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Effect of Preoperative Alpha-Blocker Use on Early Postoperative Analgesic Requirement after Ureteroscopy for Ureteral Stones: A Retrospective Cohort Study

Üreter Taşları Nedeniyle Yapılan Üreteroskopi Sonrası Erken Dönemde Analjezik İhtiyacına Ameliyat Öncesi Alfa Bloker Kullanımının Etkisi: Retrospektif Bir Kohort Çalışması

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Abstract

Objective: This study aimed to determine whether preoperative-only alpha-blocker administration reduces postoperative analgesic requirements following ureteroscopy (URS) for ureteral stones in men. Secondary outcomes included stone-free status, operative time, and variation in effect by stone size.

Materials and Methods: This retrospective cohort study reviewed records of men who underwent URS for ureteral stones. The exposure group received a preoperative alpha-blocker specifically for the stone, discontinued after surgery. Patients with postoperative stents were excluded. The primary outcome was the requirement for additional analgesia within the first 24 postoperative hours. Confounders, including stone size, Hounsfield units, age, and proximal dilatation, were adjusted for using multivariable regression. A larger cohort, which included pre-stented patients, was analysed for sensitivity.

Results: The main cohort included 346 patients (238 non-users and 108 users). The requirement for additional analgesics was lower in the alpha-blocker group (25.9% vs 47.5%; adjusted OR=0.45; 95% CI 0.27-0.77; p=0.003), with the effect most pronounced in stones larger than 10 mm (47% vs 17%; p=0.004). Alpha-blockers did not independently affect stone-free status (adjusted OR=1.41; p=0.389) or operative time (β=−1.24; p=0.428). Sensitivity analysis produced consistent results (n=479; adjusted OR=0.49; 95% CI 0.31-0.77; p=0.002).

Conclusion: Preoperative alpha-blocker use was associated with a lower requirement for additional analgesia during the early postoperative period after URS, particularly in patients with larger stones. No independent association with stone-free status was observed. The principal association was with improved early postoperative comfort rather than stone clearance.

Keywords: Alpha-blocker, postoperative analgesia, ureteroscopy

Öz

Amaç: Üreter taşı nedeniyle üreteroskopi (URS) uygulanan erkek hastalarda, yalnızca preoperatif alfa bloker kullanımının postoperatif analjezik gereksinimine etkisini değerlendirmek. İkincil olarak taşsızlık, operasyon süresi ve etkinin taş boyutuna göre değişimini incelemek.

Gereç ve Yöntem: Retrospektif kohort çalışması. Üreter taşı nedeniyle URS uygulanan erkek hastalar incelendi. Yalnızca üreter taşı için preoperatif alfa bloker başlanan hastalar maruziyet grubunu oluşturdu; ilaç ameliyat sonrası kesildi. Postoperatif stentli hastalar dışlandı. Birincil sonlanım, postoperatif ilk 24 saatte ek analjezik gereksinimiydi. Karıştırıcı faktörler (taş boyutu, HU, yaş, proksimal dilatasyon) için çok değişkenli regresyon kullanıldı. Preoperatif stentli hastaların da dahil edildiği geniş kohort duyarlılık analizinde değerlendirildi.

Bulgular: Ana kohort 346 hastadan oluştu (238 almayan, 108 alan). Ek analjezik gereksinimi alfa bloker grubunda daha düşüktü (%25,9 vs %47,5; düzeltilmiş OR=0,45; %95 GA 0,27-0,77; p=0,003). Etki en belirgin olarak 10 mm'den büyük taşlarda görüldü (%47 vs %17; p=0,004). Alfa blokerin taşsızlık (düzeltilmiş OR=1,41; p=0,389) ve operasyon süresi (β=−1,24; p=0,428) üzerinde bağımsız etkisi yoktu. Duyarlılık analizinde (n=479) bulgu tutarlıydı (düzeltilmiş OR=0,49; %95 GA 0,31-0,77; p=0,002).

Sonuç: Preoperatif alfa bloker kullanımı, URS sonrası erken dönemde daha düşük ek analjezik gereksinimi ile ilişkili bulunmuştur. Bu ilişki büyük taşlarda daha belirgin izlenmiştir. Buna karşılık, alfa bloker kullanımı ile taşsızlık arasında bağımsız bir ilişki saptanmamıştır. Temel ilişki, taş temizliğinden çok erken postoperatif konfor ile gözlenmiştir.

Anahtar Kelimeler: Alfa bloker; postoperatif analjezi, üreteroskopi

Introduction

Ureteral stones represent a prevalent urological condition. Ureteroscopy (URS) is the primary surgical intervention, particularly for distal ureteral stones [1,2]. Despite high stone-free rates, difficulties such as difficult stone access, ureteral dilatation, and postoperative pain may reduce patient comfort.

Selective alpha-1 blockers relax the ureteral smooth muscle and reduce ureteral tone plus intraluminal pressure. This facilitates stone passage and may reduce ureteral resistance during the instrumentation [3]. Their preoperative use has been extensively studied in the context of URS. Alsaikhan et al. [4] reported that these agents reduce the need for intraoperative dilatation, improve stone access and stone-free rates, and shorten operative time by approximately 6 minutes. Bhojani et al. [3] verified these findings yet observed a smaller effect on proximal stones.

However, their effect on early postoperative analgesia is less well established. Most studies have focused on agents administered during or after surgery, and only a limited number have examined the influence of preoperative drugs on early postoperative pain [5]. Tawfeek et al. [6] demonstrated that perioperative tamsulosin reduces postoperative pain and analgesic requirements in non-stented patients. However, the drug was continued after surgery; therefore, whether the benefit reflected preoperative preparation or the ongoing drug remained uncertain. Moreover, this effect has not been adequately evaluated in real-world conditions after adjusting for confounders.

This study examined preoperative-only alpha-blocker use in patients with ureteral stones who did not receive postoperative stents. The primary aim was to assess the effect of the drug on additional analgesic requirements during the first 24 postoperative hours, adjusting for confounders. Secondary objectives included evaluating stone-free rate, operative time, and variation in effect by stone size.

Materials And Methods

Study design and ethics

This was a retrospective study. Patients who underwent URS for ureteral stones at Izmır Kâtip Çelebi University between 2020 and 2025 were reviewed. The study was approved by the İzmir Kâtip Çelebi University Health Research Ethics Committee (approval no: 0667; date: July 16, 2026) and was conducted in accordance with the principles of the Declaration of Helsinki.

Patient selection

Only male patients were included because alpha-blockers are licensed solely for men in our country. As its use in women could not be documented, female patients were excluded to prevent exposure misclassification.

Patients receiving regular alpha-blocker therapy for other indications (benign prostatic hyperplasia or hypertension) were excluded. Therefore, the exposure group comprised only patients who started preoperative alpha-blocker therapy for ureteral stones.

Additional exclusion criteria were bilateral ureteral stones, concomitant kidney stones, solitary kidneys, active urinary tract infection, and coagulopathy. Patients who received a postoperative ureteral stent were also excluded to ensure the entire cohort was stent-free after surgery. Patients with preoperative stents were excluded from the main analysis because stents independently affect ureteral dilatation and pain; these patients were assessed separately in the sensitivity analysis.

Surgical technique and alpha-blocker administration

All procedures were performed under spinal or general anaesthesia, selected according to the patient’s and surgeon’s preference. Stone fragmentation was performed using a Holmium: YAG laser. A semi-rigid ureteroscope was used first, and a flexible ureteroscope was used for proximal stones and as required.

Selected patients received an alpha-blocker at the surgeon's discretion. The drug was started at least two weeks before surgery and, unless the anaesthesia team or a relevant consultant advised otherwise, was taken regularly until the day of surgery. It was discontinued after surgery, and no patient received postoperative alpha-blockers. The agents used were tamsulosin, alfuzosin, silodosin, and doxazosin.

Variables and outcomes

The following variables were recorded: age, body mass index, comorbidities (diabetes mellitus, hypertension, and coronary artery disease), stone size, stone density (Hounsfield units, HU), stone side and location, proximal dilatation, and prior URS. The type of alpha-blocker administered was also recorded.

The primary outcome was the need for additional analgesia within the first 24 postoperative hours. All patients received standard intravenous paracetamol during this period, consistent with the recommended multimodal opioid-sparing approach after URS [5]. Additional analgesic requirement was defined as the need for an additional dose despite adherence to the standard protocol. The secondary outcomes were operative time and stone-free status.

Preoperative plain radiographs (KUB) were available for all patients, and stone radiopacity was recorded. Stone-free status was assessed 2-4 weeks after surgery; radiopaque stones were evaluated using KUB and radiolucent stones using ultrasonography (US). Residual fragments were classified by size into four grades: Grade A (stone-free), Grade B (≤2 mm), Grade C (2-4 mm), and Grade D (>4 mm). As no single definition of residual fragments exists in the literature, with fragments ≤4 mm most commonly regarded as clinically insignificant [7], Grades A-C were considered successful, and Grade D was considered residual. Owing to this definitional uncertainty, Grade A alone (complete stone-free) was evaluated in a sensitivity analysis.

Statistical analysis

All analyses were performed using Jamovi. The distribution of continuous variables was assessed using the Shapiro-Wilk test. Non-normally distributed variables are presented as medians (interquartile ranges) and were compared using the Mann-Whitney U test.

Categorical variables are presented as numbers (percentages) and were compared using the chi-square or Fisher exact test.Multivariable regression was used to adjust for confounders: logistic regression for binary outcomes (additional analgesic, stone-free) and linear regression for operative duration. Stone size, HU, age, and proximal dilatation were included as confounders. Multivariable analyses included patients with complete data for all model variables (n=324 in the main cohort; n=447 in the sensitivity cohort). The effect of alpha-blockers on analgesic requirements was stratified by stone size. Statistical significance was set at $p < 0.05$.

Results

Patient flow and baseline characteristics

During the study period, 662 men who underwent URS for ureteral stones were assessed. A total of 132 patients with concomitant kidney stones or bilateral ureteral stones were excluded, leaving 530 patients with isolated unilateral stones. A further 28 patients receiving regular alpha-blockers for another indication (benign prostatic hyperplasia or hypertension) were excluded, leaving 502 patients in the study.

After excluding 23 patients with indeterminate stone-free status, the sensitivity cohort, which also included pre-stented patients, comprised 479 patients. After excluding 133 patients with preoperative stents, the main cohort comprised 346 patients. Of these, 238 (68.8%) had not received an alpha-blocker, and 108 (31.2%) had. The agents used were tamsulosin (n=67), alfuzosin (n=22), silodosin (n=14), and doxazosin (n=5). Patient flow is shown in Figure 1.

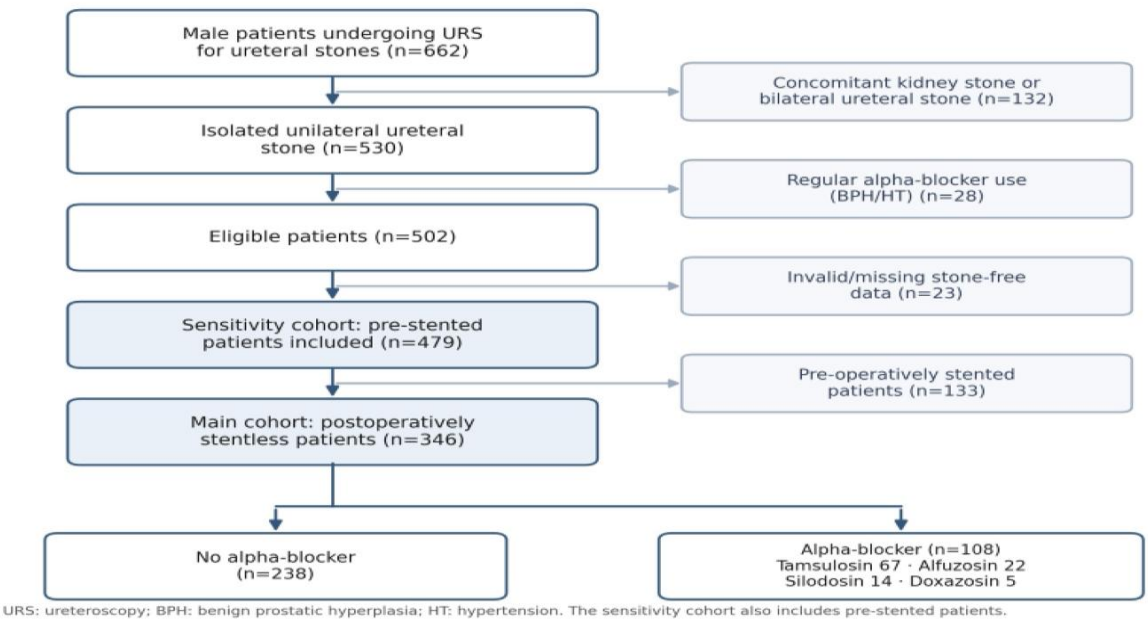

Figure 1. Patient flow diagram. URS: ureteroscopy; BPH: benign prostatic hyperplasia; HT: hypertension.

The baseline characteristics are shown in Table 1. Patients receiving an alpha-blocker were older than non-users (median 53 vs 46 years; p<0.001) and had smaller stones (median 8 vs 10 mm; p=0.027). The groups did not differ significantly in terms of other baseline variables.

Table 1. Baseline characteristics (main cohort, n=346)

Variable	No alpha-blocker (n=238)	Alpha-blocker (n=108)	p
Age, years, median (IQR)	46 (36-58)	53 (40-65)	<0.001
Body mass index, median (IQR)	26 (24-29)	26 (24-29)	0.814
Stone size, mm, median (IQR)	10 (7-13)	8 (7-11)	0.027
Stone density, HU, median (IQR)	870 (600-1090)	840 (600-1005)	0.484
Diabetes mellitus, n (%)	27 (11.3)	18 (16.7)	0.173
Hypertension, n (%)	51 (21.4)	31 (28.7)	0.172
Coronary artery disease, n (%)	22 (9.2)	7 (6.5)	0.530
Radiolucent stone, n (%)	21 (8.8)	10 (9.3)	1.000
Right side, n (%)	115 (48.3)	53 (49.1)	0.989
Proximal dilatation, n (%)	204 (86.1)	85 (78.7)	0.115
Prior ureteroscopy, n (%)	43 (18.1)	18 (16.7)	0.879

Continuous variables are presented as median (interquartile range) and were compared with the Mann-Whitney U test; categorical variables as number (percentage), compared with the Fisher exact or chi-square test. HU: Hounsfield units; IQR: interquartile range.

Primary outcome: postoperative additional analgesic requirement

The additional analgesic requirement during the first 24 postoperative hours was significantly lower in the alpha-blocker group (25.9% vs 47.5%; p<0.001). In the multivariable logistic regression adjusted for stone size, HU, age, and proximal dilatation, this effect remained significant (adjusted OR=0.45; 95% CI 0.27-0.77; p=0.003); alpha-blocker use approximately halved the odds of an additional analgesic requirement (Table 2).

In the analysis stratified by stone size, the effect was most pronounced in stones larger than 10 mm (47% vs 17%; p=0.004). In 8-10 mm stones, a non-significant trend was observed (44% vs 19%; p=0.057), and in stones ≤8 mm no significant difference was found (45% vs 34%; p=0.224).

Secondary outcomes: operative time and stone-free status

Operative time was shorter in the alpha-blocker group in the crude comparison (median 30 vs 38 minutes; p=0.003); however, this difference was no longer significant after multivariable adjustment (β=−1.24; 95% CI −4.32 to 1.84; p=0.428).

The stone-free rate (Grade A-C) did not differ markedly between groups in the crude comparison (87.0% vs 78.6%; p=0.074), and no independent effect of alpha-blockers on stone-free status was found after adjustment (adjusted OR=1.41; 95% CI 0.65-3.06; p=0.389). The result was unchanged when only complete stone-free status (Grade A) was considered (adjusted OR=1.35; 95% CI 0.67-2.73; p=0.404) (Table 2).

Table 2. *Primary and secondary outcomes (main cohort, n=346)*

Outcome	No alpha-blocker (n=238)	Alpha-blocker (n=108)	Crude p	Adjusted effect*	Adj. p
Additional analgesic ≤24 h, n (%)	113 (47.5)	28 (25.9)	<0.001	OR 0.45 (0.27-0.77)	0.003
Stone-free (Grade A-C), n (%)	187 (78.6)	94 (87.0)	0.074	OR 1.41 (0.65-3.06)	0.389
Operative time, min, median (IQR)	38 (30-50)	30 (27-45)	0.003	β −1.24 (−4.32 to 1.84)	0.428

**Multivariable regression adjusted for stone size, HU, age, and proximal dilatation. The sensitivity analysis using complete stone-free status (Grade A) yielded a similar result (adjusted OR 1.35; 95% CI 0.67-2.73; p=0.404). OR: odds ratio; β: regression coefficient; CI: confidence interval; IQR: interquartile range.*

Sensitivity analysis

The larger cohort, including pre-stented patients, comprised 479 patients, of whom 447 were included in the multivariable analysis due to missing data. The primary finding was consistent: when preoperative stent status was added to the model, the alpha-blocker continued to significantly reduce the postoperative requirement for additional analgesia (adjusted OR=0.49; 95% CI 0.31-0.77; p=0.002).

Discussion

This study evaluated preoperative-only alpha-blocker use in men undergoing URS for ureteral stones. The primary finding was that alpha-blockers reduced the early postoperative requirement for additional analgesics, an effect that persisted after adjustment for confounders (adjusted OR=0.45; 95% CI 0.27-0.77), nearly halving the odds of requiring additional analgesics. In contrast, no independent effect on stone-free status was observed. Therefore, in practice, the principal benefit of alpha-blockers is a reduction in early postoperative analgesic requirements rather than improved stone clearance.

A plausible mechanism underlies this effect. Alpha-1 blockers relax ureteral smooth muscle, suppress ureteral spasm, and lower intraluminal pressure [3]. This represents a class effect rather than a property of a single agent; meta-analyses of URS outcomes have pooled tamsulosin, silodosin, and other alpha-1 blockers [3,4], and recent meta-analyses have likewise confirmed that agents such as silodosin facilitate ureteral access during URS and shorten operative time [8,9]. In our cohort, the drug was initiated at least two weeks before surgery and continued until the day of surgery. As these agents have half-lives of approximately 9-22 hours, depending on the agent, the last dose was likely still active during the perioperative period. Hence, the ureter was likely to have remained relaxed during surgery and in the early postoperative hours. In addition, two weeks of preoperative treatment may have conditioned the ureter for instrumentation, possibly rendering the procedure less traumatic; reduced ureteral trauma may in turn lessen postoperative pain and analgesic requirement.

Our findings partly concur with those of Tawfeek et al. [6], who also reported that perioperative tamsulosin reduces postoperative pain. An important distinction, however, is that they continued the drug after surgery, whereas in our patients it was discontinued after surgery and no patient received a postoperative alpha-blocker. The analgesic benefit we observed therefore cannot be attributed to continued postoperative administration; it is more plausibly explained by preoperative preparation and the residual effect of the last preoperative dose during the perioperative period. This distinction is mechanistically important.

The analgesic benefit is also consistent with other evidence. Ketabchi and Mehrabi [10] evaluated tamsulosin in patients undergoing URS for a ureteral stone; in this randomised controlled trial, tamsulosin reduced the analgesic requirement and the number of colic episodes, supporting a favourable effect of alpha-blockers on analgesia after URS. The stratified analysis indicated that the effect depended on stone size, being most pronounced in stones larger than 10 mm (47% vs 17%; p=0.004) and weakening, without reaching significance, in smaller stones. This pattern is consistent with the proposed mechanism: larger stones require more instrumentation and dilatation, and a pre-treated, relaxed ureter is likely to confer greater benefit in such settings. The literature partly supports the interpretation; Alsaikhan et al. [4] suggested that alpha-blockers may be most effective when greater instrumentation is required. However, previous studies have largely examined the influence of size and location on stone-free status and stone passage [3]. Mohey et al. [11] reported that preoperative-only silodosin reduced the postoperative analgesic requirement in large distal stones (8.1% vs 26.2%), supporting both the preoperative regimen and the benefit in large stones. However, that study included only large stones. Our study, by contrast, demonstrated within a single cohort that the effect follows a gradient across stone size, being pronounced in large stones and weak in small ones; demonstrating this gradient represents the principal original contribution of our study. Our stone-free results warrant more prudent interpretation. In the crude analysis, the stone-free rate was slightly higher in the alpha-blocker group; however, this group had smaller stones at baseline, which may introduce selection bias. Indeed, the apparent benefit disappeared after adjustment for stone size (adjusted OR = 1.41; p = 0.389). The meta-analyses by Alsaikhan et al. [4] and Bhojani et al. [3] reported that alpha-blockers increase the stone-free rate. Still, these analyses largely rely on randomised trials in which stone size is balanced between groups. As our study mirrors real-world practice with unbalanced groups, we found no independent contribution of alpha-blockers to stone-free status; the two approaches are complementary.

Limitations

This study has several limitations. The first is its retrospective design. Alpha-blocker treatment was not randomised but administered at the surgeon's discretion, introducing selection bias, as reflected in the smaller stones and older age of the exposure group. This size difference arises because alpha-blockers, as a medical expulsive therapy, are generally prescribed for smaller distal stones (confounding by indication). Since smaller stones generally require less analgesia, this imbalance might have led to an overestimation of the analgesic benefit. Nonetheless, the benefit persisted after adjustment for stone size and was most pronounced in stones larger than 10 mm. In this subgroup, both groups had large stones, so the small-stone advantage of the alpha-blocker group is removed; the persistence of the effect here indicates that the baseline stone-size difference cannot explain the observed analgesic benefit. Multivariable adjustment was used to reduce this bias, although not all confounders can be measured.The second limitation is the imaging method. Stone-free status was assessed by KUB and US, which miss small fragments more often than computed tomography (CT) and may therefore overestimate the stone-free rate. Lopategui et al. [12] quantified this problem: in a real-practice holmium-laser series, the true CT stone-free rate was only 42.8%, rising as the fragment threshold widened (58.4% including fragments <3 mm, 69.4% including <4 mm, and 80% including ≤5 mm). As this series is methodologically close to ours, its data confirm that less sensitive imaging overestimates stone-free status. This limitation, however, applies equally to both groups and is therefore unlikely to distort the between-group comparison systematically. In addition, the absence of a single standard definition of residual fragments [7] may affect the reported rates.

The third limitation is the single-centre design, which limits generalizability. Fourth, the exact timing of the last alpha-blocker dose was unreliably recorded for all patients in this retrospective design; our interpretation of the perioperative drug effect is therefore indirect.

Conclusion

Among men undergoing URS for ureteral stones, preoperative alpha-blocker use was associated with a lower requirement for additional analgesia during the early postoperative period, particularly in patients with larger stones. This association persisted after adjustment for measured confounders and was most pronounced in patients with stones larger than 10 mm, whereas no independent association with stone-free status was observed. The principal association observed was with improved early postoperative comfort rather than stone clearance. These findings suggest a potential role for preoperative alpha-blocker use, particularly in patients with larger ureteral stones, and warrant confirmation in prospective randomised studies.

References

1. European Association of Urology. EAU Guidelines on Urolithiasis. Arnhem: EAU Guidelines Office; 2026.
2. American Urological Association. Surgical Management of Kidney and Ureteral Stones: AUA Guideline (2026), Part I. Journal of Urology. 2026. doi:10.1097/JU.0000000000004842.
3. Bhojani N, Chew BH, Bhattacharyya S, Krambeck AE, Ghani KR, Miller LE. Effect of preoperative alpha-blockers on ureteroscopy outcomes: a meta-analysis of randomised trials. BJUI Compass. 2024;5(7):613-620.
4. Alsaikhan B, Koziarz A, Lee JY, Pace KT. Preoperative alpha-blockers for ureteroscopy for ureteric stones: a systematic review and meta-analysis of randomised controlled trials. Journal of Endourology. 2020;34(1):33-41.
5. Cheung T, Raskolnikov D, Small A, Watts KL. Strategies for optimising pain management after ureteroscopy. Translational Andrology and Urology. 2024;13(7):1309-1311.
6. Tawfeek AM, Abdelwahab MS, Higazy A, et al. Effect of perioperative selective alpha-1 blockers in non-stented ureteroscopic laser lithotripsy for ureteric stones: a randomised controlled trial. Central European Journal of Urology. 2020;73(4):520-525.
7. Çavdar OF, Aydin A, Tokas T, et al. Residual stone fragments: systematic review of definitions, diagnostic standards. World Journal of Urology. 2025;43(1):194.
8. Adhoni MZU, Haider M, Somani B, Ali Z. Does silodosin improve primary ureteroscopy access and outcomes: meta-analysis of randomised controlled trials. Journal of Endourology. 2024;38(11):1148-1155.
9. Ramadhan M, Benzouak T, Ali Y, et al. Comparing tamsulosin vs silodosin before ureteroscopy: a network meta-analysis of randomised controlled trials. World Journal of Urology. 2025;43(1):671.
10. Ketabchi AA, Mehrabi S. The effect of tamsulosin, an alpha-1 receptor antagonist, as a medical expelling agent in the success rate of ureteroscopic lithotripsy. Nephro-Urology Monthly. 2013;6(1):e12836.
11. Mohey A, Gharib TM, Alazaby H, Khalil M, Abou-Taleb A, Noureldin YA. Efficacy of silodosin on the outcome of semi-rigid ureteroscopy for the management of large distal ureteric stones: masked randomised trial. Arab Journal of Urology. 2018;16(4):422-428.
12. Lopategui DM, Bhatia A, Porto JG, et al. Factors influencing computed tomography-determined stone-free rates after ureteroscopy in real-world settings and its impact on retreatment rates at medium-term follow-up. World Journal of Urology. 2025;43(1):350.