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The efficacy and safety of ureteroscopic lithotripsy and flexible ureteroscopy with continuous anticoagulant or antiplatelet drugs: A multicenter retrospective real-world study

Zijie Xu[a], Chujiang He[a], Jianwei Cao[b,c], Jianhong Wu[c,d], Dawei Wang[c,e], Jun Da[c,f], Dongliang Xu[c,g], Mingyue Tan[c,g], Xiaofeng Gao[c,h], Yonghan Peng[c,h], Jie Chen[c,i], Rong Chen[c,j], Pengfei Wu[c,k], Juntao Jiang[a], Lei Chen[a], Shujie Xia[a,c,*], Yi Shao[a,c,*]

[a]Department of Urology, Shanghai General Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China; [b]Department of Urology, Xin Hua Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China; [c]Shanghai Municipal Hospital Urology Specialist Alliance, Shanghai, China [d]Department of Urology, Huadong Hospital, Fudan University, Shanghai, China; [e]Department of Urology, Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China; [f]Department of Urology, Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China; [g]Department of Urology, Shuguang Hospital, Shanghai University of Traditional Chinese Medicine, Shanghai, China; [h]Department of Urology, Changhai Hospital, Naval Medical University, Shanghai, China; [i]Department of Urology, Shanghai Changzheng Hospital, Naval Medical University, Shanghai, China; [j]Department of Urology, Shanghai Sixth People's Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China; [k]Department of Urology, Shanghai Tenth People's Hospital, Tongji University School of Medicine, Shanghai, China

Abstract

Objective: The objective of this study is to assess the effectiveness and safety of ureteroscopic lithotripsy and flexible ureteroscopy (fURS) for treating patients on anticoagulant (AC) or antiplatelet (AP) medications.

Patients and Methods: The study included 213 patients with urinary stones who underwent ureteroscopic lithotripsy or fURS between January 2019 and October 2022 at the Shanghai Municipal Hospital Urology Specialist Alliance. Among these patients, 15 received AC therapy, 193 received AP therapy, and 5 received both AC and AP therapy. Patients were divided into 3 groups based on the real-world management of antithrombotic drugs: the continuation group (n = 62), the discontinuation group (n = 91), and the discontinuation and bridge heparin group (n = 60). Intraoperative and postoperative outcomes were compared among the 3 groups.

Results: Age, sex, body mass index, stone location, stone size, stone side, and residual fragments were not different among the groups. None of the patients received blood transfusions or had thromboembolic events, emergencies for gross hematuria, significant bleeding-related complications, or unplanned secondary ureteroscopic surgery. The mean duration of hospital stay of the continuation group (3.97 days) was significantly lower than that of the discontinuation group (5.99 days) and the discontinuation and bridge heparin group (5.75 days) ($p < 0.001$).

Conclusions: Ureteroscopic lithotripsy and fURS can be performed safely and effectively in patients on AC or AP drugs, resulting in reduced duration of hospital stay.

Keywords: Ureteroscopic lithotripsy; Flexible ureteroscopy; Anticoagulant drugs; Antiplatelet drugs

1. Introduction

The prevalence of urolithiasis has been increasing in China. The Chinese Epidemiological Survey of urolithiasis showed that the standardized prevalence rate in the national population was 6.06%.[1]

As the use of anticoagulant (AC) and antiplatelet (AP) therapy increases,[2] Daels et al.[3] reported that 6% of patients with renal stones who require ureteroscopic lithotripsy (URL) or flexible ureteroscopy (fURS) take AC or AP medications. Assessing the risk of perioperative bleeding and thromboembolic events is necessary. The American Urological Association guidelines state that ureteroscopy can be performed without discontinuation of AC or AP medications.[2,4–7] Although the Chinese Urological Association guidelines state that the URL is a surgery with a low risk of bleeding, it is unclear whether the medication should be stopped before the operation.[8,9] However, there are limited current data on patients undergoing lithotripsy for urolithiasis treated with AC or AP, and most of the available data are from single-center studies.

According to a recent survey, 20.5% of Chinese urologists believed that AP drugs can be continued, and 14.7% believed that AC drugs can be continued before the patient underwent URL and fURS.[10] In addition, the urologists' experience is the influencing factor; those who performed more than 100 URL and fURS surgeries each year are more likely to continue using AC or AP

*Corresponding Author: Yi Shao, Department of Urology, Shanghai General Hospital, Shanghai Jiao Tong University School of Medicine, No. 100, Haining Road, Hongkou District, Shanghai 200080, China. E-mail address: drshaoyi@163.com. Shu-Jie Xia, Department of Urology, Shanghai General Hospital, Shanghai Jiao Tong University School of Medicine, No. 100, Haining Road, Hongkou District, Shanghai 200080, China. E-mail address: xsjurologist@163.com.

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drugs.[10] Thus, the safety of lithotripsy in patients who are taking AC or AP drugs remains controversial. It is unclear whether AC or AP drugs should be discontinued during the perioperative period.

This multicenter retrospective real-world study in Shanghai Municipal Hospital Urology Specialist Alliance was conducted to evaluate the safety and efficacy of URL and fURS in patients with stones who underwent active AC or AP therapy.

2. Methods

2.1. General information

A total of 213 patients with stones who underwent URL or fURS between January 2019 and October 2022 were identified from the Shanghai Municipal Hospital Urology Specialist Alliance. Among them, 40 patients were from Shanghai General Hospital, 58 from Xin Hua Hospital, 28 from Huadong Hospital, 22 from Ruijin Hospital, 18 from Shanghai Ninth People's Hospital, 15 from Shuguang Hospital, 11 from Changhai Hospital, 11 from Shanghai Changzheng Hospital, 7 from Shanghai Sixth People's Hospital, and 3 from Shanghai Tenth People's Hospital (clinical trial no. ChiCTR2200065923).

All patients underwent computed tomography (CT) before surgery. The size of the stone was determined by measuring the longest diameter of the stone in the axial dimension from a CT scan, conducted by an experienced endourologist. Patients were divided into 3 groups based on the retrospective management of antithrombotic drugs: the continuation group (n = 62), the discontinuation group (n = 91), and the discontinuation and bridge heparin group (n = 60). The mean stone size was 10.81 ± 4.28 mm in the continuation group, 11.45 ± 4.88 mm in the discontinuation group, and 12.35 ± 5.04 mm in the discontinuation and bridge heparin group.

2.2. Surgical procedures

All ureteroscopic and flexible URL procedures were performed by experienced urologists. A ureteral access sheath was used during fURS. A holmium laser was performed using a 200-micron/NA 0.22 laser fiber set at 0.6–1.2 J and a pulse rate of 20–30 Hz. Stone fragments were removed using a nitinol stone basket during fURS.

All patients underwent an abdominal plain film or CT scan 1 month after surgery. Complications within 30 days were recorded. Significant bleeding-related complications included (1) termination of procedure because of poor visibility caused by bleeding, (2) unplanned second flexible ureteroscopic procedure, (3) emergency department visit for hematuria, (4) readmission for hematuria, (5) transfusion because of bleeding, and (6) unplanned return to the operating room for evaluation of ongoing bleeding and selective renal artery embolism.

2.3. Statistical analysis

Continuous data were recorded as mean ± standard deviation. The independent samples analysis of variance test was used to examine the differences in means among the 3 groups. Categorical variables were recorded as percentage, and a chi-square test was used to compare the differences. When the distribution of differences deviated significantly from normality, a Fisher exact test was performed.

3. Results

3.1. General and stone characteristics of the patients

In this study, 213 patients were enrolled, including 62 in the continuation group, 91 in the discontinuation group, and 60 in the discontinuation and bridge heparin group. Indications for AC therapy included 13 cases of atrial fibrillation, 1 case of mechanical prosthetic valves, 1 case of deep vein thrombosis, and 5 cases of coronary artery disease. Indications for AP therapy included 3 cases of atrial fibrillation, 6 cases of arterial disease, 26 cases of cerebrovascular accident, 109 cases of coronary artery disease, 10 cases of hyperlipidemia or hypertension, and 44 unspecified cases (Table 1). Active AC therapy included warfarin in 11 patients (5%) and rivaroxaban in 9 patients (4%). Active AP therapy included aspirin in 127 patients (58.4%), clopidogrel in 29 patients (13.3%), and combined clopidogrel and aspirin in 42 patients (19.3%) (Table 1). Age, sex, body mass index, stone location, stone size, and the side where the stone was present were not statistically significant between the groups (Table 2).

3.2. Surgical parameters and postoperative complications of the patients

All patients in the 3 groups were successfully treated without any intraoperative complications. The prothrombin time, international normalized ratio, activated partial thromboplastin time, fibrinogen, mean decrease in hemoglobin, and mean creatinine change were not statistically significant among the 3 groups. The mean duration of hospital stay of the continuation group (3.97 ± 2.11 d) was significantly lower than that of the discontinuation group (5.03 ± 2.91 d) and the discontinuation and bridge heparin group (5.67 ± 3.00 d). The mean operative time of the continuation group (44.82 ± 27.81) was significantly lower than that of the discontinuation group (58.88 ± 36.35 min) and the discontinuation and bridge heparin group (56.67 ± 32.91 min) (Table 3).

Perioperative complications were rare in the continuation group, discontinuation group, and discontinuation and bridge heparin group. None of the patients received blood transfusions or had thromboembolic events, emergencies for gross hematuria, significant bleeding-related complications, or unplanned secondary ureteroscopic surgery. Residual fragments larger than 4 mm were observed in 5 patients in the continuation group, 2 in the discontinuation group, and 3 in the discontinuation and bridge heparin group, with no significant differences among the groups (Table 4).

Table 1

Indications for chronic AC and AP therapy.

		AC		AP		
Indications	Total	Warfarin	Rivaroxaban	Aspirin	Clopidogrel	Clopidogrel and aspirin
Atrial fibrillation	16	5	8	2	1	-
Mechanical prosthetic heart valve	1	1	-	-	-	-
Deep vein thrombosis	1	-	1	-	-	-
Arterial disease	6	-	-	2	3	1
Cerebrovascular accident	26	-	-	20	6	-
Coronary artery disease	114	5	-	71	8	30
Hyperlipidemia or hypertension	10	-	-	2	8	-
Unspecified	44	-	-	30	3	11
Total	218*	11	9	127	29	42

AC = anticoagulant; AP = antiplatelet.

*Among 213 patients, 5 received both AC and AP therapy.

Table 2

Patient demographics.

Variables	Continuation (n = 62)	Discontinuation (n = 91)	Discontinuation and bridge heparin (n = 60)	*p*
Mean age, yr, mean ± SD	67.34 ± 8.77	66.16 ± 8.82	66.75 ± 7.39	0.717
Sex, n (%)				0.189
Female	19 (30.65)	28 (30.77)	11 (18.33)	
Male	43 (69.35)	63 (69.23)	49 (81.67)	
Body mass index, kg/m^2, mean ± SD	23.70 ± 3.59	24.26 ± 3.56	24.28 ± 2.75	0.662
Stone location, n				0.129
Bladder	1 (1.61)	12 (13.19)	7 (11.67)	
Ureter	37 (59.68)	43 (47.25)	29 (48.33)	
Kidney	17 (27.42)	31 (34.07)	21 (35.00)	
Ureter and kidney	7 (11.29)	5 (5.49)	3 (5.00)	
Stone side, n (%)				0.090
Left	37 (60.66)	41 (51.90)	32 (60.38)	
Right	24 (39.34)	29 (36.71)	18 (33.96)	
Both	0	9 (11.39)	3 (5.66)	
Stone size, mm, mean ± SD	10.88 ± 4.37	12.54 ± 5.41	12.35 ± 4.74	0.105

4. Discussion

There are two main findings of the present study. First, continuing the use of AC or AP drugs during URL and fURS can significantly reduce the duration of hospital stay and the operative time. The mean duration of hospital stay of the continuation group (3.97 ± 2.08 d) was significantly lower than that of the discontinuation group (5.99 ± 3.55 d) and the discontinuation and bridge heparin group (5.75 ± 3.38 d) ($p < 0.001$). This could reduce the preoperative waiting time and simplify the preoperative preparation process. The other URL and fURS can be performed safely and effectively in patients with cardiovascular and cerebrovascular diseases, who are administered active AC or AP therapy. None of the patients in our study received blood transfusions or had thromboembolic events, emergencies for gross hematuria, significant bleeding-related complications, or unplanned secondary ureteroscopic surgery.

Table 3

Surgery parameters.

Variables	Continuation	Discontinuation	Discontinuation and bridge heparin	*p*
Mean operative time, min, mean ± SD	44.82 ± 27.81	58.88 ± 36.35	56.67 ± 32.91	0.030*
Duration of hospital stay, d, mean ± SD	3.97 ± 2.08	5.99 ± 3.55	5.75 ± 3.38	0.000**
PT, mean ± SD	11.92 ± 2.90	12.05 ± 1.36	12.10 ± 1.58	0.875
INR, mean ± SD	1.03 ± 0.28	1.01 ± 0.11	1.02 ± 0.14	0.682
APTT, mean ± SD	29.07 ± 4.54	30.55 ± 5.14	30.33 ± 6.70	0.243
FIB, mean ± SD	3.58 ± 1.06	3.51 ± 1.08	3.52 ± 1.42	0.933
Hb drop, g/L, mean ± SD	2.55 ± 10.29	6.37 ± 7.21	5.67 ± 11.55	0.067
Creatinine change, μmol/L, mean ± SD	−2.87 ± 21.95	−0.33 ± 19.58	−3.80 ± 22.65	0.640

APTT = activated partial thromboplastin time; FIB = fibrinogen; Hb = hemoglobin; INR = international normalized ratio; PT = prothrombin time.

Table 4

Postoperative complications.

Variables, n	Continuation (n = 62)	Discontinuation (n = 91)	Discontinuation and bridge heparin (n = 60)	*p*
Required blood transfusion	0	0	0	/
Thromboembolic	0	0	0	/
Residual fragments >4 mm	5	2	3	0.240
Emergency for gross hematuria	0	0	0	/
Significant bleeding-related complications	0	0	0	/
Unplanned secondary ureteroscopic surgery	0	0	0	/

At present, it is challenging for urologists to manage patients with renal stones who are under AC or AP therapy. Hiller et al.[11] reported that continuous use of AC or AP agents for ureteroscopic surgery did not increase the incidence of bleeding-related complications. However, continuous use of AP increased the risk of rehospitalization. Daels et al.[3] reported that ureteroscopy for patients with stones who are on continuous AC or AP medications increases the risk of bleeding. The overall percentage of complications after ureteroscopy was 3.5%, with the highest rate (7%) observed among patients on continuous AC. The incidence of bleeding complications in patients receiving continuous AC therapy was 1.1%, compared with 0.4% in patients not receiving AC therapy. This difference was statistically significant ($p < 0.01$). However, our study showed a contradictory result that continuous AC use did not increase the rate of bleeding complications. On the other hand, there was a 1% to 2% probability of thrombotic events occurring during perioperative heparin bridging.[12] Meanwhile, the cost and time of surgical treatment in patients with AC or AP medications are much higher than in patients without AC or AP medications.[13] Our study found that continuous AC therapy could decrease the length of hospital stay, which may benefit patients.

Our study was a multicenter study indicating a comprehensive data collection and outputs. Furthermore, few similar studies that have compared intraoperative and postoperative outcomes in patients are divided into 3 groups: continuation group, discontinuation group, and discontinuation and bridge heparin group. According to our study, we believe that the continuation of AC or AP drugs during URL and fURS can still be performed safely and effectively. This practice can also reduce the preoperative waiting time and simplify the preoperative preparation process providing significant benefits to these patients.

Limitations

However, this study has inherent limitations. First, the mean stone size was 10.81 ± 4.28, 11.45 ± 4.88, and 12.35 ± 5.04 mm. Further comprehensive and multicenter studies are needed to investigate the safety and effectiveness of URL and fURS in patients undergoing active AP or AC therapy and have large (>15 mm) and complex stones. Second, as the study was conducted in a clinical setting, the decision to discontinue drugs or bridge certain patients with heparin depended on the surgeons' preference. Last, because of inadequate collection of follow-up data on patients, we are unable to accurately calculate data on the stone-free rate.

5. Conclusions

Ureteroscopic lithotripsy and fURS can be safely and effectively performed in patients who continue treatment with AC or AP drugs, which can lead to a reduced duration of the hospital stay.

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None.

Statement of ethics

This study underwent review and approval by the Ethics Review Boards of Shanghai General Hospital (clinical trial no. ChiCTR 2200065923). Our study was approved by The Institutional Ethics Committee of Shanghai General Hospital. Written informed consents were obtained from all subjects. The study design and all testing procedures were performed according to the ethical standards of the Helsinki Declaration II.

Conflict of interest statement

No potential conflict of interest was reported by the authors.

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Author contributions

ZX, CH, LC: Analyzed the results of the study;
ZX: Wrote the paper;
JC, JW, DW, JD, DX, MT, XG, YP, JC, RC, PW, JJ: Performed data collection;
SX, YS: Revised the paper;
YS: Designed the study.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

References

[1] Zeng G, Mai Z, Xia S, et al. Prevalence of kidney stones in China: An ultrasonography based cross-sectional study. *BJU Int* 2017;120(1):109–116.
[2] Culkin DJ, Exaire EJ, Green D, et al. Anticoagulation and antiplatelet therapy in urological practice: ICUD/AUA review paper. *J Urol* 2014;192(4):1026–1034.
[3] Daels FP, Gaizauskas A, Rioja J, et al. Age-related prevalence of diabetes mellitus, cardiovascular disease and anticoagulation therapy use in a urolithiasis population and their effect on outcomes: The Clinical Research Office of the Endourological Society Ureteroscopy Global Study. *World J Urol* 2015;33(6):859–864.
[4] Kuo RL, Aslan P, Fitzgerald KB, Preminger GM. Use of ureteroscopy and holmium: YAG laser in patients with bleeding diatheses. *Urology* 1998;52(4):609–613.
[5] Watterson JD, Girvan AR, Cook AJ, et al. Safety and efficacy of holmium:YAG laser lithotripsy in patients with bleeding diatheses. *J Urol* 2002;168(2):442–445.
[6] Turna B, Stein RJ, Smaldone MC, et al. Safety and efficacy of flexible ureterorenoscopy and holmium:YAG lithotripsy for intrarenal stones in anticoagulated cases. *J Urol* 2008;179(4):1415–1419.
[7] Aboumarzouk OM, Somani BK, Monga M. Flexible ureteroscopy and holmium: YAG laser lithotripsy for stone disease in patients with bleeding diathesis: A systematic review of the literature. *Int Braz J Urol* 2012;38(3):298–305 discussion 306.
[8] Metersky ML, Nathanson I. Introducing the future of ACCP clinical practice guidelines. *Chest* 2012;141(2):285–286.
[9] Roffi M, Patrono C, Collet JP, et al. 2015 ESC guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task force for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J* 2016;37(3):267–315.
[10] Xu ZJ, Chen L, Li D, et al. Ureteroscopic and flexible ureteroscopic lithotripsy: Continuation or discontinuation of anticoagulant or antiplatelet drugs? A Chinese survey among urologists. *Urolithiasis* 2023;51(1):39.
[11] Hiller SC, Qi J, Leavitt D, et al. Ureteroscopy in patients taking anticoagulant or antiplatelet therapy: Practice patterns and outcomes in a surgical collaborative. *J Urol* 2021;205(3):833–840.
[12] Kaatz S, Paje D. Update in bridging anticoagulation. *J Thromb Thrombolysis* 2011;31(3):259–264.
[13] Klingler HC, Kramer G, Lodde M, Dorfinger K, Hofbauer J, Marberger M. Stone treatment and coagulopathy. *Eur Urol* 2003;43(1):75–79.

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