REVIEW ARTICLE

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Impact of Preoperative Silodosin on Ureteroscopy Outcomes for Ureterolithiasis: A Systematic Review and Meta-Analysis

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ABSTRACT

Purpose: To perform a systematic review and meta-analysis evaluating the efficacy and safety of preoperative silodosin in improving ureteroscopy (URS) outcomes for ureterolithiasis.

Materials and Methods: PubMed, EMBASE and Cochrane Central were systematically searched for studies comparing preoperative silodosin with placebo or 'no preoperative silodosin' in patients undergoing URS for ureteral stones. Primary outcomes included ureteral wall injury, analgesia use, fever, haematuria, stone-free rate (SFR), operative time, and complications. Statistical analysis was performed using Review Manager 5.1.7. Study quality and risk of bias were assessed per Cochrane guidelines.

Results: Nine studies, including eight randomized clinical trials, including 960 patients were analysed; 450 (46.8%) received silodosin. Compared to controls, silodosin significantly reduced ureteral injuries (RR 0.30; 95% CI: 0.18–0.49; p < 0.00001) and operative time (MD -17.72 minutes; 95% CI: -24.72 to -10.72; p < 0.00001). It also lowered analgesia needs (RR 0.35; 95% CI: 0.16–0.75; p = 0.007), with trends toward reduced fever (RR 0.67; 95% CI: 0.36–1.22; p = 0.19) and haematuria (RR 0.57; 95% CI: 0.32–1.02; p = 0.06). In studies with ≥10 days of preoperative use, silodosin significantly improved SFR (RR 1.17; 95% CI: 1.10–1.26; p < 0.00001).

Conclusions: Preoperative silodosin reduces ureteral injuries, operative time, and complications, supporting its use to improve safety and efficiency of URS for ureterolithiasis.

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INTRODUCTION

Ureterolithiasis, defined as the presence of calculi within the ureter, represents a common urological condition associated with significant clinical morbidity, including acute pain, urinary tract obstruction, and other complications necessitating timely intervention (1, 2). Ureteroscopy (URS) has emerged as a cornerstone modality for the management of ureteral stones, offering high stone-free rates and broad applicability. Despite its efficacy, URS is not without technical challenges; it is frequently associated with prolonged operative times, the need for ureteral dilation, and procedural complications that may adversely affect patient outcomes and recovery (1).

In an effort to address these challenges, pharmacological adjuncts, most notably α-adrenergic receptor antagonists, have been explored for their capacity to optimize preoperative conditions. Among these, silodosin, a highly selective α1A-adrenergic receptor blocker, has garnered increasing attention for its potential to improve ureteroscopic outcomes, particularly in comparison to tamsulosin in the context of distal ureteral calculi (3). Silodosin's greater selectivity for α1A receptors, as opposed to tamsulosin's broader affinity for both α1A and α1D subtypes, may enhance its efficacy in promoting ureteral smooth muscle relaxation and facilitating stone passage (3). These pharmacodynamic properties have led to the conduction of several randomized controlled trials (RCTs) evaluating silodosin's role in the preoperative setting.

Accordingly, we conducted a systematic review and meta-analysis to assess the impact of preoperative silodosin on the safety and efficacy of URS for ureterolithiasis. Specifically, this study evaluates outcomes including ureteral wall injury, stone-free rate (SFR), operative time, analgesic requirement, and perioperative complications. By synthesizing current evidence, it seeks to clarify silodosin's role in optimizing ureteroscopic procedures and to provide high-quality data to support clinical decision-making in urological practice.

MATERIALS AND METHODS

Protocol and Registration

This systematic review and meta-analysis followed the Cochrane Handbook and PRISMA guidelines (4, 5). The protocol was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) (protocol: CRD42025633316).

Inclusion and Exclusion Criteria

Studies were included if they: (I) compared preoperative silodosin with a control; (II) involved patients undergoing ureteroscopy (URS); and (III) addressed ureterolithiasis. The control groups included no treatment or placebo, defined as an inert substance mimicking silodosin without pharmacologic effects. These comparators served to isolate silodosin's specific impact on surgical outcomes.

Conversely, studies were excluded if they were animal studies, case reports, or case series, as well as those that did not align with the PICOT framework. Specifically: (P) Population – patients with ureterolithiasis scheduled for URS; (I) Intervention – preoperative use of silodosin; (C) Comparison – no alpha-blockers or placebo; (O) Outcomes – intraoperative dilation, SFR, operative time, hospital stay, ureteral navigation, and complications; and (T) Type of studies – primary studies only, thereby excluding animal studies and case reports or series.

Search Strategy

Searches were conducted in PubMed, Embase, and Cochrane databases for studies published between 2014 and 2024. No language or sample size restrictions were applied. The search strategy is detailed in Supplementary Table-S1 (see material supplementary).

Study Selection and Data Extraction

Two reviewers independently screened studies using Rayyan software (6), resolving discrepancies by consensus. Data were extracted by one reviewer and cross-checked by the other. Extracted

variables included study design, sample size, age, BMI, stone location, stone size, and outcomes. All data were stored in a standardized database.

Endpoints and Definitions

The endpoints of interest were categorized as intraoperative and postoperative. Intraoperative endpoints included operative time, ureteral wall injury, and need for dilation (defined as requiring dilation if the ureteroscope could not pass the ureterovesical junction). Postoperative endpoints included SFR (residual fragments < 4 mm), need for analgesia, fever (≥ 38º C), and haematuria. Follow-up timing and imaging varied by study protocol. Only studies with comparable definitions were included in outcome-specific syntheses.

Quality Assessment

Quality assessment of included studies was conducted using Cochrane tools.: RoB 2 for RCTs (7) and ROBINS-I for non-randomized studies (8), ensuring reliability and transparency of findings.

Statistical analysis

Meta-analyses were conducted using Review Manager 5.4 (Copenhagen) (9). For dichotomous outcomes, risk ratios (RRs) with 95% confidence intervals (CIs) were calculated, whereas continuous outcomes were analysed using mean differences (MDs). Moreover, a random-effects model was employed, as variations in study populations and protocols were anticipated.

In addition, heterogeneity was assessed via Cochran's Q and I^2 statistics, with $p < 0.10$ and $I^2 > 25\%$ considered significant. To further address heterogeneity, sensitivity analyses were performed. Furthermore, subgroup analyses were conducted based on study type (RCT vs. non-RCT) and duration of silodosin use (<10 vs. ≥10 days). Finally, when only medians and interquartile ranges were reported, means and standard deviations were estimated using the method proposed by Wan et al. (10).

RESULTS

Selected Studies and Baseline Characteristics

A total of 313 articles were identified through PubMed, Embase, and Cochrane. After removing 151 duplicates, 162 records were screened, and 12 underwent full-text review. Four conference abstracts were excluded. Additional studies identified via backward snowballing brought the final number to nine included in the meta-analysis. The selection process is detailed in the PRISMA flow diagram (Figure-1), with the full checklist in the supplementary material (Figures S12–S14) (see material supplementary).

Nine studies (eight RCTs) with 960 patients were analysed (1, 2, 11-17). Of these, 450 (46.8%) received 8 mg/day of silodosin for 3–14 days before URS. Follow-up ranged from 1 to 3 months. Additionally, 613 patients were male (63.8%) and 145 (55.9%) had lower ureteral stones. Baseline characteristics are summarized in Table-1 and Table-S2 (see material supplementary).

Quality Assessment

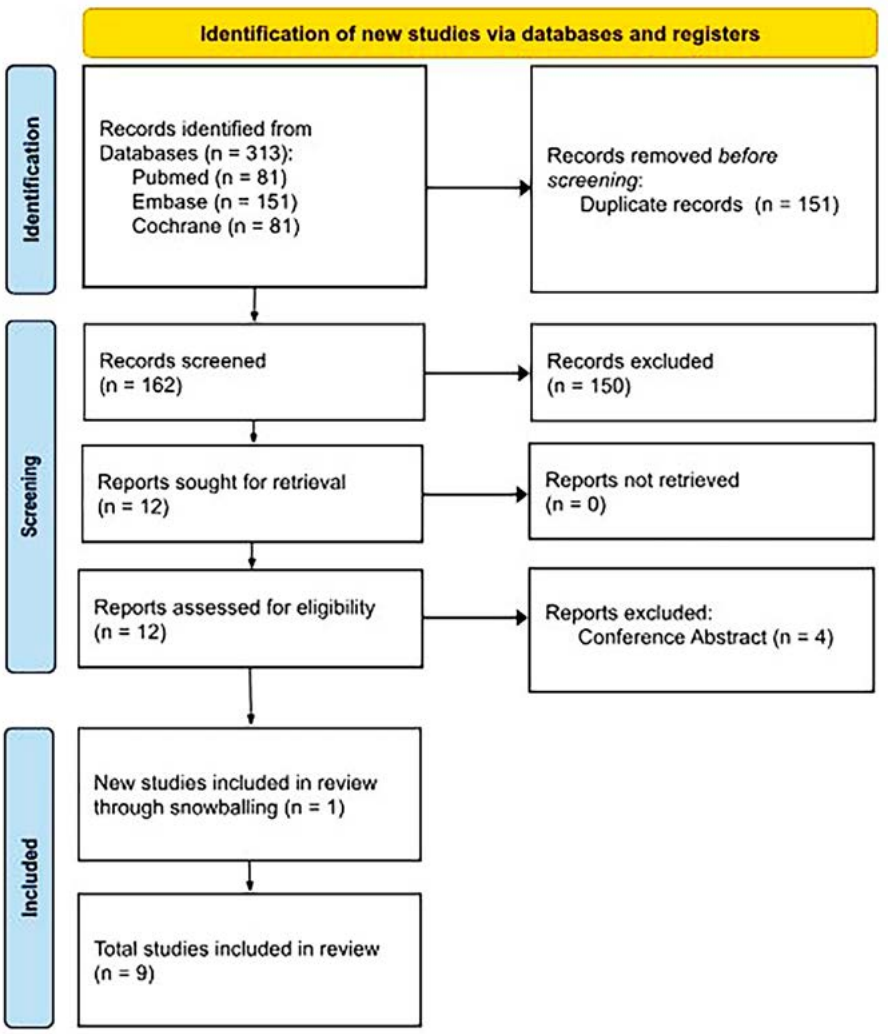
Two reviewers independently appraised the quality of individual studies. Notably, two RCTs raised some bias concerns: Aydin et al. (2), due to differences in ureteroscope use, and Goyal et al. (15), due to unclear blinding. Furthermore, Alaridy et al. (2) was rated as having moderate risk of bias per ROBINS-I, owing to unadjusted confounders and missing data.

Endpoints Pooled Analysis

A meta-analysis showed that preoperative silodosin significantly improved 6 outcomes. It reduced ureteral injury (RR 0.31; 95% CI: 0.20–0.49; $p < 0.00001$; $I^2 = 0\%$; Figure-2A) and shortened operative time by 14.17 minutes (95% CI: -19.37 to -8.97; $p < 0.000001$; $I^2 = 96\%$; Figure-2B).

The SFR showed no significant difference between the silodosin and control groups (RR 1.13; 95% CI 0.97 – 1.31; $p = 0.12$; $I^2 = 91\%$; Figure-2C). However, it is important to note that the timing and method of postoperative imaging to assess stone-free sta-

Figure 1 - PRISMA flow diagram of study screening and selection.



tus varied considerably across the included studies. Some trials performed evaluations as early as 1 week after surgery, whereas others waited up to 3 months. Additionally, the imaging modalities used were not standardized, further contributing to the observed heterogeneity. Despite these variations in follow-up protocols, the requirement for ureteral dilation was significantly lower in the silodosin group (RR 0.37; 95% CI 0.27 – 0.51; p < 0.00001; I^2 = 31%; Figure-2D), and silodosin-treated patients required less post-operative analgesia than controls (RR 0.46; 95% CI 0.25–0.82; p = 0.009; I^2 = 0%; Figure-S2) (see material supplementary).

Subgroup Analyses

Subgroup Analysis of RCTs

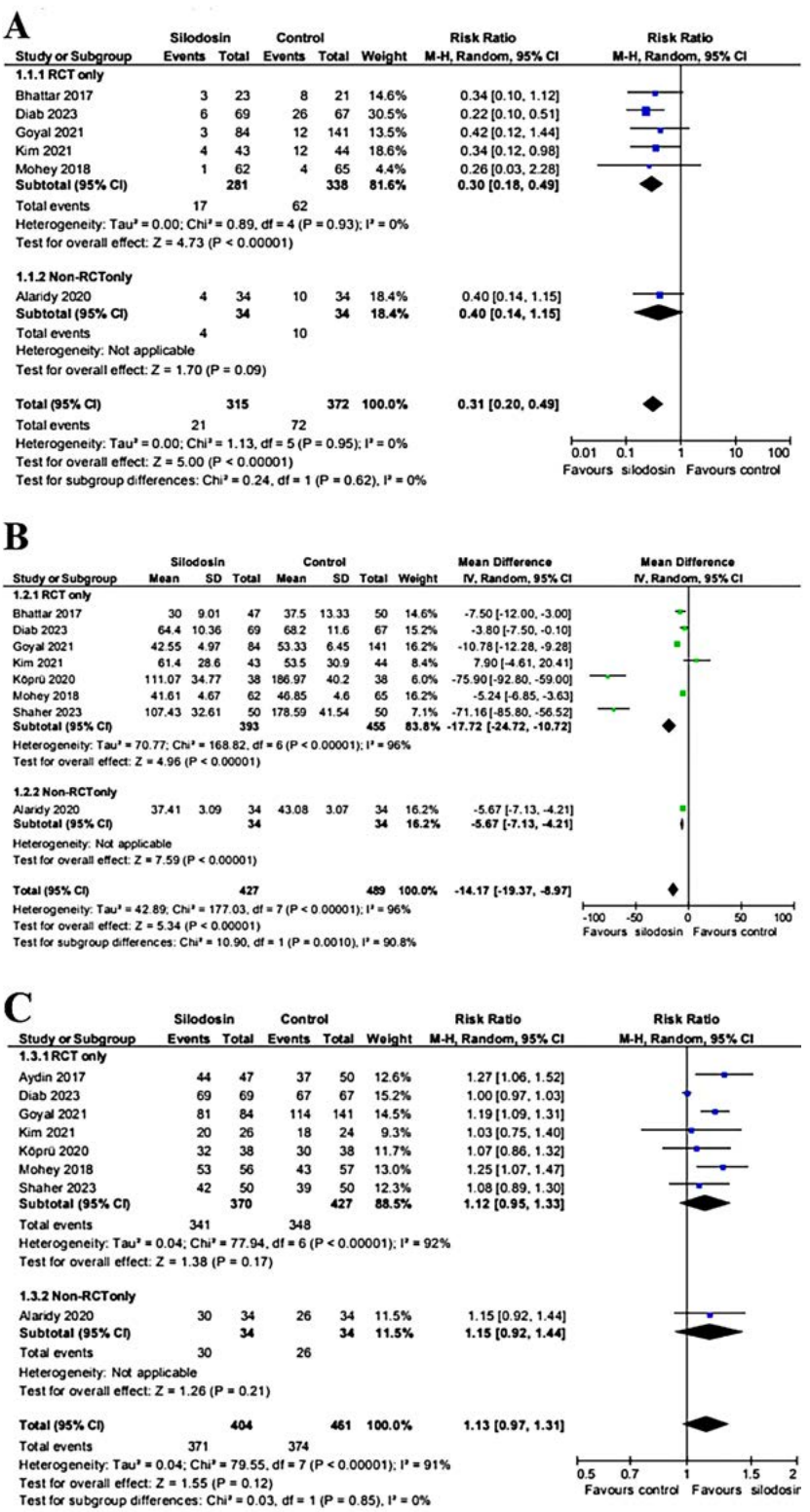
In the subgroup analyses limited to RCTs, the previously observed outcomes remained consistent in both direction and statistical significance. The incidence of ureteral wall injury (RR 0.30; 95% CI 0.18 - 0.49; p < 0.00001; I^2 = 0%; Figure-2A), reduction in operative time (MD -17.72; 95% CI -24.72 to -10.72; p < 0.00001; I^2 = 96%; Figure-2B), lower requirement for ureteral dilation (RR 0.31; 95% CI 0.23 - 0.43; p < 0.00001; I^2 = 0%; Figure-2D), reduced need for post-operative analgesia (RR 0.35; CI 0.16 - 0.75; p = 0.007; I^2 = 0%; Figure-S2) (see material supplementary), as

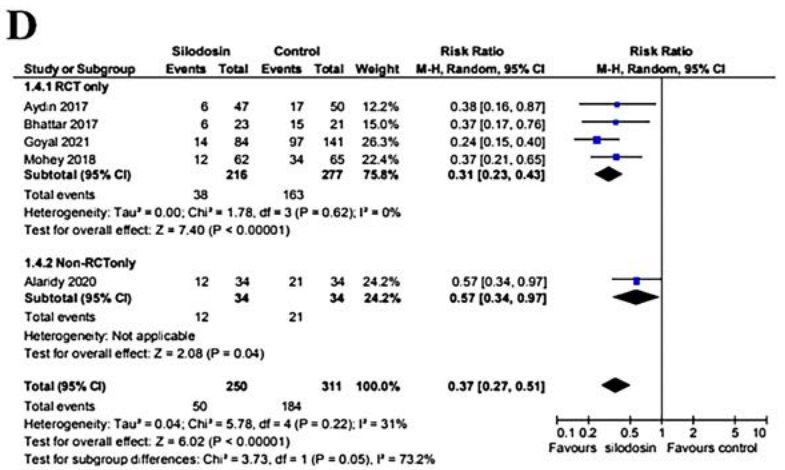
Table 1 - Baseline characteristics of the included studies.

Study, year	Study Design	Type of Control	Follow-up (months)	Time of therapy (dways)	Baseline Population Size, No. Silodosin Control	Age, years (mean ± SD) Silodosin Control	BMI, kg/mm² (mean ± SD) Silodosin Control	Male, No. (%) Silodosin Control	Stone size, mm (mean ± SD) Silodosin Control	Location of ureteral calculi (upper/middle/ lower) Silodosin Control
Alaridy et al., 2020 (2)	Non-RCT	Placebo	1	7	34 34	33.29 ± 9.51 34.60 ± 12.01	NA	25 (73.52) 25 (73.52)	10.35 ± 2.38 10.41 ± 2.43	3/6/25 3/6/25
Aydin et al., 2017 (11)	RCT	No pre-treatment	1	3	47 5	43.00 ± 14.29* 37.50 ± 12.50*	NA	32 (68.08) 33 (66.00)	NA	12/9/26 8/12/30
Bhattar et al., 2017 (12)	RCT	Placebo	NA	14	23 21	35.52 ± 11.00 33.22 ± 10.07	23.34 34.10	15 (65.21) 15 (71.42)	9.14 ± 1.52 9.74 ± 1.98	5/4/14 6/3/12
Diab et al., 2023 (1)	RCT	Placebo	3	7	69 67	41.40 ± 14.26 42.40 ± 15.44	26.90 ± 3.79, 27.30 ± 3.97	38 (46.37) 41 (61.19)	12.50 ± 3.91 13.00 ± 3.71	70/0/0 70/0/0
Goyal et al., 2021 (13)	RCT	Placebo	0.5	10	84 141	39.28 ± 8.25 38.22 ± 8.34	27.75 ± 2.22 27.46 ± 2.29	53 (63.19) 86 (60.99)	8.77 ± 4.12 8.53 ± 0.49	0/0/84 0/0/93
Kim et al., 2021 (14)	RCT	No pre-treatment	3	3	43 44	48.50 ± 11.60 45.80 ± 13.80	26.80± 4.90, 25.20 ± 3.30	29 (67.44) 23 (52.27)	8.86 ± 3.60 8.68 ± 5.07	50/0/0 50/0/0
Köprü et al., 2020 (15)	RCT	No pre-treatment	3	10	38 38	45.41 ± 12.88* 46.52 ± 14.52*	NA	30 (78.94) 23 (60.52)	19.02 ± 5.90 17.94 ± 4.60	2/8/6 2/6/7
Mohey et al., 2018 (16)	RCT	Placebo	1	10	62 65	38.27 ± 9.37 39.67 ± 9.54	27.55 ± 2.28 27.80 ± 3.50	39 (62.90) 39 (60.00)	12.60 ± 1.25 12.90 ± 1.29	0/0/62 0/0/65
Shaher et al., 2023 (17)	RCT	Placebo	1	10	50 50	44.65 ± 10.13 45.37 ± 12.78	26.12 ± 2.63 26.34 ± 2.74	37 (74.00) 30 (60.00)	18.33 ± 5.17 17.61 ± 4.25	11/0/0 8/0/0

BMI = Body Mass Index; RCT = Randomised controlled trial; NA = Not available
* Mean and standard deviation (SD) estimated from median and interquartile range or median and range

Figure 2 - Forest plots for pooled risk ratio and mean difference of significant ureteral wall injury (A), operative time (B), SFR (C), and ureteral dilation required (D).





well as fewer cases of postoperative fever (RR 0.49; 95% CI 0.27 - 0.88; p = 0.02; I^2 = 0%; Figure-S3A) (see material supplementary) and haematuria (RR 0.52; CI 0.28 - 0.98; p = 0.04; I^2 = 0%; Figure-S3B) (see material supplementary) all continued to favour the silodosin group. The SFR remained statistically similar between the silodosin and control groups (RR 1.12; 95% CI 0.95 - 1.33; p = 0.17; I^2 = 92%; Figure-2C). This consistency across RCTs strengthens the robustness of the findings and supports silodosin's effectiveness as a preoperative option for patients undergoing URS.

Subgroup Analysis Stratified by Duration of Preoperative Therapy (≥10 days vs <10 days)

In the subgroup analyses stratified into studies that conducted pre-URS therapy for ten days or more and those with therapy lasting fewer than ten days, the previously observed outcomes remained consistent in both direction and statistical significance (Figures S4, S5, and S6) (see material supplementary), except for the SFR outcome. A significant improvement in SFR was observed compared to the control in the subgroup receiving Silodosin for ≥ 10 days (RR 1.17, 95% CI: 1.10 – 1.26, p < 0.00001; I^2 = 0; Figure-S7) (see material supplementary). In contrast, the subgroup with therapy duration < 10 days showed no significant difference (RR 1.11, 95% CI: 0.82 – 1.49, p = 0.48; I^2 = 93; Figure-S5) (see material supplementary). Despite these findings, the test for subgroup differences revealed no statistically significant effect modification by therapy duration (p = 0.70).

Subgroup Analysis of Different Calculi Location

We performed a subgroup analysis stratifying data by stone location (distal ureteric stones, proximal ureteric stones, and studies including mixed locations) (Figures S8-S11) (see material supplementary).

The use of preoperative silodosin was associated with improved outcomes, particularly for distal ureteral calculi, whereas proximal stones generally showed non-significant results for several endpoints. This pattern was consistently observed across operative time, need for analgesia, and SFR.

Distal calculi treated with silodosin demonstrated a significant reduction in operative time (MD -8.02; 95% CI: –13.45 to –2.59; p = 0.004; I^2 = 96%; Figure-S8) (see material supplementary), whereas proximal calculi showed a non-significant reduction (MD -21.92; 95% CI: –59.09 to 15.26; I^2 = 98%; p = 0.25; Figure-S8). Silodosin significantly reduced the requirement for postoperative analgesia in distal stones (RR 0.31; 95% CI: 0.12–0.79; p = 0.01; Figure-S9) (see material supplementary), while no significant difference was observed for proximal (RR 0.45; 95% CI: 0.12–1.77; p = 0.25; I^2 = 0%; Figure-S9). Distal calculi exhibited a significant improvement in SFR with silodosin (RR 1.21; 95% CI: 1.12–1.31; p < 0.00001; I^2

= 0%; Figure-S11) (see material supplementary), as did mixed-location stones (RR 1.17; 95% CI: 1.04–1.32; p = 0.008; I^2 = 0%; Figure-S11). Proximal stones showed no significant effect (RR 1.02; 95% CI 0.90–1.16; p = 0.73; I^2 = 46%; Figure-S11).

Interestingly, silodosin significantly reduced wall injury rates for proximal calculi (RR 0.26; 95% CI: 0.14–0.50; p < 0.0001; I^2 = 0%; Figure-S8) and mixed-location stones (RR 0.37; 95% CI 0.17–0.82; p = 0.01; I^2 = 0%; Figure-S8), while a non-significant reduction was observed for distal stones (RR 0.37; 95% CI: 0.13–1.09; 0.07; I^2 = 0%; Figure-S8).

Due to a lack of events, no pooled effect could be estimated for proximal calculi on the outcome of need for ureteral dilation. However, distal (RR 0.29; 95% CI: 0.19–0.44; p < 0.0001; I^2 = 21%; Figure-S9) and mixed-location stones (RR 0.46; 95% CI 0.32–0.68; p < 0.0001; I^2 = 0%; Figure-S9) showed consistent significant reductions.

When stratified by stone location, no significant differences were observed for either fever or haematuria (Figure-S10) (see material supplementary). However, pooled analysis across all locations revealed a significant reduction in postoperative fever (p = 0.02) and haematuria (p = 0.02) with preoperative silodosin.

Sensitivity Analysis

We conducted leave-one-out sensitivity analyses to assess the robustness of our findings for outcomes with elevated heterogeneity. For ureteral wall injury, operative time, and ureteral dilation, the exclusion of individual studies did not impact the statistical significance or the I^2 statistics. This confirms the consistency of the results and indicates they are not disproportionately influenced by any single study. However, the SFR, excluding the study by Diab et al. (13), resulted in a substantial change in effect size, favouring the silodosin group with a RR of 1.18 (95% CI 1.11 - 1.25; p < 0.00001). Moreover, the I^2 statistic decreased dramatically from 91% to 0% upon the exclusion of this study. These findings highlight its significant impact on the overall results and suggest it was a major source of variability.

DISCUSSION

This systematic review and meta-analysis demonstrated that preoperative silodosin improves both the safety and efficiency of ureteroscopy (URS) for ureterolithiasis. Specifically, silodosin significantly reduced ureteral wall injury, operative time, ureteral dilation, need for analgesia, fever, and haematuria.

Moreover, these findings align with those of Bhojani et al. (18), who showed that alpha-blockers benefit URS outcomes. However, their study evaluated the drug class as a whole, whereas ours focused specifically on silodosin. Notably, silodosin has shown superiority over tamsulosin, likely due to its higher α1A receptor selectivity (3).

Ureteral wall injury, a key endpoint in six studies, can cause serious complications such as avulsion (19). In this context, our analysis demonstrated consistent reductions in injury rates across subgroups and in sensitivity analyses. In addition, the reduced operative time observed in the silodosin group may reflect its ability to relax ureteral smooth muscle, thereby easing scope passage and decreasing the need for mechanical dilation (20).

Consequently, shorter surgeries may also explain the lower incidence of postoperative fever, as reduced tissue manipulation and trauma likely diminish the risk of infection. By facilitating smoother endoscope advancement, silodosin minimizes ureteral irritation, which may translate to fewer postoperative complications.

Regarding treatment duration, it ranged from 3 to 14 days across the included studies. Although all durations demonstrated some benefit, longer silodosin treatment was associated with significantly higher SFR, supported by low heterogeneity (I^2 = 0%) and narrower confidence intervals. In contrast, the subgroup with <10 days of treatment showed no significant benefit and exhibited high heterogeneity. Although the difference between subgroups was not statistically significant, longer silodosin exposure may enhance ureteral relaxation and stone clearance, thus warranting further investigation.

Regarding stone location, preoperative silodosin significantly improved outcomes in ureteroscopy, particularly for distal ureteral stones, where reductions in operative time, analgesic requirement, and higher stone-free rates were observed. This is consistent with the known distribution of α1-adrenergic receptors, which are more densely expressed in the distal ureter (21). Proximal calculi did not show consistent benefits in efficiency but demonstrated a marked reduction in wall injury.

Furthermore, variability in surgical techniques, such as the use of rigid versus flexible ureteroscopes, access sheaths, and different laser technologies, may have influenced the observed outcomes. Institutional resources and surgeon experience likely contributed to these variations. Additionally, patient-related factors, including comorbidities and stone characteristics (size and location), may have added to the heterogeneity. While some studies focused on distal ureteral stones, where alpha-blockers are particularly effective (22, 23), others included stones at various ureteral locations. Regarding BMI, all included studies reported a mean BMI within the overweight range in both the silodosin and control groups. The only exception was one study (12), in which the mean BMI was in the normal range for the silodosin group, whereas the control group had a mean BMI in the class I obesity range. These discrepancies likely explain the heterogeneity in certain outcomes, despite subgroup and sensitivity analyses.

A key strength of this meta-analysis is its individualized assessment of each complication, thereby avoiding potential bias from composite outcome reporting. Indeed, grouping complications could lead to double-counting patients and obscure drug-specific effects. Our findings, therefore, support silodosin's favourable safety profile, showing reductions in complications and operative time. Although adverse events were not uniformly reported, existing data suggest that silodosin may be safer than other alpha-blockers such as tamsulosin (3, 24).

In conclusion, silodosin appears to be an effective and safe preoperative adjunct in URS. It reduces complications and operative time, with potential advantages for extended preoperative use. Nevertheless, heterogeneity across studies and inconsistent adverse event reporting underscore the need for standardized protocols and further high-quality trials to define its optimal clinical application.

Limitations

This meta-analysis provides Level 1 evidence supporting preoperative silodosin use before URS for ureterolithiasis. However, several limitations must be acknowledged.

First, the stone location varied considerably among patients, potentially influencing procedural difficulty and outcomes. Second, significant heterogeneity was noted in the assessment of SFR, including inconsistent definitions (e.g., residual fragments < 2 mm vs. 0 mm), different imaging modalities (CT, X-ray, or ultrasound), and varied follow-up timing (1 week to 3 months). These inconsistencies limit the comparability of SFR results.

Third, none of the RCTs accounted for spontaneous stone expulsion rates, which may have reduced the true effect size in patients who might not have required surgery. Fourth, essential procedural variables, such as stone location, surgical technique, stent placement, and duration, were not uniformly reported across studies, potentially confounding analyses of postoperative outcomes like pain and hematuria, which may often be attributed to ureteric stent use and may not significantly impact patient management or outcomes after ureteroscopy.

Lastly, stricture formation, a relevant long-term complication, was not addressed in any of the included studies. This omission restricts the evaluation of silodosin's potential long-term protective effects.

These limitations underscore the challenge of synthesizing data from heterogeneous trials and highlight the need for future research employing standardized protocols, uniform definitions, and comprehensive outcome reporting to better define silodosin's role in URS optimization.

CONCLUSIONS

In this meta-analysis, utilizing silodosin as a preoperative treatment in the URS approach for ure-

terolithiasis improves both the safety and efficiency of the procedure compared to no preoperative therapy. Future research should prioritize RCTs that incorporate stratification based on stone location while also focusing on standardizing the definition of SFR, ensuring proper follow-up, and optimizing preoperative silodosin treatment duration.

ABBREVIATIONS

BMI = Body Mass Index
CI = Confidence intervals
MD = Mean difference
PICOT = Population, intervention, comparison, outcome, and type of studies
PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analysis
PROSPERO = Prospective Register of Systematic Reviews
RCT = Randomized controlled trial
RoB 2 = Risk of Bias 2
ROBINS-I = Risk of Bias in Non-Randomized Studies of Interventions
RR = Risk ratio
SD = Standard deviation
SFR = Stone-free rate
URS = Ureteroscopy

Ethical approval

Ethical approval was not required for a meta-analysis of previously published studies.

Research involving human participants and/or animals

The study did not involve human participants and/or animals.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. Diab T, El-Shaer W, Ibrahim S, El-Barky E, Elezz AA. Does preoperative silodosin administration facilitate ureteral dilation during flexible ureterorenoscopy? A randomized clinical trial. Int Urol Nephrol. 2024;56:839–846. doi:10.1007/s11255-023-03824-6.
2. Alaridy HM, Zwain KMA, Al-Mosawi HQ, Hadi NR. Comparison of silodosin, tadalafil and combinations prior to ureteroscopic management of ureteral stones. Sys Rev Pharm. 2020;11:238–242.
3. Abdullah A, Basoo Gupta Y, Selvaraj S, Ramachandran M, K N, R M, et al. A comparison between silodosin and tamsulosin for medical expulsive therapy of distal ureteral calculus. Cureus. 2023;15:e47008. doi:10.7759/cureus.47008.
4. Higgins JPT, Thomas J, eds. Cochrane handbook for systematic reviews of interventions [Internet]. 2nd ed. Hoboken (NJ): Wiley-Blackwell; 2019 [cited 2025 Jan 7]. doi:10.1002/9781119536604.
5. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi:10.1136/bmj.n71.
6. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. Syst Rev. 2016;5:210. doi:10.1186/s13643-016-0384-4.
7. Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: a revised tool for assessing risk of bias in randomized trials. BMJ. 2019;366:l4898. doi:10.1136/bmj.l4898.
8. Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomized studies of interventions. BMJ. 2016;355:i4919. doi:10.1136/bmj.i4919.
9. The Cochrane Collaboration. Review Manager (RevMan) [Computer program]. 2020.
10. Wan X, Wang W, Liu J, Tong T. Estimating the sample mean and standard deviation from the sample size, median, range and/or interquartile range. BMC Med Res Methodol. 2014;14:135. doi:10.1186/1471-2288-14-135.

11. Aydın M, Kılınç MF, Yavuz A, Bayar G. Do alpha-1 antagonist medications affect the success of semi-rigid ureteroscopy? A prospective, randomized, single-blind, multicentric study. Urolithiasis. 2018;46:567–572. doi:10.1007/s00240-017-1026-6.
12. Bhattar R, Jain V, Tomar V, Yadav SS. Safety and efficacy of silodosin and tadalafil in ease of negotiation of large ureteroscope in the management of ureteral stone: a prospective randomized trial. Turk J Urol. 2017;43:484–489. doi:10.5152/tud.2017.83548.
13. Goyal S. Does preoperative alpha blocker actually help in negotiation of 8/9.8 Fr ureteroscope through vesicoureteric junction? A single center randomized trial. Glob J Res Anal. 2021;10:38–41.
14. Kim JK, Choi CI, Lee SH, Han JH, Shim YS, Choo MS; Young Endourological Study Group. Silodosin for prevention of ureteral injuries resulting from insertion of a ureteral access sheath: a randomized controlled trial. Eur Urol Focus. 2022;8:572–579. doi:10.1016/j.euf.2021.03.009.
15. Köprü B, Ebiloğlu T, Kaya E, Özkent MS, Doğan M, Ertaş K, et al. Does preoperative use of silodosin affect the stages of F-URS procedure? Arch Esp Urol. 2020;73:47–53.
16. 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 ureteral stones: blinded randomized trial. Arab J Urol. 2018;16:422–428. doi:10.1016/j.aju.2018.10.085.
17. Shaher H, Sebaey A, Albaky AMA, Mahmoud MAA, Elaal AMA. Efficacy of pre-operative silodosin on flexible ureteroscopy procedure: a randomized controlled study. Arab J Urol. 2023;21:267–272. doi:10.1080/2090598X.2023.2208790.
18. Bhojani N, Chew BH, Bhattacharyya S, Krambeck AE, Ghani KR, Miller LE. Effect of preoperative alpha-blockers on ureteroscopy outcomes: a meta-analysis of randomized trials. BJUI Compass. 2024;5:727–734. doi:10.1002/bco2.358.
19. De Coninck V, Keller EX, Somani B, Giusti G, Proietti S. Complications of ureteroscopy: a complete overview. World J Urol. 2020;38:2147–2166. doi:10.1007/s00345-019-03012-1.
20. Alsaikhan B, Koziarz A, Lee JY, Pace KT. Preoperative alpha-blockers for ureteroscopy for ureteral stones: a systematic review and meta-analysis of randomized controlled trials. J Endourol. 2020;34:33–41. doi:10.1089/end.2019.0520.
21. Sasaki S, Tomiyama Y, Kobayashi S, Kojima Y, Kubota Y, Kohri K. Characterization of α1-adrenoceptor subtypes mediating contraction in human isolated ureters. Urology. 2011;77:762.e13–762.e17. doi:10.1016/j.urology.2010.09.034.
22. Yuksel M, Yilmaz S, Tokgoz H, Yalcinkaya S, Baş S, Ipekci T, et al. Efficacy of silodosin in the treatment of distal ureteral stones 4 to 10 mm in diameter. Int J Clin Exp Med. 2015;8:19086–19092.
23. Vincendeau S, Bellissant E, Houlgatte A, Doré B, Bruyère F, Renault A, et al. Tamsulosin hydrochloride vs placebo for management of distal ureteral stones: a multicentric, randomized, double-blind trial. Arch Intern Med. 2010;170:2021–2027. doi:10.1001/archinternmed.2010.447.
24. Cicione A, Nacchia A, Baldassarri V, Tema G, Rovesti LM, Mancini E, et al. Adverse events related to alpha-blockers: analysis of real-life data from Eudra-Vigilance. Minerva Urol Nephrol. 2023;75:479–485. doi:10.23736/S2724-6051.23.05225-4.

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APPENDIX

SUPPLEMENTARY MATERIALS

Impact of Preoperative Silodosin on Ureteroscopy Outcomes for Ureterolithiasis: A Systematic Review and Meta-Analysis

SUPPLEMENTARY FIGURES

Figure S1 - Diagram of Risk of Bias assessment in randomised trials using the RoB 2 tool (A) and non-randomised trials using the ROBINS-I tool (B).

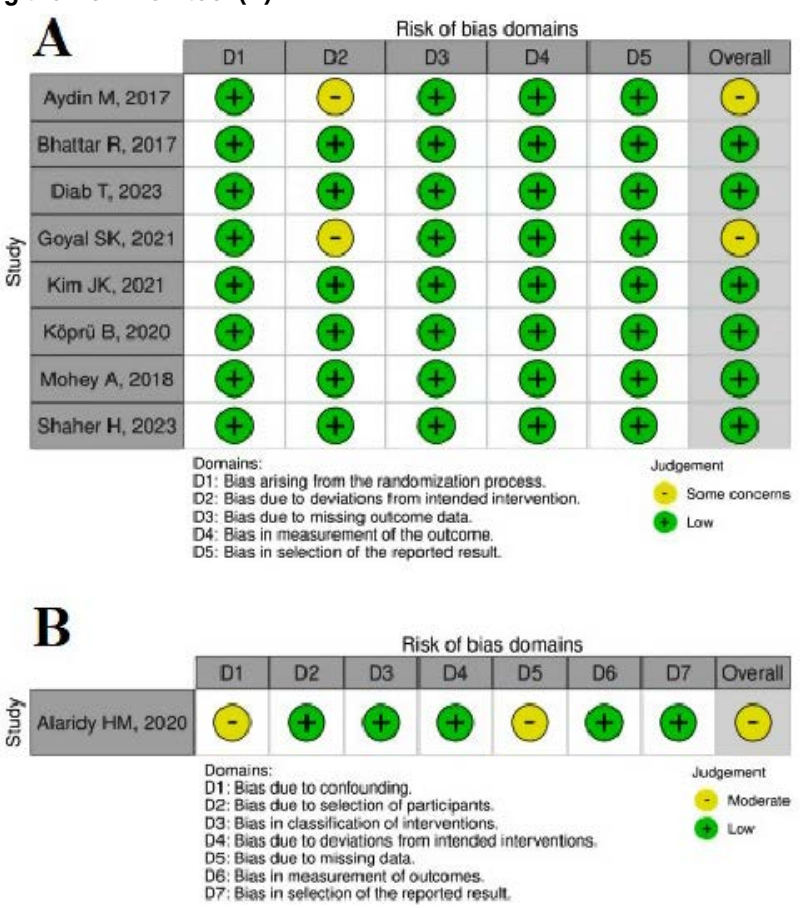


Figure S2 - Forrest plot: Need for analgesia.

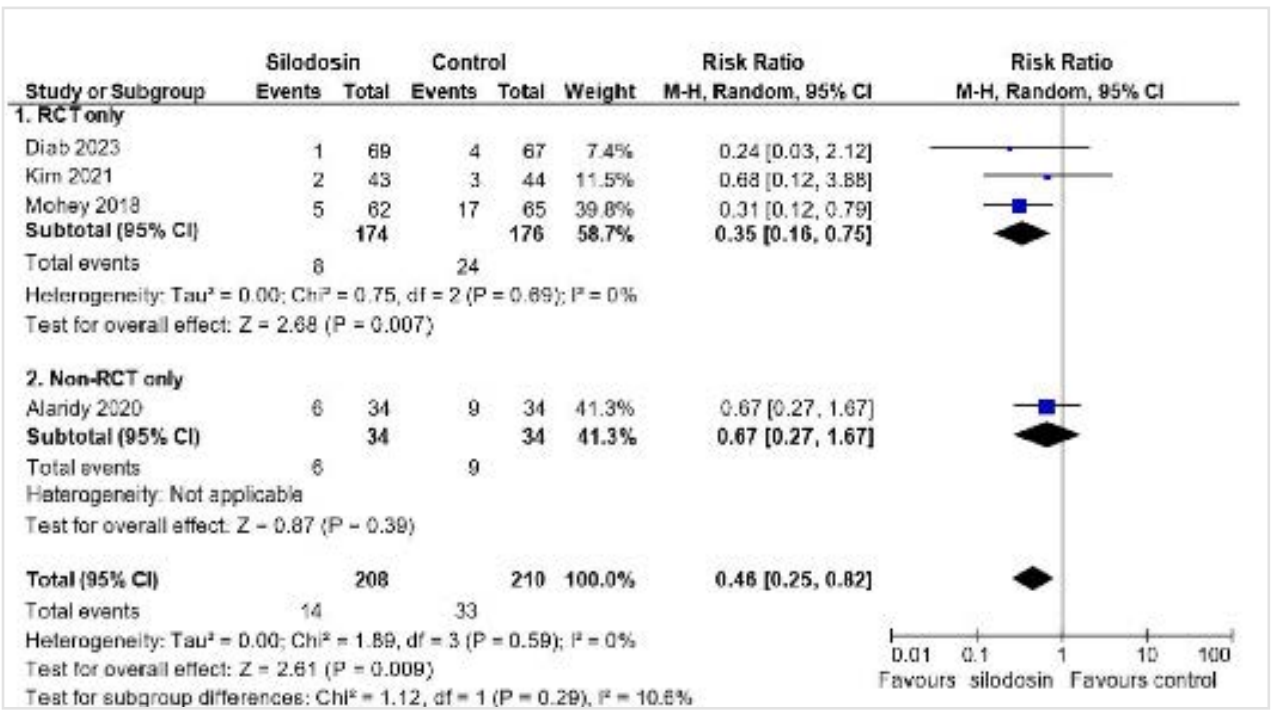
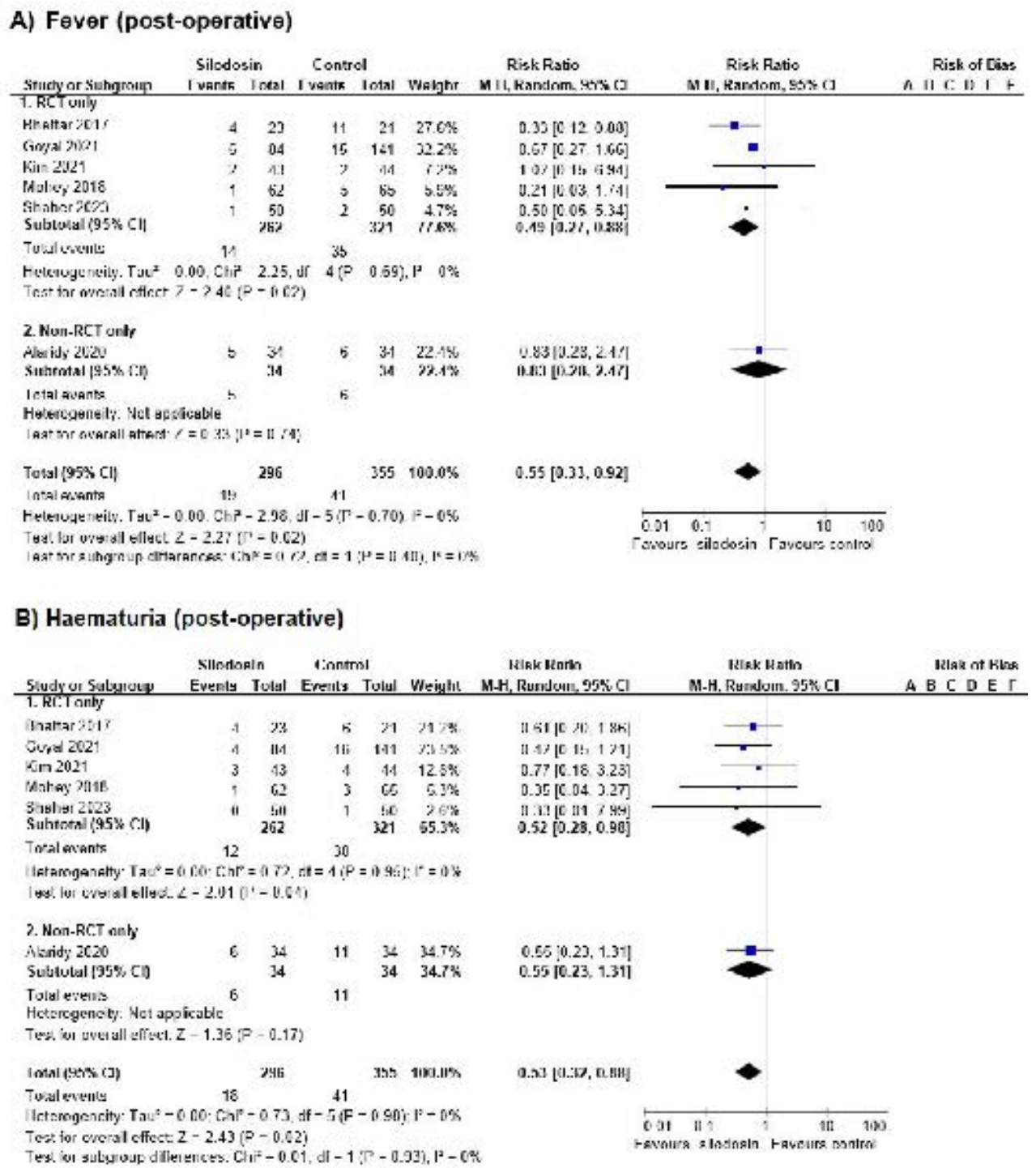
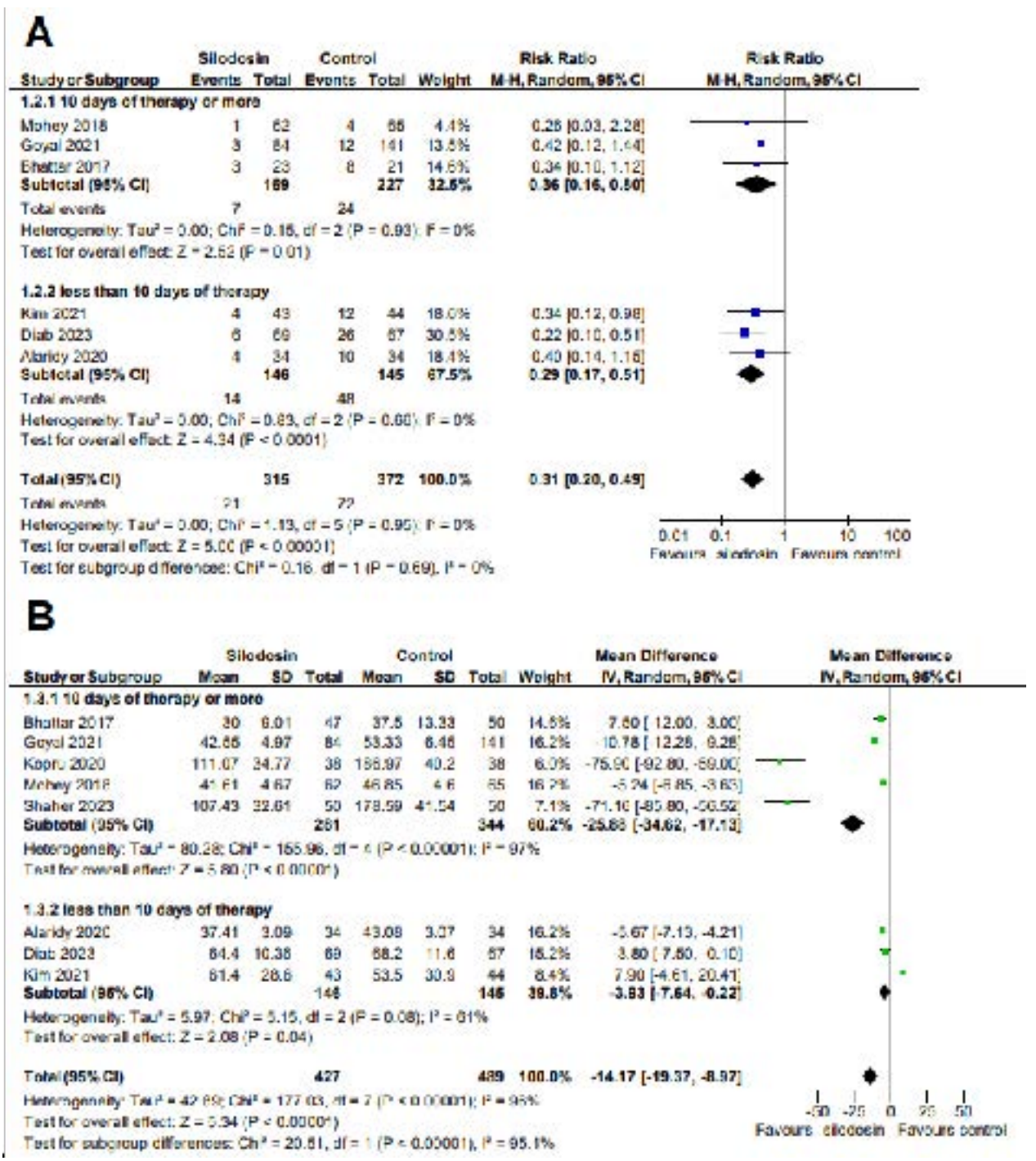


Figure S3 - Forrest plot: Post-operative fever (A) and hematuria (B).



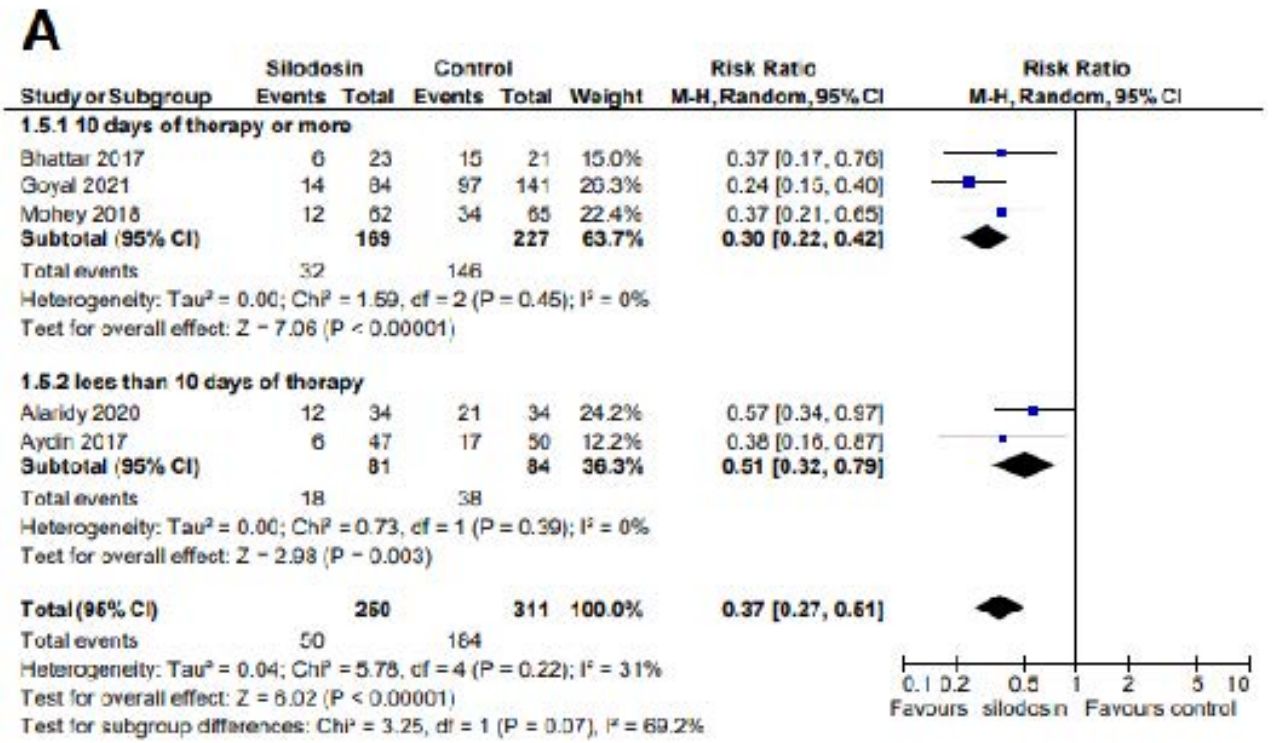
Subgroup Analyses - 10 days or more of silodosin preoperative therapy:

Figure S4 - Forrest plot: Ureteral wall injury (A) and Operative time (B).



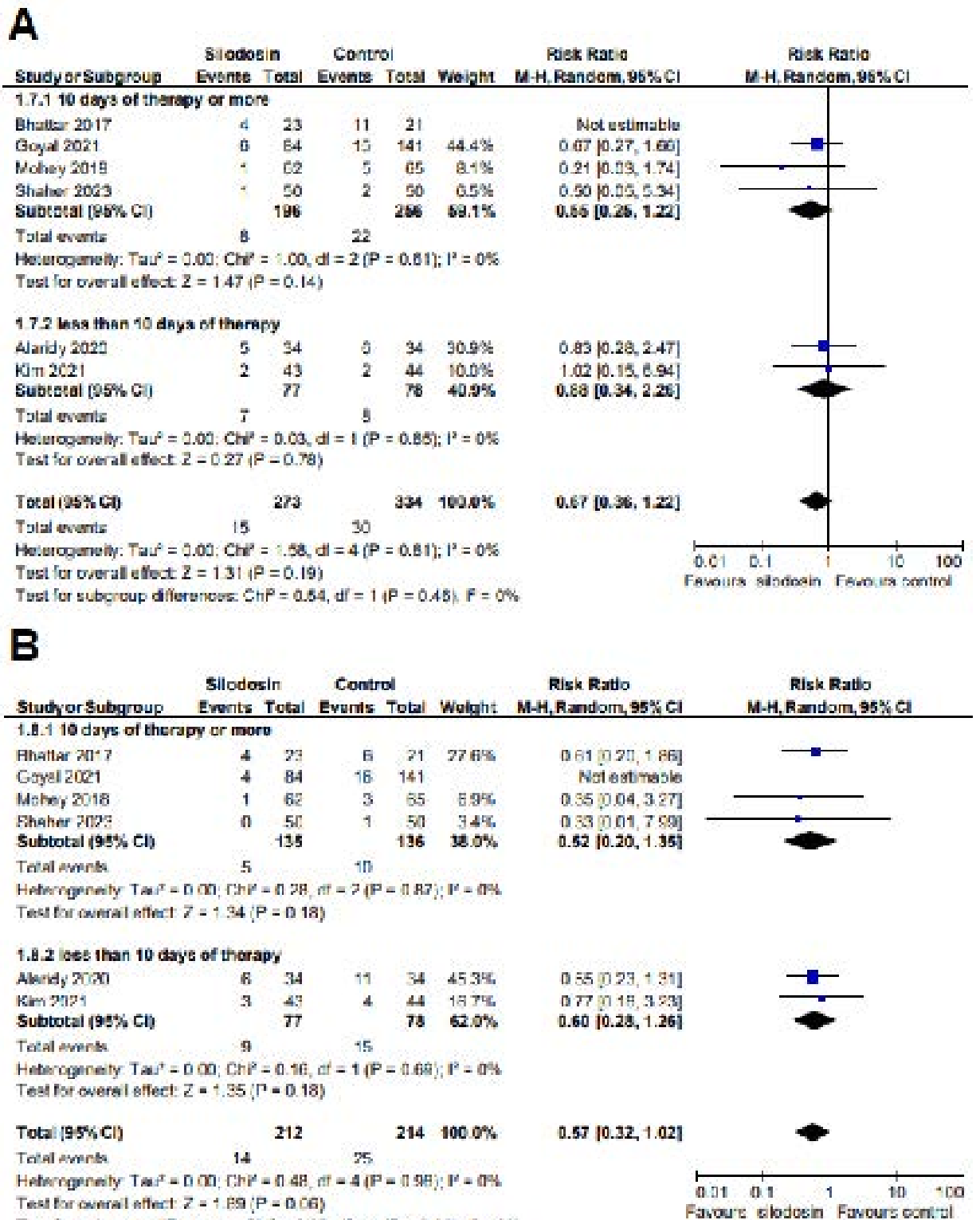
Subgroup Analyses - 10 days or more of silodosin preoperative therapy:

Figure S5 - Forrest plot: Need for ureteral dilation (A) and need for analgesia (B).



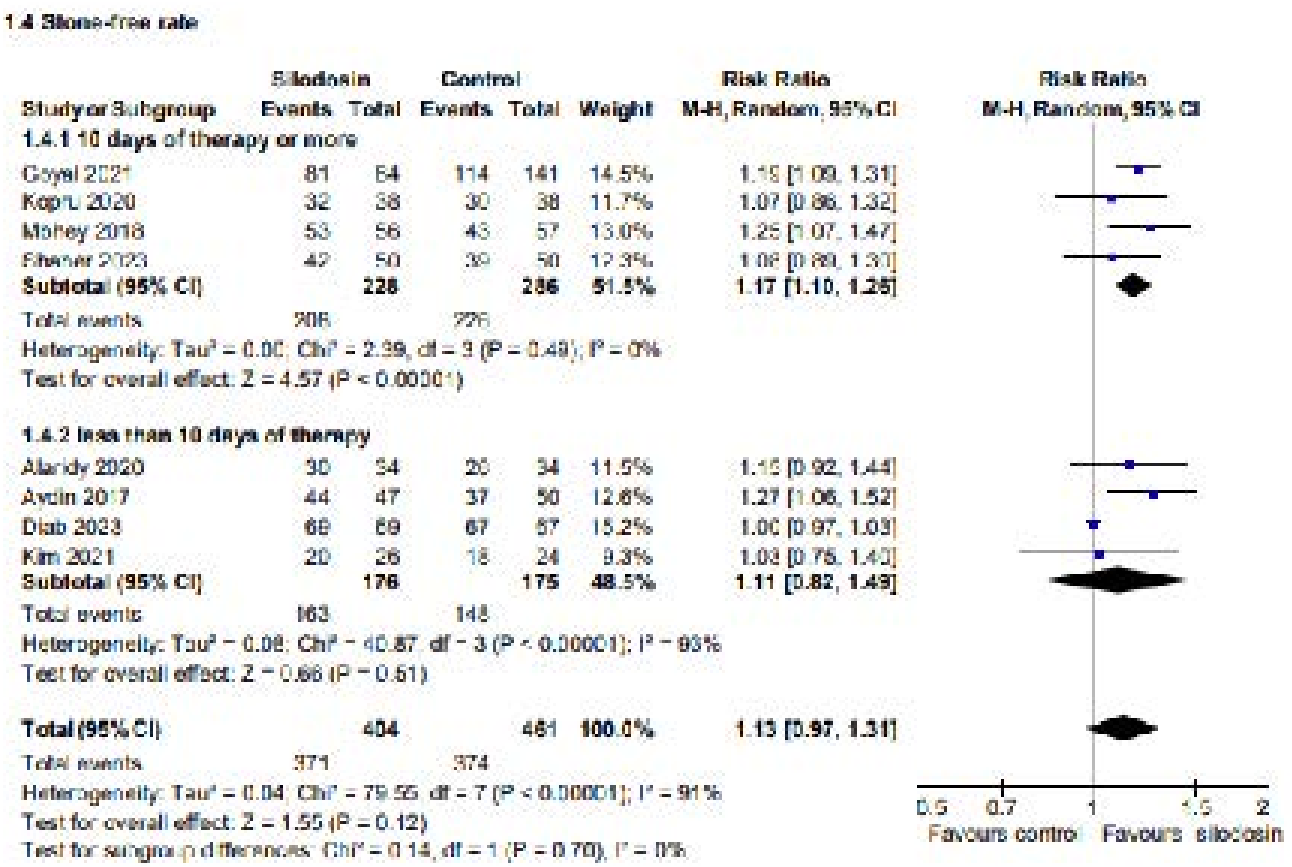
Subgroup Analyses - 10 days or more of silodosin preoperative therapy:

Figure S6 - Forrest plot: Post-operative fever (A) and haematuria (B).



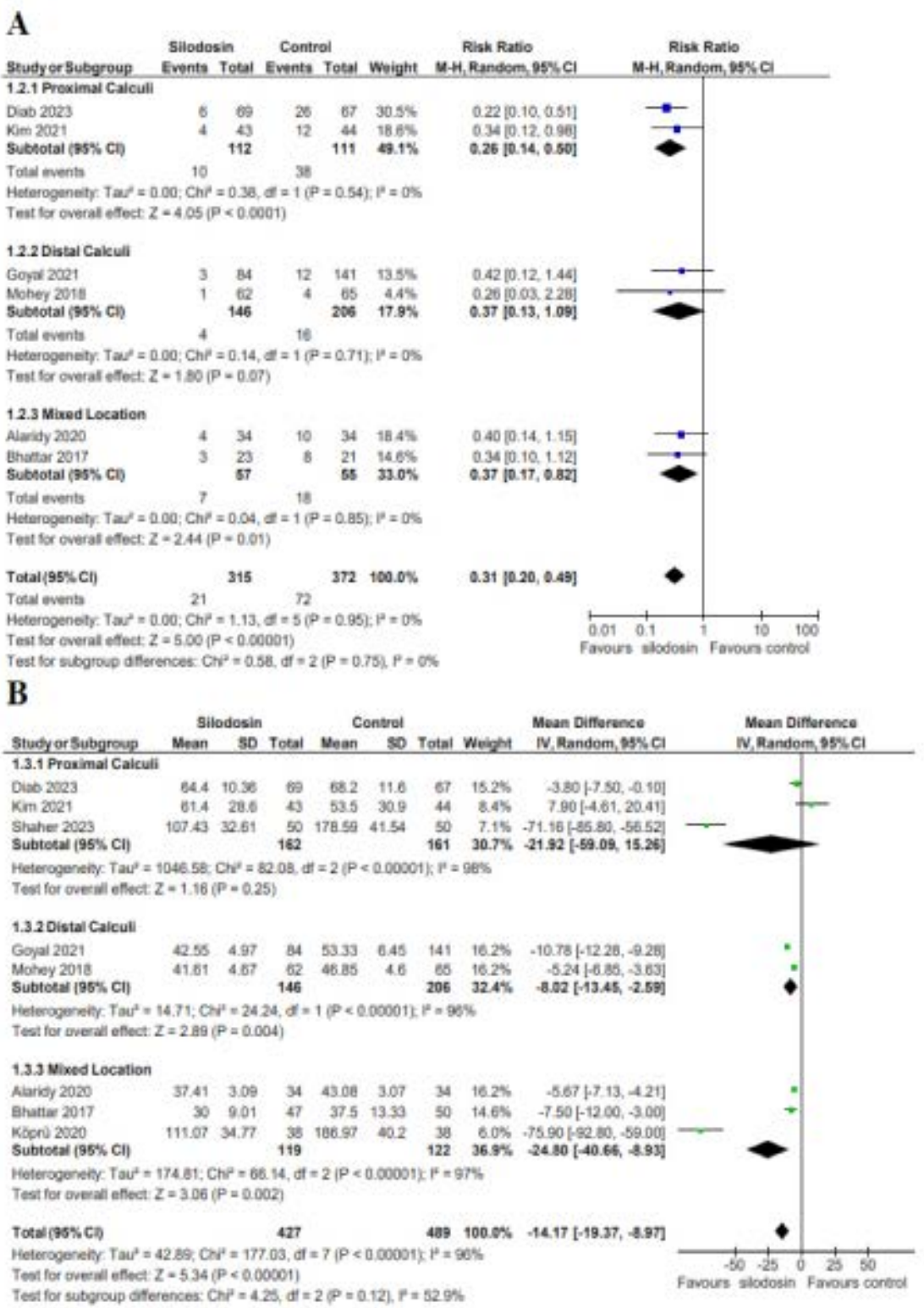
Subgroup Analyses - 10 days or more of silodosin preoperative therapy:

Figure S7 - Forrest plot: Stone-free rate.



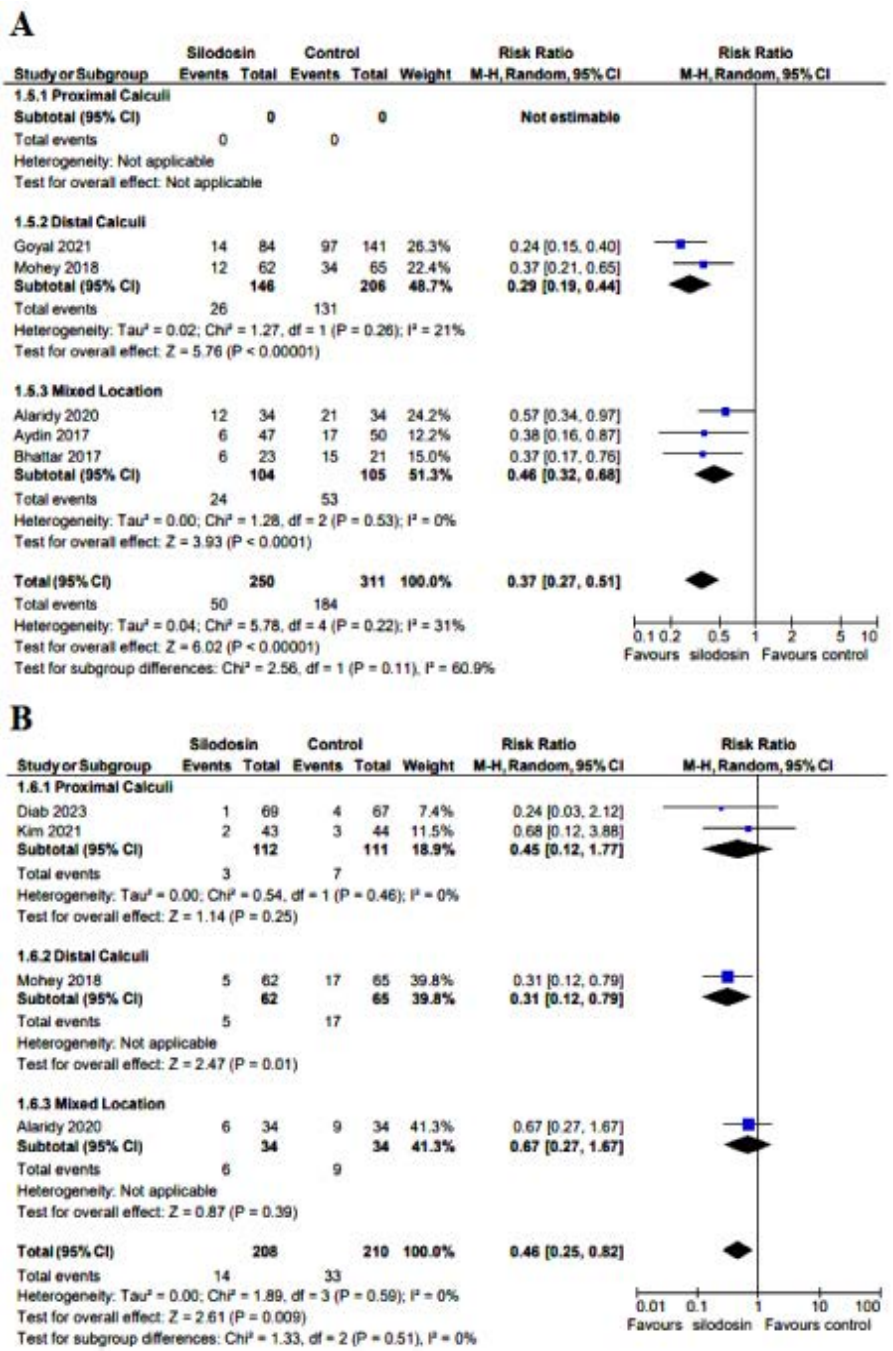
Subgroup Analyses - Different calculi location (proximal, distal, and mixed location):

Figure S8 - Forrest plot: Ureteral wall injury (A) and Operative time (B).



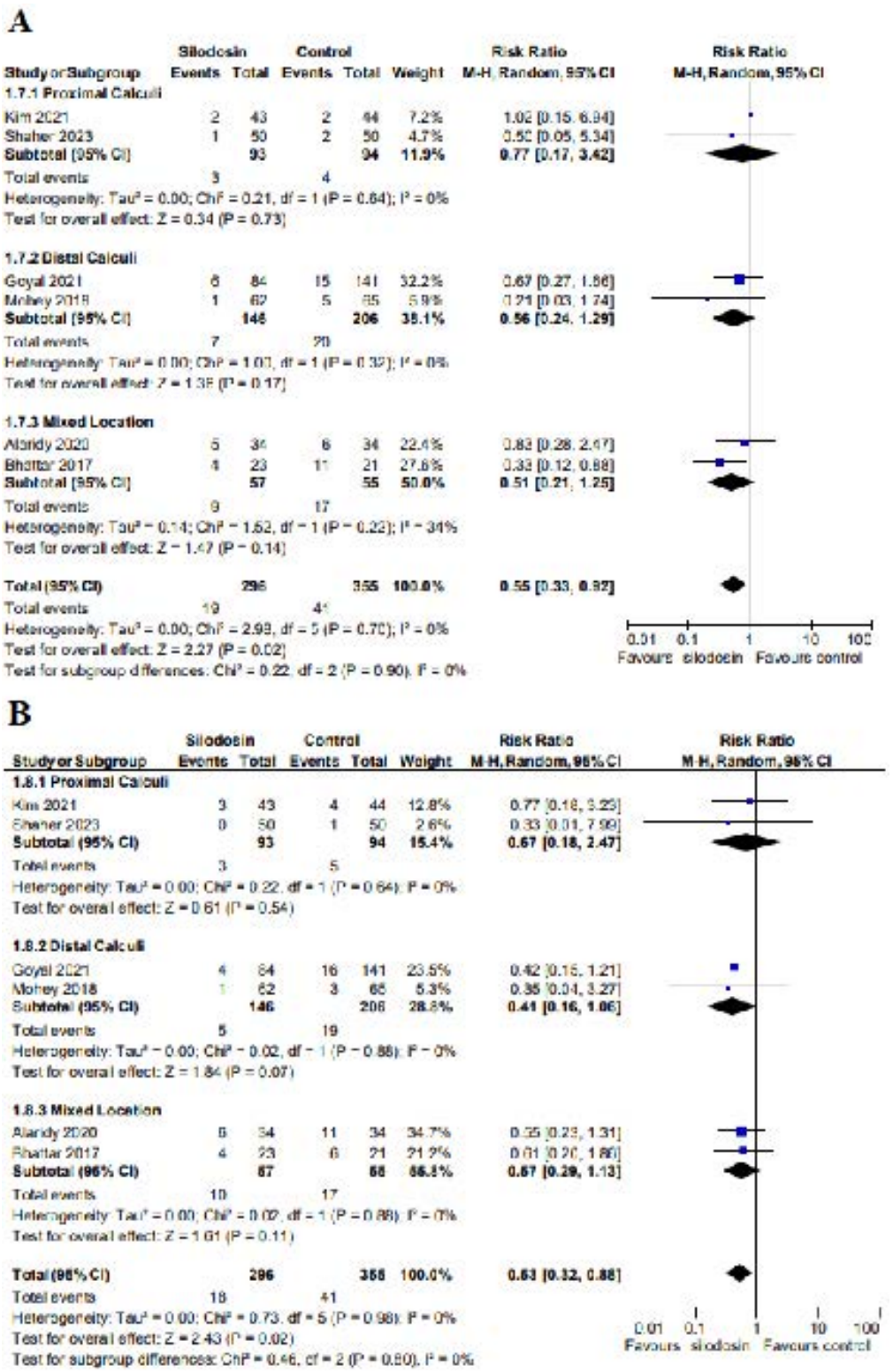
Subgroup Analyses - Different calculi location (proximal, distal, and mixed location):

Figure S9 - Forrest plot: Need for ureteral dilation (A) and need for analgesia (B).



Subgroup Analyses - Different calculi location (proximal, distal, and mixed location):

Figure S10 - Forrest plot: Post-operative fever (A) and haematuria (B).



Subgroup Analyses - Different calculi location (proximal, distal, and mixed location):

Figure S11 - Forrest plot: Stone-free rate.

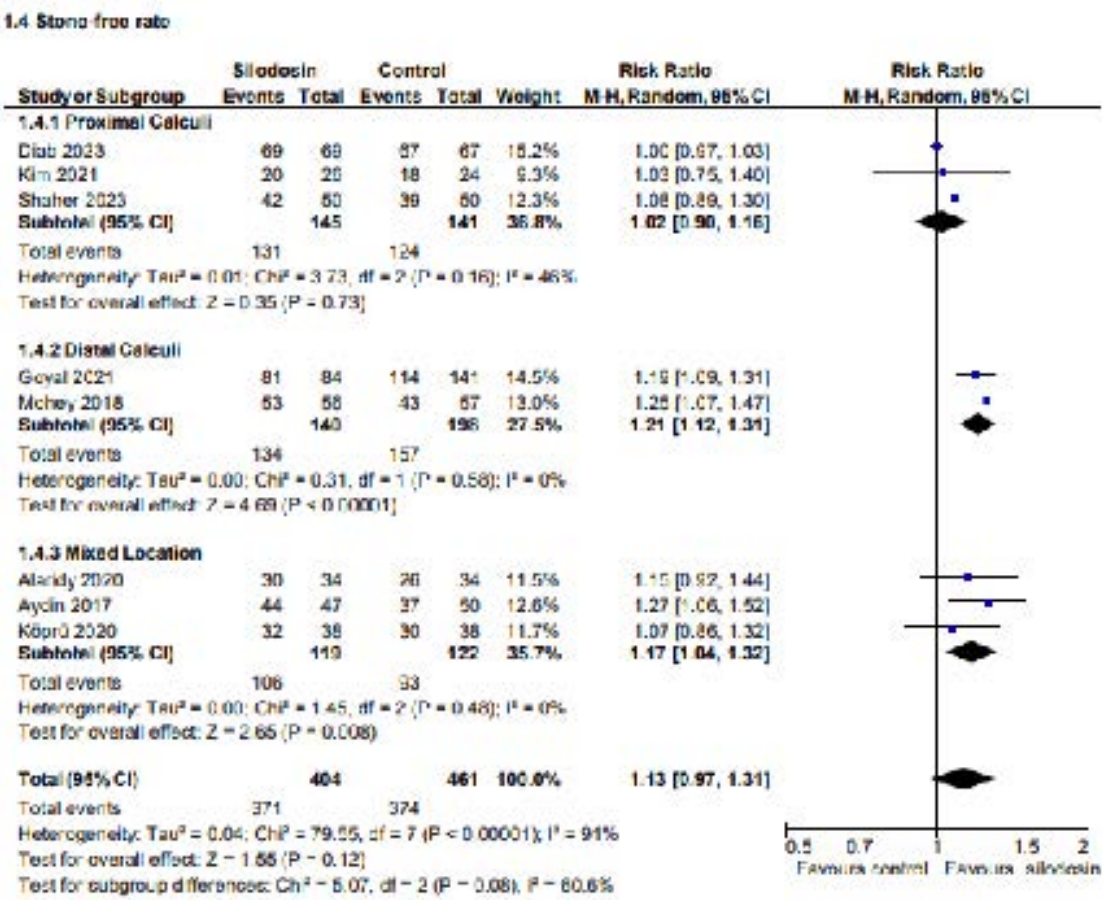


Figure S12 - PRISMA 2020 Checklist, Part 1.

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title, page 1.
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract, page 2.
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Introduction, paragraph 2.
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Introduction, paragraph 3.
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Methods – Inclusion and Exclusion Criteria.
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Methods - Search Strategy.
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Supplementary Material – Table S1.
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Methods - Study Selection and Data Extraction.
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Methods - Study Selection and Data Extraction.
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Methods -Endpoints and Definitions
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Results – Table 1. Supplementary Material – Table S2. Table S3.
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Methods - Quality Assessment.
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Methods - Statistical Analysis.
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #6)).	Methods - Endpoints and Definitions.
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Methods - Statistical Analysis; Results – Table 1.
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Methods –

Figure S13 - PRISMA 2020 Checklist, Part 2.

Section and Topic	Item #	Checklist item	Location where item is reported
			Statistical Analysis.
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Methods - Statistical Analysis.
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Methods - Statistical Analysis.
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Methods - Statistical Analysis.
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Methods – Quality Assessment
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Methods - Statistical Analysis.
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Results – Figure 1.
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Results – Figure 1.
Study characteristics	17	Cite each included study and present its characteristics.	Results – Table 1.
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Supplementary Material – Figure S1.
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Results – Figure 2; Supplementary Material – Figure S2-S7.
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Results - Quality Assessment.
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Results – Figure 2; Supplementary Material – Figure S2-S7.
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Results -Endpoints Pooled analyses; Discussion, paragraph 6 and 7.
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Results - Sensitivity analyses.
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Results - Quality Assessment.
Certainty of	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Results - Endpoints

Figure S14 - PRISMA 2020 Checklist, Part 3.

Section and Topic	Item #	Checklist item	Location where item is reported
evidence			Pooled analysis.
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Discussion, paragraph 2, 3, 4, 5, 7 and 8.
	23b	Discuss any limitations of the evidence included in the review.	Discussion – Limitation.
	23c	Discuss any limitations of the review processes used.	Discussion – Limitation.
	23d	Discuss implications of the results for practice, policy, and future research.	Discussion, paragraph 1. Conclusion.
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Methods, paragraph 1.
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Methods, paragraph 1.
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Acknowledgements.
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Acknowledgements.
Competing interests	26	Declare any competing interests of review authors.	Acknowledgements.
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Not applicable.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. This work is licensed under CC BY 4.0. To view a copy of this license, visit https://creativecommons.org/licenses/by/4.0/

Table S1 - Detailed search strategy according to each database.

Database	Search strategy
PubMed/ MEDLINE	("ureteral stones" OR "ureteral calculi"[Mesh] OR "ureteral stone" OR "ureteral calculi" OR "ureterolithiasis" OR "ureteric stones" OR "ureteric calculi" OR "ureteric stone" OR "ureteric calculi" OR "ureteroscopy" OR "ureteroscopic" OR "ureterorenoscopy" OR "ureteral access") AND ("silodosin")
Embase	('ureteral stones' OR 'ureteral calculi' OR 'ureteral stone' OR 'ureteral calculi' OR 'ureterolithiasis' OR 'ureteric stones' OR 'ureteric calculi' OR 'ureteric stone' OR 'ureteric calculi' OR 'ureteroscopy' OR 'ureteroscopic' OR 'ureterorenoscopy' OR 'ureteral access') AND ('silodosin')
Cochrane	("ureteral stones" OR "ureteral calculi"[Mesh] OR "ureteral stone" OR "ureteral calculi" OR "ureterolithiasis" OR "ureteric stones" OR "ureteric calculi" OR "ureteric stone" OR "ureteric calculi" OR "ureteroscopy" OR "ureteroscopic" OR "ureterorenoscopy" OR "ureteral access") AND ("silodosin")

Table S2 - Extended baseline characteristics of the included studies.

Study, year	Study Design	Type of Control	Follow-up (months)	Time of therapy (days)	Baseline Population Size, No. Silodosin Control	Age, years (mean ± SD) Silodosin Control	Male, No. (%) Silodosin Control	BMI, kg/mm² (mean ± SD) Silodosin Control	Stone size, mm (mean ± SD) Silodosin Control	Location of ureteral calculi (upper/middle/lower) Silodosin Control	Stent Placement, No. (%) Silodosin Control	Type of procedure (both groups)	Ureteral access sheat (both groups)	Surgeon experience (both groups)	Anatomical abnormality (both groups)	History of ipsilateral ureteric surgery (both groups)	Infection (both groups)	Stone surface, mm² (median ± SD) Silodosin Control	Stone density, Hounsfeld unit (mean ± SD) Silodosin Control
Alaridy et al., 2020 (2)	Non-RCT	Placebo	1	7	34 34	33.29 ± 9.51 34.60 ± 12.01	25 (73.52) 25 73.52)	NA	10.35 ± 2.38 10.41 ± 2.43	3/6/25 3/6/25	NA	Semi-rigid	NA	Senior urologist	Excluded	Excluded	Excluded	NA	NA
Aydin et al., 2017 (11)	RCT	No pretreatment	1	3	47 5	43.00 ± 14.29* 37.50 ± 12.50*	32 (68.08) 33 (66.00)	NA	NA	12/9/26 8/12/30	NA	Semi-rigid	NA	NA	NA	Excluded	Excluded	38 (NA) 35.5 (NA)	NA
Bhattar et al., 2017 (12)	RCT	Placebo	NA	14	23 21	35.52 ± 11.00 33.22 ± 10.07	15 (65.21) 15 (71.42)	23.34 34.10	9.14 ± 1.52 9.74 ± 1.98	5/4/14 6/3/12	23 (100.00) 21 (100.00)	NA	NA	Senior urologist	Excluded	Excluded	Excluded	NA	NA
Diab et al., 2023 (1)	RCT	Placebo	3	7	69 67	41.40 ± 14.26 42.40 ± 15.44	38 (46.37) 41 (61.19)	26.90 ± 3.79, 27.30 ± 3.97	12.50 ± 3.91 13.00 ± 3.71	70/0/0 70/0/0	69 (100.00) 67 (100.00)	Flexible	Yes	Senior urologist	Excluded	Excluded	Excluded	NA	1022 ± 259.6 1008.7 ± 266.4
Goyal et al., 2021 (13)	RCT	Placebo	0.5	10	84 141	39.28 ± 8.25 38.22 ± 8.34	53 (63.19) 86 (60.99)	27.75 ± 2.22 27.46 ± 2.29	8.77 ± 4.12 8.53 ± 0.49	0/0/84 0/0/93	NA	Semi-rigid	NA	Senior urologist	Excluded	Excluded	NA	NA	NA
Kim et al., 2021 (14)	RCT	No pretreatment	3	3	43 44	48.50 ± 11.60, 45.80 ± 13.80	29 (67.44) 23 (52.27)	26.80± 4.90, 25.20 ± 3.30	8.86 ± 3.60 8.68 ± 5.07	50/0/0 50/0/0	43 (100.00) 44 (100.00)	Flexible	Yes	Senior urologist	Excluded	Excluded	NA	NA	589 ± 290 532 ± 325
Köprü et al., 2020 (15)	RCT	No pretreatment	3	10	38 38	45.41 ± 12.88*, 46.52 ± 14.52*	30 (78.94) 23 (60.52)	NA	19.02 ± 5.90 17.94 ± 4.60	2/8/6 2/6/7	21 (55.26) 23 (60.52)	Flexible	Yes	NA	NA	NA	NA	NA	NA
Mohey et al., 2018 (16)	RCT	Placebo	1	10	62 65	38.27 ± 9.37, 39.67 ± 9.54	39 (62.90) 39 (60.00)	27.55 ± 2.28 27.80 ± 3.50	12.60 ± 1.25 12.90 ± 1.29	0/0/62 0/0/65	62 (100.00) 65 (100.00)	Semi-rigid	NA	Senior urologist	Excluded	Excluded	NA	NA	907.66 ± 208.52 898.97 ± 212.04
Shaher et al., 2023 (17)	RCT	Placebo	1	10	50 50	44.65 ± 10.13 45.37 ± 12.78	37 (74.00) 30 (60.00)	26.12 ± 2.63 26.34 ± 2.74	18.33 ± 5.17 17.61 ± 4.25	11/0/0 8/0/0	26 (52.00) 30 (60.00)	Flexible	Yes	NA	Excluded	Excluded	NA	NA	837.64 ± 234.3 819.5 ± 240.1

BMI = Body Mass Index; RCT = Randomised controlled trial; NA = Not available

* Mean and standard deviation (SD) estimated from median and interquartile range or median and range