conducted using Pearson chi-square and Fisher's exact test. A significance level of p<0.05 was considered statistically significant. The analysis was carried out using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).

3. Results

Between 2016 and 2021, 345 patients who underwent TUCL for bladder stones were included in the study. Mean age of the patients was 60 (SD=15.00, range=18-93) years. The mean (SD) stone size was 3 (2.2) cm. When the etiology of the bladder stones were examined, it was found that 68.4% of the causes developed as obstructive, 8.1% as non-obstructive (neurogen) causes, 19.1% were secondary to migratory stones and 4.3% were secondary to a foreign body in the bladder. Patients underwent 5 different surgeries. The number of the patients who underwent TUCL, TUCL+ (TUR-P/IOU/TUIP), TUCL+TUR-BT, TUCL+(RIRS/URS), TUCL+TRUS-BX was 176, 109, 14, 22, 27 respectively (Table-1).

Table 1

Demographic data, the relationship of operation groups with length of hospital stay and duration of operation.

		Group 1	Group 2	p
Patients				n:345
Age (year)				60 (SD=15, range=18-93)
Gender				329 M 16 F
Etiology				
	• Obstructive			236 (68.4%)
	• Non-obstructive (neurogenous)			28 (8.1%)
	• Migratory stone			66 (19.1%)
	• Foreign body			15 (4.3%)
Operation type				
Group 1	1: TUCL			174(0.4%)
	2: TUCL + (TUR-P/DVIU /TUIP)			108 (31.3%)
Group 2	3: TUCL + TUR-BT			14 (4.1%)
	4: TUCL + (RIRS/URS)			22 (6.4%)
	5: TUCL + TRUS-BX			27 (7.8%)
		Group 1	Group 2	p
Stone size (cm) (Mean [SD])		2.8 (2.1)	3.1 (2.3)	.216
Operation time (min) (Mean [SD])		51 (23)	81 (27)	.033
Hospital stay (day) (Mean [SD])		1.9 (1.9)	3.1 (2.8)	.020

M: Male, F: Female, TUCL: Transurethral cystolithotripsy, TUR-P: Transurethral resection of the prostate, DVIU: Direct vision internal optic urethrotomy
 TUIP: Transurethral incision of the prostate, TUR-BT: Transurethral resection of the bladder tumor, RIRS/URS: Retrograde intrarenal surgery/ Ureterorenoscopy
 TRUS-BX: Transrectal ultrasound guided prostate biopsy

Table 2Association of operation groups with Clavien ≥ 2 complications

		Complications Clavien ≥ 2		p
		(-)	(+)	
Group 1	1: TUCL	156(45.2%)	18(5.2%)	.019
	2: TUCL +(TUR-P/ DVIU/ TUIP)	92	16(4.6%)	
	3: TUCL + TUR-BT	9	5(1.4%)	
	4: TUCL + (RIRS/URS)	20	2(0.5%)	
Group 2	5: TUCL + TRUS-BX	17	10(2.9%)	
	Total	294(85.2%)	51(14.7%)	345(100%)

TUCL: Transurethral cystolithotripsy, TUR-P: Transurethral resection of the prostate, DVIU: Direct vision internal optic urethrotomy

TUIP: Transurethral incision of the prostate, TUR-BT: Transurethral resection of the bladder tumor, RIRS/URS: Retrograde intrarenal surgery/ Ureterorenoscopy, TRUS-BX: Transrectal ultrasound guided prostate biopsy

Clavien 2 and above complication rates were 5.2% and 9.5% for group1 and group 2 respectively. Clavien 3A and above complication rates were 3.5% and 7.2% for group1 and group 2 respectively. Complication rates were significantly higher in group 2 ($p=.019$ ve $p=.030$) (Table-2,3).

When TUCL and TUCL+ (TUR-P/IOU/TUIP) were compared in subgroup analysis, no difference was observed between both Clavien 2 and above, Clavien 3A and the above complications respectively. When subgroups were examined in group 2, it was observed that Clavien 3A and the above complications were mostly caused by bladder perforation or impaired urinary drainage. It was observed that 5 of 9 patients who underwent TUCL + TUR-BT required additional endoscopic intervention due to hematuria (Table-3).

Clavien 3A and the above complications were detected in 6 of 21 patients who underwent TUCL + TRUS-BX. Following removal of the

postoperative urinary catheter, a percutaneous cystostomy catheter was inserted in one patient due to the development of acute urinary retention. Cystoscopy was performed on five patients due to hematuria. Clavien 2 and the above complications were examined, it was observed that complication rates of the patients increased from 1.7% to 2.9% and hospital stay was prolonged due to the need for antibiotic treatment in 5 patients with post-procedure fever and urosepsis.

There was no difference in stone sizes between the groups (Table-1). The incidence of both Clavien 2 and above, Clavien 3A and the above complications, was significantly higher during the fracture of multiple stones compared to a single stone ($p=.018$; $p=.011$).

It was determined that both the operation time and the length of hospital stay were significantly longer in group 2 ($p=.033$; $p=.020$) (Table-1).

Table 3Relation of operation groups with Clavien $\geq 3A$ complications.

		Complications Clavien $\geq 3A$		p
		(-)	(+)	
Group 1	1: TUCL	162 (46.9%)	12 (3.5%)	.030
	2: TUCL +(TUR-P/DVIU/TUIP)	96 (27.8%)	13 (3.7%)	
	3: TUCL + TUR-BT	9 (2.6%)	5 (1.4%)	
Group 2	4: TUCL + (RIRS/URS)	20 (5.8%)	1 (0.2%)	.030
	5: TUCL + TRUS-BX	21 (6.1%)	6 (1.7%)	
Total		308 (89.2%)	37 (10.7%)	345 (100%)

TUCL: Transurethral cystolithotripsy, TUR-P: Transurethral resection of the prostate, DVIU: Direct vision internal optic urethrotomy

TUIP: Transurethral incision of the prostate, TUR-BT: Transurethral resection of the bladder tumor, RIRS/URS: Retrograde intrarenal surgery/ Ureterorenoscopy, TRUS-BX: Transrectal ultrasound guided prostate biopsy

4. Discussion

Bladder stones may occur primarily but often occur as a result of a concomitant predisposing disease. Bladder outlet obstruction, neurogenic lower urinary tract symptoms, foreign body, chronic bacteriuria and kidney stones were some of the reasons⁶. Bladder outlet obstruction in adults is the most common cause of bladder stone formation, accounting for 45-79% of bladder stones^{7,8}. For this reason, bladder stones are often not treated alone. It is usually performed synchronously with TUR-P, IOU or an additional surgical procedure⁹.

Cystolithotomy is the most effective method in the treatment of bladder stones. However, in this method, the duration of catheterization and hospital stay are longer compared to minimally invasive methods¹⁰. It is known that blood transfusion may be needed when open prostatectomy with cystolithotomy is performed. Hematuria and related complications may develop in the postoperative period. Amid advancing technology, minimally invasive techniques have gained widespread acceptance for their ability to mitigate the risk of complications, shorten hospital stays, and expedite recovery times.¹¹ In both adults and children, TUCL provides a high stone-free ratio, and appears to be safe with a very low risk of complications, major post-operative and late complications. Long-term urethral stricture development in transurethral interventions has not been reported with supporting evidence. In the literature, there are studies demonstrating that urethral stricture develops at a rate of 2.9% to 19.6%, respectively, at 12 to 24 months follow-up¹¹⁻¹³.

In our study, the incidence of both Clavien 2 and higher, Clavien 3A and higher complications of multiple stones were significantly higher compared to single stones. The literature lacks studies on the analysis of single or multiple stone processes. Due to limited data, it is difficult to advise an opinion on the complications caused by multiple stones for today. However, it is thought that the size of the multiple stones is larger than the single stone, and therefore complications due to the prolongation of the operation time are more common. The findings of the study must be corroborated by clinical investigations. Studies comparing the safety of BPH and bladder stone treatment in the same session and BPH treatment alone showed no difference in terms of major complications¹². In synchronous procedures, no difference was found in complications, except for urinary tract infections which were more frequent¹⁴⁻¹⁶. An observational study compared 321 patients who underwent holmium laser enucleation of the prostate (HOLEP) and synchronous TUCL+HOLEP. There was no difference in terms of clinically significant perioperative and postoperative complications in patients who underwent synchronous intervention, except for postoperative early urinary incontinence and prolongation of operation times¹⁷. In our study, the complication rates of Clavien 2 and above, Clavien 3A and the above were found to be 5.2% and 3.5%, respectively, in patients who underwent TUCL, regardless of stone size. However, we found that when a synchronous interventional procedure is added to TUCL, complication rates increase, operation times and hospital stays are prolonged. When only TUCL and TUCL+ (TUR-P/IOU/TUIP) were compared in the subgroup analyzes, no difference was observed in terms of postoperative complications of both Clavien 2 and above, Clavien 3A and above, in line with the literature. We found that the complication rate of Clavien 3A and above in patients who underwent TUCL+(TUR-P/IOU/TUIP) was 3.7%, similar to TUCL alone. Although the results were similar, it is difficult to state that the complications and hospital stays in group 2 increased due to the synchronous procedure, since the subgroup patient distribution was not standardized in our study. However, it seems that TUR-BT

or TRUS-BX synchronized with TUCL increases complications.

Complications occurred in 35% (5/14) of TUR-BT patients who were performed synchronously with TUCL. Patients in this group required additional endoscopic intervention, mostly secondary to impaired urinary drainage. The hypothesis for the increase in complications is that small stone fragments are missed, or the resection is not optimally performed as a result of loss of vision due to bleeding of the tumoral tissue as a result of stone breakage. The main reason for the need for additional intervention after the operation is the combination of small tissue and clot fragments with stone fragments and subsequent deterioration of urinary drainage. In these patients, it should be tried not to contact the tumor tissue with the laser during cystolithotripsy, and high negative pressure should be avoided during the collection of stones. Although the number of patients in the TUCL+TUR-BT group limits our comparison with other patient groups, it seems that caution should be exercised during a synchronous operation.

Clavien 3A and higher complications (6/27) were seen in 22% of TRUS-BX patients who were performed synchronously with TUCL, while the rate of Clavien 2 and higher complications was 37% (10/27). After the procedure, antibiotic treatments were changed in 5 patients due to fever and suspected urosepsis. We observed that the follow-up and hospitalization periods of the patients were prolonged after the revision of antibiotic therapy. In addition, we observed that in some patients who underwent TUCL+TRUS-BX, in the early period after discharge, the patients applied to the emergency room due to urinary infections and these patients needed hospitalization again. Early infection rates were higher in this patient group than in patients who underwent TUCL alone. Although the stone analysis results of the patients were not available, it can be concluded that simultaneous TRUS-BX increases the infective complications, considering that the stones in these patients develop as a result of bladder outlet obstruction and that this group of stones is mostly infection stones¹⁸. Although the small number of TUCL+TRUS-BX patients limits our comparison with other patient groups, it seems that synchronous operation increases the risk of urinary infection at an early period. Therefore, performing TUCL and TRUS-BX in different sessions in this group of patients may be beneficial in terms of both hospitals stay and early postoperative complications. However, these results need to be supported by prospective randomized clinical studies.

Antibiotic revision due to high fever was performed on only one patient who underwent RIRS/URS with TUCL, and the patient's hospitalization time was prolonged. One patient required repeated cystoscopy and additional endoscopic intervention due to hematuria.

The limitations of our study are that the stone size, surgical methods applied, and antibiotic prophylaxis are not standardized for each group. However, we believe that we found results that could be supported by prospective randomized clinical studies.

5. Conclusion

Considering the results of our study, TUCL is a reliable technique regardless of stone size. TUCL+(TUR-P/IOU/TUIP) has similar results with those who only had TUCL in terms of early postoperative complications. Synchronous TUCL+RIRS/URS can be done safely. Early postoperative complications increase in patients undergoing synchronous TUCL+TUR-BT. These patients may need additional postoperative endoscopic procedures and may prolong hospitalization. Early postoperative complications increase in patients undergoing synchronous TUCL+TRUS-BX. Infective complications may develop in the postoperative period and the duration of hospitalization may be prolonged accordingly.

Therefore, if possible, TUCL+TRUS-BX should be performed in different sessions.

Statement of ethics

The study was started after the approval of the Dışkapı Yıldırım Beyazıt E&R Hospital ethics committee (29/11/2021-125/04).

Conflict of interest statement

The authors declare that they have no financial conflict of interest with regard to the content of this report.

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Author Contributions

All authors contributed equally to the article. All authors read and approved the final manuscript.

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