



Efficacy of sexual intercourse in the spontaneous passage of distal or intramural ureteral stones: a randomized controlled trial

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Background: The role of sexual intercourse as an alternative treatment approach for ureteral stones (UTSs) is a recent area of investigation with only small sample-sized studies. This study aims to evaluate the role of sexual intercourse in the spontaneous passage of distal or intramural UTSs via a larger sample size.

Materials and methods: The study population included cases that had either a distal ureteric or an intramural radiopaque stone. The patients were divided into two groups; group A was instructed to engage in sexual intercourse two to three times per week while also receiving symptomatic treatment for 4 weeks. Group B received symptomatic treatment alone and was instructed to abstain from sexual intercourse or masturbation for the same period.

Results: A total of 160 male patients were enrolled in this study. The ages of the patients ranged from 21 to 58 years. The rate of stone expulsion after 2 weeks was 68.18% in group A and 53% in group B ($P=0.053$). The expulsion rate after 4 weeks was 80% in group A and 68.4% in group B ($P=0.072$). The mean expulsion time was 13.9 ± 5.4 days for the experimental group and 15.2 ± 6.7 days for the control group ($P=0.179$). The experimental group required fewer analgesic injections in comparison to the control group ($P<0.05$).

Conclusion: While the role of sexual intercourse in facilitating the passage of distal or intramural UTSs cannot be fully established, it may aid to some extent. However, it should not be relied upon as a standalone treatment modality.

Keywords: medical expulsive therapy, stone passage, ureteral calculi, ureterorenoscopic lithotripsy, urolithiasis

Introduction

Urolithiasis is a well-known, multifactorial disease estimated to affect around 5–10% of individuals worldwide, with a male-to-female ratio of 2:1^[1]. Ureteral stones (UTSs) are a common

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HIGHLIGHTS

- Ureteral stones are a common presentation and referral in daily urological practice.
- The escalating burden of kidney stone disease has substantial costs for healthcare systems.
- Several studies have indicated that sexual intercourse may serve as a potential alternative treatment approach for ureteral stones.

presentation and referral in daily urological practice, frequently causing episodes of acute renal colic due to obstruction. Among all urinary stones, ~20% can be located in the ureter, while 70% are found in the distal ureteric segment^[2,3]. The escalating burden of kidney stone disease has substantial costs for healthcare systems, and the disease also has a negative impact on the patient's quality of life^[4]. There is a 50% chance of distal UTS spontaneously passing via conservative treatment within a 6-week period^[3]. Various treatment options are available for UTS, encompassing both invasive and noninvasive approaches. These options include observation for spontaneous passage, medical expulsive therapy (MET), ureterorenoscopic lithotripsy (URSL), and extracorporeal shockwave lithotripsy (ESWL). However, invasive techniques are associated with several drawbacks, like high cost, work loss, complications, and hospitalization^[2,5,6]. Recently, several studies have indicated that sexual intercourse

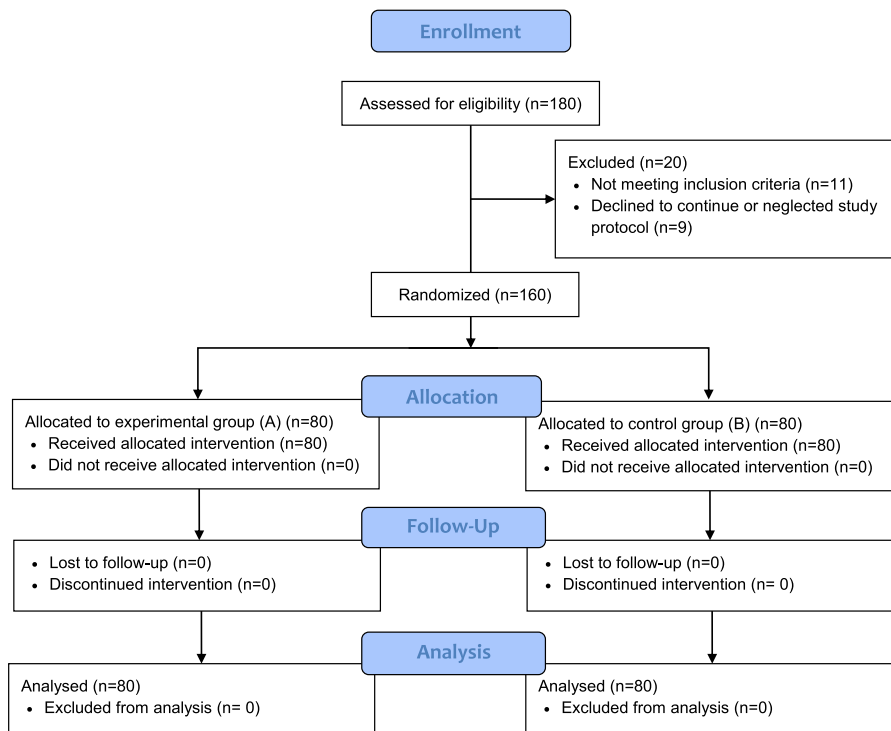


Figure 1. CONSORT (Consolidated Standards of Reporting Trials) flow diagram.

may serve as a potential alternative therapeutic approach in the treatment of UTS. However, they all have the limitation of a small sample size^[5]. It has been suggested that the release of nitric oxide during erection and sexual intercourse could potentially induce relaxation of the distal ureter and facilitate the passage of stones^[7]. This study is a randomized controlled trial (RCT) aiming to evaluate the role of sexual intercourse in the spontaneous passage of distal or intramural UTS.

Materials and methods

Study design and setting

This was a single-center RCT designed to evaluate the role of sexual intercourse in the spontaneous passage of distal or intramural UTSs in patients who presented with renal colic between November 2021 and February 2023. The study was carried out according to the Consolidated Standards of Reporting Trials (CONSORT) 2010 criteria^[8], the guidelines and standards set forth by Good Clinical Practice, and by adhering to the principles outlined in the most widely recognized version of the Helsinki Declaration. The study has been ethically approved. Written informed consent was obtained from each patient, ensuring that they were fully informed and willingly participating in the study.

Participants

The study population included all the cases that had either a distal ureteric or an intramural radiopaque stone with a size between 4 and 8 mm. Patients who met any of the following criteria were excluded: (1) being less than 18 years old, (2) being unmarried, (3) having erectile dysfunction or loss of libido, (4) having stone sizes smaller than 4 mm, (5) having multiple ureteric stones, (6)

having stones in the upper or middle ureteric segments, (6) possessing irregular or spiky stones, (7) showing signs of hydronephrosis or impaired renal function, (8) having a urinary tract infection, neurogenic bladder, vesicoureteral reflux, skeletal deformity, or fever, (9) having undergone previous ureteric endoscopy or surgery, or (10) neglecting the study protocol. Ultrasound (US), plain X-ray, and non-enhanced computed tomography were used for examination and stone detection. Urine analysis, serum creatinine, and blood urea measurements were also done for all of the patients.

Randomization and masking

Once the cases were confirmed to be eligible, using the SAS statistical software and simple random sampling, a research team member generated random allocation sequence codes to randomly assign patients into two groups, namely group A and group B, with an equal allocation ratio of 1:1 (Fig. 1).

Study protocol

For a period of 4 weeks, group A was instructed to engage in sexual intercourse two to three times per week while also receiving symptomatic treatment; meanwhile, group B, serving as the control group, received symptomatic treatment alone and was instructed to abstain from sexual intercourse or masturbation. The patients were instructed to adhere to consuming 1–2 l of water daily, receive symptomatic treatment including 75 mg diclofenac intramuscular as needed for pain and filter their urine through a sheet to identify any passing stones. Regular follow-up was conducted on a weekly basis using plain X-ray, US, and urine analysis. Patients were also questioned about various aspects, such as stone passage, expulsion time, frequency of colicky

Table 1
Patient characteristics and outcomes

Parameters	Group A (n = 80)	Group B (n = 80)	P
Age, years, mean ± SD	30.5 ± 6.8	35.5 ± 10.6	0.001
Stone size, mm, mean ± SD	5.03 ± 1.6	5.07 ± 1.2	0.858
Stone site, n (%)			0.227
Distal	60 (75%)	52 (65%)	
Intramural	20 (25%)	28 (35%)	
Expulsion rate after 2 weeks, n (%)	54 (68.18%)	42 (53%)	0.053
Expulsion rate after 4 weeks, n (%)	64 (80%)	54 (68.4%)	0.072
Expulsion time, days, mean ± SD	13.9 ± 5.4	15.2 ± 6.7	0.179
Need for analgesia, number of daily injections, mean ± SD	2.1 ± 0.9	2.7 ± 0.3	<0.05
Ureterorenoscopic lithotripsy, n (%)	16 (20%)	26 (32%)	0.072

attacks, number of analgesic injections, and frequency of sexual intercourse. The follow-up period was continued until either the stone was successfully passed or a maximum duration of 4 weeks elapsed.

Outcome measures

The primary outcome was spontaneous stone passage after 4 weeks (not requiring further interventions to facilitate the passage of stones at 4 weeks). The secondary outcomes included spontaneous stone passage after 2 weeks, expulsion time, need for analgesia, and URSL.

Sample size

The calculation for the required sample size was based on the expectation that the stone-free rate would increase by 25% in the treatment group at week 4. In order to identify this difference with a statistical power of 90% at a significance level of 0.05, it was estimated that a total of 74 patients would be necessary for each group in the study. However, to accommodate potential patient dropouts, the plan was to include 90 patients in each group.

Data analysis

The hospital's database was utilized to gather patient information. The collected data underwent analysis using Statistical Package for the Social Sciences software version 25. Proportions and percentages were used to present qualitative data, and a Chi-square (χ^2) test was employed to compare them. For quantitative variables, an independent samples *t*-test was conducted, and the results were presented in terms of means and standard deviations. The significance level was set at $P < 0.05$.

Results

Initially, 180 eligible male patients with distal or intramural UTS were assessed. Among them, 11 were excluded for not meeting inclusion criteria and 9 cases declined to continue the study or neglected study protocol. Finally, a total of 160 male patients were enrolled in this study. The ages of the patients ranged from 21 to 58 years old. The mean age of group A was 30.5 ± 6.8 and that of group B was 35.5 ± 10.6 , which were significantly different ($P = 0.001$). The stone size and location were comparable

between both groups, indicating no significant difference. Out of the total cases included in both groups, 70% had distal ureteric stones, while the remaining cases had intramural stones, with no significant difference between the groups. The rate of stone expulsion after 2 weeks was 68.18% in group A and 53% in group B, which revealed an almost significant predilection toward the experimental group ($P = 0.053$). In addition, the expulsion rate after 4 weeks was 80% in group A and 68.4% in group B; although there was a noticeable difference, it was not significant ($P = 0.072$). On the basis of overall expulsion time, the mean expulsion time was 13.9 ± 5.4 days for the experimental group and 15.2 ± 6.7 days for the control group ($P = 0.179$). On the need for analgesia, the experimental group required fewer injections in comparison to the control group ($P < 0.05$). In total, 16 cases (20%) in group A and 26 cases (32%) in group B necessitated URSL due to the non-spontaneous passage of stones; however, the result did not reach a significant level (Table 1).

Discussion and conclusion

Urolithiasis is a commonly encountered problem in the urinary tract. The increasing frequency of UTS poses a significant concern, particularly in regions characterized by dry and warm climates. It accounts for ~22% of all urinary stones, with the majority located in the distal ureter and renal colic being the most common symptom^[3]. Several factors influence the expulsion of UTS, such as the location, number, size, and type of stone, inflammation, ureteric spasm, edema of the mucosa, and anatomy of the ureter^[3,9]. Stone diameter plays a significant role in the likelihood of spontaneous passage. Stones with a diameter less than 4 mm have the potential to pass naturally, while those greater than 6 mm have a 5% or less chance of passing without intervention^[3]. In addition, increasing fluid intake enhances the probability of spontaneous expulsion^[7]. Abou Heidar *et al.*^[10] developed a nomogram to predict the factors of spontaneous stone passage failure and concluded that female gender, high creatinine level, elevated neutrophil-to-lymphocyte ratio, stone size greater than 5 mm, proximal stone, hydronephrosis, and leukocyte esterase greater than 75 significantly decreased spontaneous stone passage. The medical treatment is usually to reduce edema and spasms and promote smooth muscle relaxation to facilitate stone expulsion^[3,9].

Tamsulosin as a MET has shown promising effects on decreasing renal colic episodes and the demand for diclofenac injections^[11]. A systematic review and meta-analysis of eight randomized, double-blind, placebo-controlled trials has revealed that tamsulosin had a positive impact on the passage of stones in a specific subgroup of participants who have large distal UTS. Administering a 28-day trial of 0.4 mg tamsulosin once a day, or until the stone is passed, is expected to improve stone passage in patients with confirmed distal UTS measuring between 5 and 10 mm^[12]. The effectiveness of α -blockers as MET for treating UTS has been subject to scrutiny. The SUSPEND trial tried to determine the efficacy of α -blockers (tamsulosin) and calcium channel blockers (nifedipine) in the management of UTS, and the results demonstrated no significant impact on the need for intervention or pain relief after 4 weeks^[13]. Furthermore, tamsulosin may not be a favorable choice for men who wish to avoid medication and its associated side effects, such as retrograde ejaculation (experienced by 8–18% of users), as well as

orthostatic hypotension, headache, dizziness, and diarrhea. Prior use of tamsulosin can also complicate cataract surgery by causing floppy iris syndrome^[4].

Recently, there has been an increasing focus on the efficacy of sexual intercourse as an alternative therapy to tamsulosin in the treatment of UTS. However, all the published studies have the significant limitation of having a small sample size. Doluoglu *et al.* hypothesized that the non-adrenergic, non-cholinergic nerve endings could potentially stimulate the distal ureter during sexual intercourse, leading to the expulsion of distal UTS through a pathway mediated by nitric oxide. During erection and sexual intercourse, nitric oxide is released in significant amounts within the cavernosal tissues, resulting in the relaxation of smooth muscles in the ureter and facilitating the process of distal UTS expulsion^[7]. Abdel-Kadir conducted an RCT to compare two groups of patients with distal and intramural UTS ranging from 5 to 10 mm in size. Each group consisted of 28 patients. The first group (group A) served as the experimental group and engaged in sexual intercourse three to four times a week while also receiving symptomatic treatment. The second group (group B) received symptomatic treatment alone and abstained from sexual intercourse until the end of the study. It was found that group A had a higher stone expulsion rate (82%) during the first 2 weeks of follow-up compared to group B (53%). After 4 weeks of follow-up, the stone expulsion rate reached 89% in group A compared to 71.4% in group B^[3]. The findings of Abdel-Kadir were consistent with those of Doluoglu *et al.*^[7], even though the size of the stones in the study of Abdel-Kadir^[3] was greater (5–10 mm) than the previous one (≤ 6 mm).

According to the study conducted by Bayraktar and Albayrak^[5], sexual intercourse not only increased the natural passage of UTS but also accelerated the expulsion process, reduced the frequency of renal colic episodes, and minimized the need for analgesia. A meta-analysis conducted by Xu *et al.* compared sexual intercourse with a placebo in treating distal UTS and found similar results to previous studies. However, the authors reported that the role of masturbation in UTS passage requires further investigation^[6]. Another study used sexual intercourse as an adjuvant management option after shockwave lithotripsy (SWL) for distal UTS. It was found that the stone-free rate of the experimental group following the first and second weeks after SWL was significantly higher than that of the control group. Moreover, sexual intercourse also decreased the formation rate of steinstrasse^[14]. Turgut^[1] also reported a significant role of sexual intercourse in treating distal UTS in females. Our study was the largest RCT in comparison to the previous ones, aiming to investigate the role of sexual intercourse in the spontaneous passage of distal UTS. Although our findings showed increased stone passage rate after both 2 weeks and 4 weeks in the experimental group, 68.18 versus 53% and 80 versus 68.4%, respectively, the difference did not reach a significant level. However, this may not indicate that there is no difference between the groups, as they are clearly associated with considerably different stone passage rates. Despite that, the need for injecting analgesia was significantly lower in the experimental group. In order to fully establish whether sexual intercourse has a role in spontaneous stone passage or not, more RCT studies and meta-analyses to summarize these studies are required.

Conservative treatment for distal UTS typically lasts for a recommended duration of 4 weeks to minimize the potential complications. Patients who do not pass their stones within a

4-week follow-up period should undergo ureteroscopic treatment^[3,7]. In the present study, 20% of the cases in group A and 32% of group B underwent URSL due to the lack of spontaneous stone passage. All the referenced studies in this trial have been checked to prevent citing non-peer-reviewed data^[15].

Despite the current study having points of strength as it is an RCT investigation, it has several significant limitations, one of the major ones being that the samples were sourced only from a single center. There was also bias in which the authors could not be entirely certain about the participants' engagement with the study protocol. Additionally, the frequency of performing sexual intercourse by the enrollees was determined based on previously published studies rather than on formal guidelines or scientific facts. Modern clinical trials encounter numerous obstacles, with one of the most prevalent being compliance with study protocols and the willingness of participants to share their data^[16]. This issue has been a recurring concern in all prior research on the current subject, introducing a potential source of bias^[1,3,7].

In conclusion, while the role of sexual intercourse in facilitating the passage of distal or intramural UTSs cannot be fully established, it may aid to some extent. However, it should not be relied upon as a standalone treatment modality. Further studies that include larger sample sizes, both genders, and different ethnicities are necessary to evaluate the efficacy of this regimen for proper consideration, and there is a need to conduct meta-analysis studies in the future to summarize the findings of RCT studies done in this area.

Ethical approval

Ethical approval was obtained from the Medical Research Center, Amina Hospital, Sialkot, Pakistan, reference No: MRC-01-21-011.

Consent

Patient consent: Written informed consent was obtained from the patients for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

K.H.B.: was a major contributor to the conception of the study, as well as in the literature search for related studies, and final approval of the manuscript; H.O.A. and H.M.R.: writing the manuscript, literature review, and final approval of the manuscript; R.B., F.H.K. and B.A.A.: were involved in the literature review, the design of the study, and revision of the manuscript; W.S.B., H.M.M., N.H.A.A., A.A.C., and N.A.C.: critical revision of the manuscript and final approval; F.H.F. and I.A.: confirm the authenticity of all the raw data and revision of the manuscript; N.S. and F.S.G.: data analysis and interpretation and revision of the manuscript.

Conflicts of interest disclosure

There are no conflicts of interest.

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Data availability statement

The data that support the findings are available from the corresponding author upon request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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