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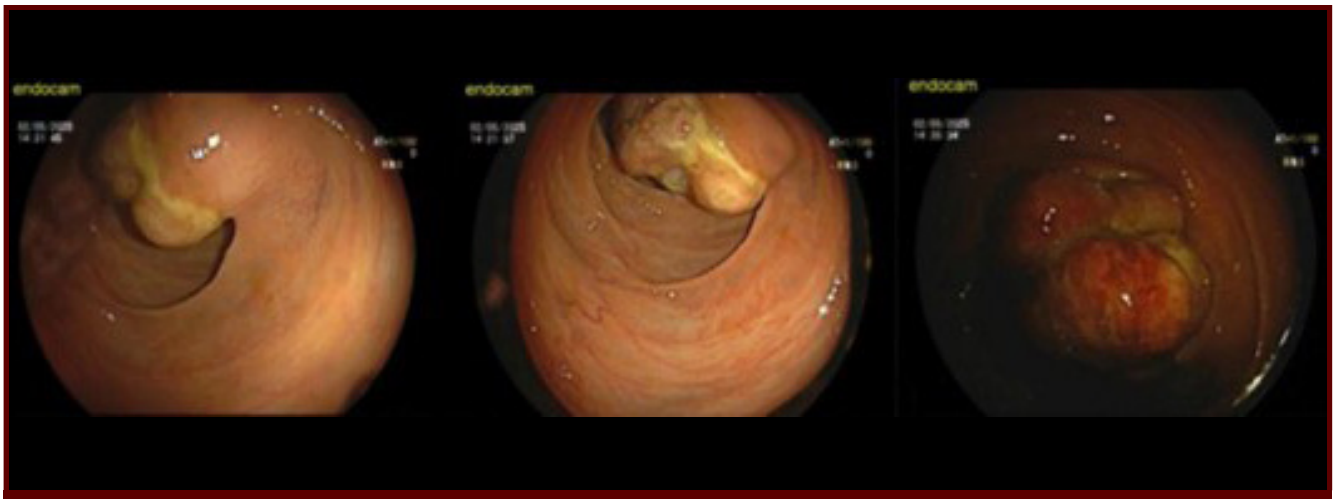

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Dear Colleagues,

We are pleased introduce the June 2026 issue of The New Journal of Urology (Volume 21, Issue 2). This issue features five original articles, two case reports, and a narrative review covering key topics across functional urology, endourology, andrology, and uro-oncology.

Our original research section opens with a randomized controlled trial comparing supervised versus video-assisted pelvic floor muscle training combined with tolterodine for urge incontinence. Another study provides a detailed overview of Turkish urology residency theses between 2015 and 2020, tracking their long-term academic outcomes.

In endourology, authors examine volumetric predictors of stone-free status after mini-PCNL, while a separate clinical study evaluates the safety and efficacy of same-session surgery for bilateral ureteral stones. Additionally, this issue includes research on the relationship between lower urinary tract symptoms (LUTS), disability, and physical activity levels in women with hip osteoarthritis.

The case reports in this issue address rare and complex clinical scenarios: a case of high-grade urothelial carcinoma with sarcomatoid differentiation presenting as colonic metastasis, and a case examining genital self-mutilation and regret in gender dysphoria. Also, this issue includes a narrative review that examines how paternal selective serotonin reuptake inhibitor (SSRI) use impacts male fertility and pregnancy outcomes.

The New Journal of Urology has been indexed in the TÜBİTAK ULAKBİM TR Index since 2011. Our journal is also available across major databases, including DOAJ, Google Scholar, Turkish Medline, Turkish Citation Index, SOBIAD, Scilit, Ideal Online Database, J-GATE, and EBSCO, utilizing the CrossRef DOI and ORCID systems for all publications.

We are grateful to the authors for their valuable scientific contributions and to our reviewers for their thorough evaluation of these manuscripts. We invite you to read this new issue, submit your latest research to our journal, and contribute to the peer-review process.

Best regards,

Editor-in-Chief
Ali İhsan Taşçı

Editor
Yavuz Onur Danacıoğlu

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RESEARCH ARTICLE

Comparison of Supervised versus Video-Assisted Pelvic Floor Muscle Training Combined with Tolterodine in the Treatment of Urge Incontinence: A Randomized Controlled Trial

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Abstract

Objective: This study aimed to compare the clinical efficacy of physiotherapist-supervised versus video-assisted pelvic floor muscle training (PFMT) combined with tolterodine therapy in women with urge incontinence.

Material and Methods: In this prospective randomized controlled trial, 120 women aged 18–60 years with urge incontinence were randomized into two groups. Both groups received tolterodine 4 mg/day. The Video group (n = 60) performed home-based Kegel exercises with instructional video support. The Supervised group (n = 60) attended twice-weekly physiotherapist-supervised sessions. Outcomes were assessed by the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) at baseline and 16 weeks. Adverse effects and treatment discontinuation were recorded.

Results: A total of 102 patients completed the trial (Video: 52; Supervised: 50). Both groups showed significant improvement in ICIQ-SF scores ($p < 0.001$), with superior improvement in the Supervised group ($p = 0.017$). Adverse event rates were similar ($p > 0.05$), and no serious adverse events were reported.

Conclusion: PFMT combined with tolterodine improves urge incontinence symptoms. Supervised training yields greater benefit, though video-assisted PFMT remains a cost-effective and accessible alternative.

Keywords: urge incontinence, pelvic floor muscle training, randomized controlled trial, tolterodine

Cite; Ertas K, Bedir N, Keles MF, Ilter S, Eryilmaz R. Comparison of Supervised versus Video-Assisted Pelvic Floor Muscle Training Combined with Tolterodine in the Treatment of Urge Incontinence: A Randomized Controlled Trial. New J Urol. 2026;21(2):53–59. **doi:** https://doi.org/10.33719/nju1781256

INTRODUCTION

Urge incontinence is defined as the involuntary loss of urine accompanied by a sudden and compelling desire to void, and it can severely impair quality of life in women. Its prevalence has been reported to range between 11% and 36% (1). This condition negatively affects not only the physical but also the psychosocial aspects of patients' lives (2). Current treatment strategies are primarily based on pharmacological agents such as antimuscarinics and β3-adrenergic agonists; however, the side effects of these medications and poor adherence rates have increased the importance of conservative approaches (3).

Pelvic floor muscle training (PFMT) is a low-cost, non-invasive, and evidence-based intervention (4,5). Nevertheless, the optimal method of exercise delivery remains controversial. Recent randomized controlled trials have demonstrated that supervised PFMT is superior to unsupervised home-based exercises in terms of symptom control (6). Furthermore, meta-analyses published in 2023 confirmed that supervised training is more effective than home programs in improving both quality of life and symptom management (7). On the other hand, digital health applications and video-based training programs have emerged as promising tools to enhance patient adherence (8,9).

In this study, we aimed to compare the effectiveness of two different PFMT approaches (supervised by a physiotherapist and video-assisted) when combined with tolterodine therapy in women diagnosed with urge incontinence.

MATERIAL AND METHODS

Study Design

This study was designed as a superiority randomized controlled trial**,** aiming to compare the clinical effectiveness of supervised versus video-assisted pelvic floor muscle training combined with tolterodine therapy.

Participants

Between October 2024 and August 2025, a total of 120 women who presented to the Urology Department of our university hospital and were diagnosed with urge incontinence according to ICS criteria were enrolled. Inclusion criteria were: age 18–60 years and presence of symptoms for at least 3 months. Exclusion criteria were pregnancy, active urinary tract infection, history of pelvic radiotherapy or major pelvic surgery, neurological diseases affecting bladder function (such as multiple sclerosis, spinal cord injury, Parkinson's disease), severe cardiac failure, and contraindications to tolterodine use. Urge urinary incontinence was diagnosed according to International Continence Society (ICS) criteria, defined as involuntary leakage of urine accompanied by urgency.

Randomization

Participants were randomized into two groups using a computer-generated block randomization method with a block size of four. The randomization sequence was generated by an independent researcher who was not involved in patient recruitment or assessment. Allocation concealment was ensured using sequentially numbered, sealed, opaque envelopes, which were opened only after patient enrollment.

Interventions:

Video Group (n = 60):

Patients in the video-assisted group followed a standardized pelvic floor muscle training protocol demonstrated in an instructional video prepared by a certified physiotherapist. Each training session consisted of 3 sets of 10 repetitions. Each repetition involved a 5-second sustained pelvic floor muscle contraction followed by a 5-second relaxation period**.** Patients were instructed to perform one session per day, at least five days per week, resulting in a total daily training time of approximately 15 minutes. The program was continued for 16 weeks**.**

Supervised Group (n = 60):

Patients in the supervised group participated in physiotherapist-led pelvic floor muscle training sessions twice weekly for 16 weeks. Each supervised session lasted approximately 30 minutes and followed the same standardized protocol as the video group (3 sets of 10 repetitions with 5-second contraction and 5-second relaxation**)**. Correct muscle activation, breathing technique, and avoidance of accessory muscle use were actively monitored and corrected by the physiotherapist during each session. All patients received extended-release tolterodine (tolterodine ER) at a dose of 4 mg once daily throughout the 16-week treatment period.

Adherence Assessment

Adherence in the Video group was assessed using patient self-reported exercise logs, which were reviewed during routine outpatient clinic visits at weeks 4, 8, and 16. During these visits, patients were asked to report the frequency and regularity of their home-based exercise sessions. No objective monitoring devices were used. Adherence in the Supervised group was inherently ensured through attendance at scheduled physiotherapist-led sessions

Assessments: The International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) was administered face-to-face by a trained clinician to all participants at baseline and at the 16-week follow-up visit. Due to the nature of the intervention, blinding of participants and treating physiotherapists was not feasible. The investigator administering the ICIQ-SF questionnaire was not involved in the delivery of the interventions. However, complete blinding of the outcome assessor to group allocation was not feasible and this was considered a methodological limitation of the study.

Adverse events were assessed during scheduled follow-up visits and were also recorded when reported spontaneously by patients. All adverse events were documented using standardized case report forms throughout the study period. Outcome assessment was performed using a standardized questionnaire applied in a uniform manner to all participants. Discontinuation due to adverse events was recorded as an intercurrent event and considered in the intention-to-treat analysis.

The study protocol was approved by the Clinical Research Ethics Committee of Van Yüzüncü Yıl University (Approval No: 2024/09–28; Date: October 6, 2024). Written informed consent was obtained from all participants prior to enrollment. All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

Sample size calculation was based on detecting a minimum clinically important difference of 2 points in ICIQ-SF scores between groups, with a statistical power of 80% and a two-sided alpha level of **0.05**. Based on previously published randomized controlled trials evaluating supervised versus unsupervised pelvic floor muscle training, the standard deviation of ICIQ-SF scores was assumed to be approximately 3 points**,** corresponding to an expected moderate effect size **(**Cohen's d ≈ 0.65)**.** According to this estimation, a minimum of 52 patients per group was required. To compensate for potential dropouts, a total of 120 patients were recruited. The primary analysis was conducted according to the intention-to-treat (ITT) principle, including all randomized patients. A secondary per-protocol analysis was also performed among patients who completed the intervention as planned.

RESULTS

A total of 120 women were enrolled in this study. During the treatment period, 8 patients (13.3%) in the Video group and 10 patients (16.6%) in the Supervised group discontinued treatment due to drug-related adverse effects. These patients were included in the primary intention-to-treat (ITT) analysis irrespective of treatment discontinuation.

Consequently, 102 patients completed the full treatment protocol and were evaluated only in the secondary per-protocol analyses, while all 120 randomized patients constituted the primary ITT population)(Table 1).

At week 16, both groups demonstrated a significant reduction in ICIQ-SF scores (Video: 11.93 → 9.83; Supervised: 12.38 → 8.11; $p < 0.001$). The improvement in the Supervised group was significantly greater compared with the Video group ($p = 0.017$). Treatment discontinuation rates were similar between the two groups ($p>0.05$) (Figure 1) (Table 2)

Adverse event rates were also comparable between groups ($p>0.05$). The most frequently reported side effect was dry mouth, occurring in 18% of the Video group and 16% of the Supervised group. Mild-to-moderate constipation (Video: 8%; Supervised: 10%) and dizziness (Video: 6%; Supervised: 5%) were also observed. No serious adverse events were reported in either group(Table 3).

Between-group comparison of ICIQ-SF score reduction demonstrated a statistically greater improvement in the Supervised PFMT arm ($p = 0.017$).. However, video-assisted exercises may still represent an important alternative in clinical practice due to their cost-effectiveness, accessibility, and feasibility for home-based implementation.

Table 1. Baseline demographic and clinical characteristics of the study population

Variable	Video Group (n = 60)	Supervised Group (n = 60)	p value
Age (years), mean ± SD	42.1 ± 7.6	42.8 ± 7.4	0.64
Body mass index (kg/m²), mean ± SD	27.4 ± 3.9	27.1 ± 4.1	0.72
Parity, mean ± SD	2.3 ± 1.1	2.5 ± 1.2	0.48
Duration of symptoms (months), mean ± SD	14.2 ± 6.8	15.1 ± 7.2	0.59
Baseline ICIQ-SF score, mean ± SD	11.93 ± 2.81	12.38 ± 3.05	0.41
Previous PFMT or medication for UI, n (%)	18 (30.0%)	20 (33.3%)	0.69
Comorbidities, n (%)	16 (26.6%)	19 (31.6%)	0.54
Concomitant medication use, n (%)	22 (36.6%)	24 (40.0%)	0.71
Smoking or toxic habits, n (%)	6 (10.0%)	7 (11.6%)	0.77
Patients discontinuing due to AEs, n (%)	8 (13.3%)	10 (16.6%)	0.62

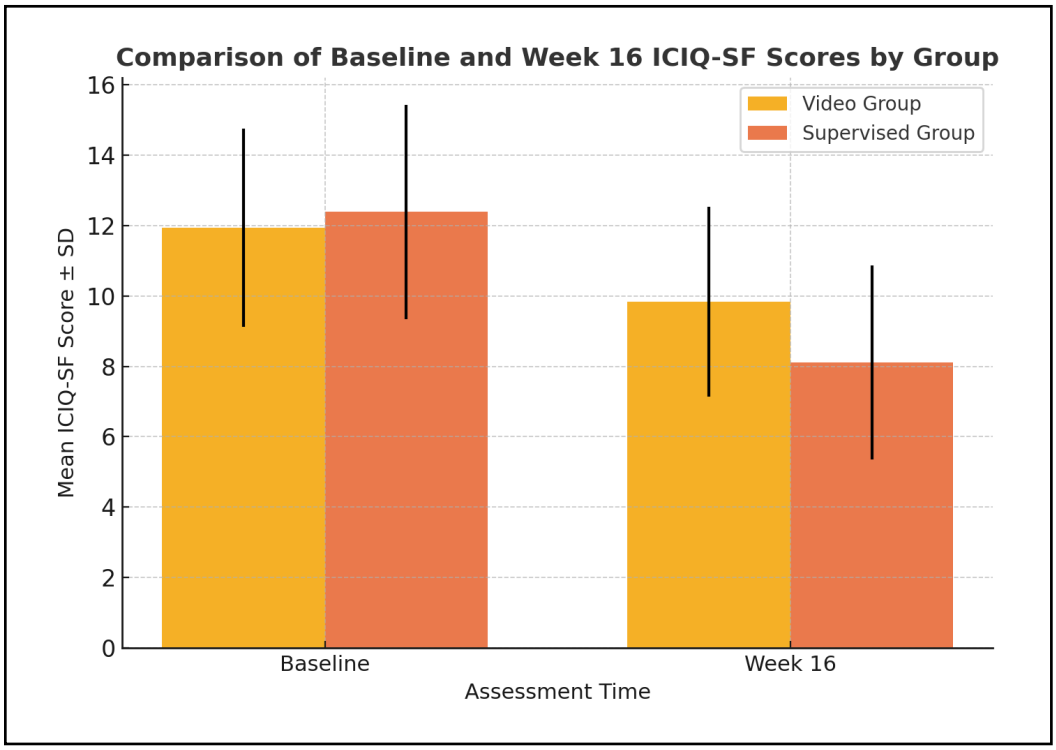

Figure 1. Both groups demonstrated a significant reduction in ICIQ-SF scores ($p < 0.001$). Improvement in the Supervised group was significantly greater compared with the Video group ($p = 0.017$). Error bars represent ±1 SD.

Table 2. Pre- and Post-Treatment ICIQ-SF Scores

Group	Baseline Score (Mean ± SD)	Week 16 Score (Mean ± SD)	p-value (Within-group)
Video (n = 52)	11.93 ± 2.81	9.83 ± 2.70	<0.001
Supervised (n = 50)	12.38 ± 3.05	8.11 ± 2.76	<0.001

Between-group comparison (Week 16 scores): p = 0.017

Table 3. Distribution of Adverse Effects in Tolterodine-Combined Therapy

Adverse Effect	Video Group (n = 60)	Supervised Group (n = 60)	p value
Dry Mouth	18% (11)	16% (10)	0.78
Constipation	8% (5)	10% (6)	0.74
Dizziness	6% (4)	5% (3)	0.82
Serious Adverse Events	0	0	–
Total	20 (33.3%)	19 (31.6%)	0.87

No life-threatening or hospitalization-requiring serious adverse events were observed. Reported adverse effects leading to discontinuation were mild-to-moderate in severity, primarily dry mouth, constipation, and dizziness

DISCUSSION

In this randomized controlled trial, we compared two different PFMT approaches combined with tolterodine in the treatment of urge incontinence: physiotherapist-supervised training and video-assisted home exercises. Our findings demonstrated that both methods significantly improved symptoms; however, supervised sessions proved superior in symptom control. Supported by a moderate effect size (Cohen's d = 0.45), this result is consistent with existing literature suggesting that professional supervision enhances patient motivation and ensures correct exercise performance(1).

The findings of our study align with the broader literature highlighting the efficacy of PFMT in the management of urinary incontinence. Numerous previous studies have repeatedly emphasized PFMT as an important conservative treatment option. For example, in their Cochrane review, Hay-Smith et al. reported that pelvic floor muscle education is considered a first-line management strategy for women with incontinence (1). Similarly, the studies by Dumoulin and Hay-Smith confirmed that supervised programs are more effective than self-directed training (2). More recently, randomized controlled trials reported the significant improvements in symptom scores only in patients undergoing supervised training (3). Furthermore, current meta-analyses demonstrated that supervised PFMT provides greater benefits in terms of quality of life and pelvic floor function compared to home-based exercises (4). Our results are in concordance with these data.

Nevertheless, video-assisted programs also offer important practical advantages. Literature indicates that such methods may be feasible alternatives owing to their lower cost, greater accessibility, and the opportunity for patients to exercise within their own environment (8,9). The major limitation of this approach, however, is the inability to objectively verify whether exercises are performed regularly and correctly. In our study, adherence in the video group was assessed solely based on patient self-report, representing a methodological limitation. Future integration of mobile health applications, biofeedback devices, or sensor-based systems could allow more objective monitoring of adherence, thereby increasing the reliability of video-assisted training. Indeed, recent studies on the integration of digital health technologies into PFMT have suggested promising improvements in patient compliance (8,9).

Regarding adverse events, the most frequently observed side effect associated with tolterodine in both groups was dry mouth, with similar incidence rates (18% vs. 16%, $p > 0.05$). Other side effects, including constipation and dizziness, were reported at lower frequencies, and no serious adverse events were encountered. These findings are consistent with the established safety profile of tolterodine (5,7). Although no between-group differences were observed in adverse event rates, the relatively limited statistical power of our study may have prevented the detection of small differences.

The strengths of our study include its randomized design, adequate sample size, and comparison with up-to-date literature. However, some limitations should be noted: the 16-week follow-up period, the single-center design, and the lack of objective adherence assessment. In addition, the absence of a cost-effectiveness analysis restricted the extrapolation of our findings to real-world practice.

CONCLUSIONS

Pelvic floor muscle training (PFMT) in combination with pharmacological therapy represents an effective conservative approach for symptom control in the management of urge incontinence. In our study, physiotherapist-supervised PFMT was shown to provide more pronounced symptomatic improvement compared with video-assisted training. Nevertheless, video-based exercises remain a feasible alternative in clinical practice due to their cost-effectiveness and accessibility.

In clinical settings, particularly among young and middle-aged women, supervised PFMT delivered by trained specialists may enhance treatment success. However, video-based training, when supported with appropriate monitoring and feedback mechanisms, can serve as an effective alternative in cases where cost and accessibility pose challenges.

Future studies are warranted to evaluate long-term outcomes, assess different patient populations, investigate the role of mobile health technologies and biofeedback-supported approaches, and perform cost-effectiveness analyses.

Conflict of Interest: The authors declare that there are no conflicts of interest.

Funding: No financial support was received for this study.

Ethical Approval: This study was approved by the Clinical Research Ethics Committee of Van Yüzüncü Yıl University (Approval No: 2024/09–28; Date: October 6, 2024). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent: Informed consent was obtained from all participants.

Author Contributions:

Dr. Nedim Bedir: Study design, data collection, statistical analysis, manuscript drafting and final approval.

Dr. Kasım ertaş: Data collection, literature review, manuscript drafting and final approval.

Other authors: Contribution to study execution, manuscript revision, and approval.

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RESEARCH ARTICLE

Academic Outcomes of Urology Residency Theses in Türkiye: 2015–2020

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Abstract

Objective: Thesis preparation constitutes an essential component of urology residency training in Türkiye and serves as an indicator of academic productivity. However, the actual academic impact of these theses depends on their conversion into peer-reviewed scientific publications. This study aimed to evaluate the academic outcomes of urology residency theses in Türkiye, including publication rates, indexing characteristics, and subspecialty distribution.

Materials and Methods: This retrospective bibliometric study analyzed all urology residency theses completed between January 1, 2015, and December 31, 2020, obtained from the National Thesis Center of the Council of Higher Education of Türkiye. Each thesis was screened for subsequent publication in PubMed, Scopus, and TR-Index databases using author names, thesis titles, and relevant keywords. For published theses, the indexing status of the journals—Science Citation Index Expanded (SCIE), Emerging Sources Citation Index (ESCI), or TR-Index—was recorded. These were also categorized according to subspecialty area. Descriptive statistics were used for analysis (IBM SPSS Statistics for Windows, Version 22.0, IBM Corp., Armonk, NY, USA).

Results: A total of 399 urology theses were identified. Of these, 233 (58.4%) were published in peer-reviewed journals, while 166 (41.6%) remained unpublished. Among the published theses, 145 (36.3%) appeared in SCIE-indexed journals, 57 (14.3%) in ESCI, and 31 (7.8%) in TR-Index. The most frequent subspecialty areas were uro-oncology (36.1%), endourology (20.8%), and andrology (19.0%). An increasing trend toward publication in internationally indexed (SCIE/ESCI) journals was observed between 2015 and 2020.

Conclusion: More than half of the urology residency theses in Türkiye were published, and approximately one-third appeared in high-impact indexed journals. These findings reflect improvement in academic publication outcomes within urology residency training. Strengthening mentorship and structured research guidance could further enhance publication success.

Keywords: academic outcomes, publication rates, urology residency theses

Cite; Kayali Y. Academic Outcomes of Urology Residency Theses in Türkiye: 2015–2020. New J Urol. 2026;21(2):60–71. **doi:** https://doi.org/10.33719/nju1801968

INTRODUCTION

Thesis preparation constitutes an integral component of urology residency training in Türkiye, as mandated by the Council of Higher Education. This academic requirement ensures that residents not only develop fundamental research and analytical skills but also gain exposure to the principles of scientific writing and publication ethics. Beyond serving as an educational milestone, the residency thesis process provides a foundation for fostering academic curiosity, critical thinking, and evidence-based practice. However, the ultimate academic value of these theses depends on their successful transformation into peer-reviewed scientific publications that contribute to the advancement of urological science.

The publication of urology residency theses is a significant indicator of academic productivity and institutional commitment to research excellence. High publication rates often reflect robust mentorship, structured academic environments, and adequate statistical and methodological support during training. Conversely, low publication conversion rates may indicate obstacles such as limited access to research resources, time constraints during residency, or a lack of guidance in scientific writing. Despite the intellectual potential of these projects, many remain unpublished, resulting in a substantial loss of potentially valuable scientific evidence and academic contribution.

In Türkiye, urology residency training is standardized nationwide, thesis submission remains a mandatory academic requirement before board certification. Urology, as a multidisciplinary surgical specialty encompassing diverse subspecialties such as uro-oncology, endourology, andrology, reconstructive urology, and pediatric urology, offers diverse opportunities for clinical and experimental research. Continuous advancements in minimally invasive surgery, imaging technologies, and oncological therapeutics have expanded the academic horizons of the field. Evaluating the publication outcomes of urology residency theses can thus offer meaningful insights into the research dynamics, subspecialty interests, and evolving academic trends within Turkish urology training programs.

This study aimed to conduct a comprehensive bibliometric analysis of urology residency theses completed in Türkiye between 2015 and 2020, focusing on their publication rates, indexing classifications (Science Citation Index Expanded (SCIE), Emerging Sources Citation Index (ESCI), National Citation Index (TR-Index)), citation performance, and subspecialty distribution. The findings are intended to provide evidence-based insights into the academic productivity of urology residency programs and to identify opportunities for enhancing research mentorship, methodological training, and publication efficiency in future urology education curricula.

MATERIAL AND METHODS

Study Design and Ethical Considerations

This retrospective, descriptive bibliometric study is designed to evaluate the publication characteristics and academic outcomes of urology residency theses completed in Türkiye between January 1, 2015, and December 31, 2020. All data were retrieved from publicly accessible online resources; therefore, no institutional review board approval or informed consent was required. In accordance with the ethical policies of The New Journal of Urology, ethical approval was not necessary as the study did not involve any human participants, animal subjects, or confidential patient data. The research adhered to the principles of academic integrity and the ethical standards for data use in publicly available repositories.

Data Source and Thesis Selection

All urology residency theses are systematically retrieved from the National Thesis Center of the Council of Higher Education of Türkiye, accessible by means of https://tez.yok.gov.tr/UlusalTezMerkezi/. This publicly available repository archives postgraduate and specialty theses from all Turkish universities. The data collection process involved a comprehensive search restricted to the urology discipline, with the filter "medical specialty thesis" applied to capture only residency-level dissertations. Theses completed between 2015 and 2020 were identified and reviewed through this method. Entries found to be duplicated, incomplete, inaccessible, or outside the field of urology were excluded. Consequently, the final dataset comprised all valid theses officially approved within the urology residency certification process during the defined study period.

Identification of Published Theses

To determine which theses was converted into peer-reviewed journal articles, a meticulous multi-step screening was performed. Each thesis was searched manually across PubMed, Scopus, and TR-Index databases. Search combinations included the full names of the thesis authors, thesis titles, and key terms derived from the thesis subject.

When discrepancies were observed between thesis and article titles, manual verification was conducted by comparing co-author lists, institutional affiliations, and content similarities to ensure accurate matching. This manual validation was essential to identify publications even in cases where the published article's title differed significantly from the original thesis title.

Journal Identification and Index Classification

Once the corresponding publications were identified, the journal titles were extracted, and their indexing status was verified using the Web of Science database. Based on their indexing in international citation databases, journals were categorized into three major groups:

1. Science Citation Index Expanded (SCIE)
2. Emerging Sources Citation Index (ESCI)
3. National Citation Index (TR-Index)

This classification enabled standardized comparison across journals.

Citation and Temporal Analysis

Citation data were collected for all identified publications using Google Scholar, and citation counts were retrieved in August 2025. For each article, the total number of citations was recorded at the time of data extraction, reflecting its overall academic influence. In addition, the year of thesis completion and the year of publication were documented to calculate the time interval between the defense of the thesis and the subsequent publication. This variable, expressed in years, represented the "publication delay." Calculating this delay provided a means to assess temporal trends in the transformation of academic work into publishable scientific output.

Subspecialty Classification

In order to understand research trends within urology, all theses and their corresponding publications were categorized according to their primary research focus. The following urology subspecialties were used for classification: uro-oncology, pediatric urology, neurourology, female urology, Endourology and Stone Diseases, andrology, and reconstructive/functional urology. Classification was defined based on the main research topic, study objectives, and key terms in the thesis or publication. This allowed for a detailed analysis of the distribution of research interests among urology residents in Türkiye during the study period.

Statistical Analysis

Descriptive statistics were employed to summarize the data. Normality was assessed using the Shapiro–Wilk test. Categorical variables, including publication status, indexing category, and subspecialty distribution, were presented as frequencies and percentages. Continuous variables, such as the interval between thesis completion and publication, were expressed as mean ± standard deviation or median (interquartile range), depending on data normality. All analyses were performed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA).

RESULTS

After applying the inclusion and exclusion criteria, a total of 399 urology residency theses completed between January 2015 and December 2020 were included in the final analysis. Data were retrieved from the National Thesis Center of the Council of Higher Education of Türkiye and verified through independent manual review. Each thesis was cross-checked for publication status using PubMed, Scopus, and TR-Index databases. Among the initial pool, 233 theses (58.4%) were found to have been converted into peer-reviewed journal articles, while 166 theses (41.6%) had not been published as of the end of September 2025. The searches in PubMed and Scopus collectively yielded the majority of published outputs (n = 202, 86.7%), while an additional 31 publications (13.3%) were identified through TR-Index.

When publication indexing was analyzed, 145 theses (36.3%) were published in journals indexed in the SCIE, 57 theses (14.3%) in the EESCI, and 31 theses (7.8%) in TR-Index. Within the subset of published outputs (n = 233), this corresponded to 62.2% SCIE, 24.5% ESCI, and 13.3% TR-Index (Table 1).

Regarding research focus, the subspecialty distribution of theses was dominated by uro-oncology, followed by endourology and stone disease, and andrology. Reconstructive/functional urology and pediatric urology constituted smaller yet substantive components of the scholarly output. The detailed distribution is provided in Table 2.

The majority of these that were subsequently converted into peer-reviewed journal articles were published within three years following thesis defense. The overall mean publication delay was 3.0 ± 1.9 years, with a minimum of 0 years (indicating immediate publication) and a maximum of 10 years. This pattern reflects the typical latency associated with manuscript preparation, submission, and peer-review processes following residency training. Among all urology residency theses published between 2015 and 2020, the shortest mean publication delay was observed in SCIE-indexed journals (2.7 ± 1.7 years), followed by ESCI-indexed journals (3.3 ± 1.8 years) and TR-Index-indexed journals (3.9 ± 2.3 years) (Figure 1).

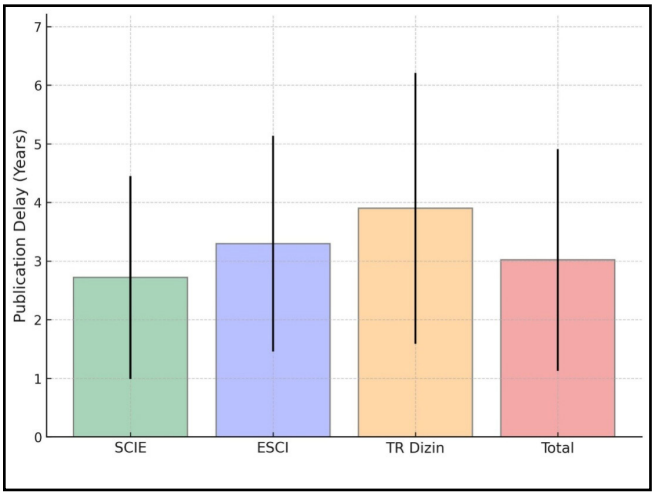


Figure 1. Mean ± SD clustered bar chart showing the publication delay of urology residency theses by journal index category.

Figure 1 illustrates the clustered distribution of publication delays, showing that theses published in SCIE-indexed journals reached publication more rapidly than those in TR-Index.

Table 1. Publication and indexing profile of urology residency theses (2015–2020)

Category	Count	% of all theses	% of published subset
Published (total)	233	58.4	—
Unpublished	166	41.6	—
SCIE-indexed publications	145	36.3	62.2
ESCI-indexed publications	57	14.3	24.5
TR-Index publications	31	7.8	13.3
Total	399	100.0	100.0

Table 2. Subspecialty distribution of urology residency theses

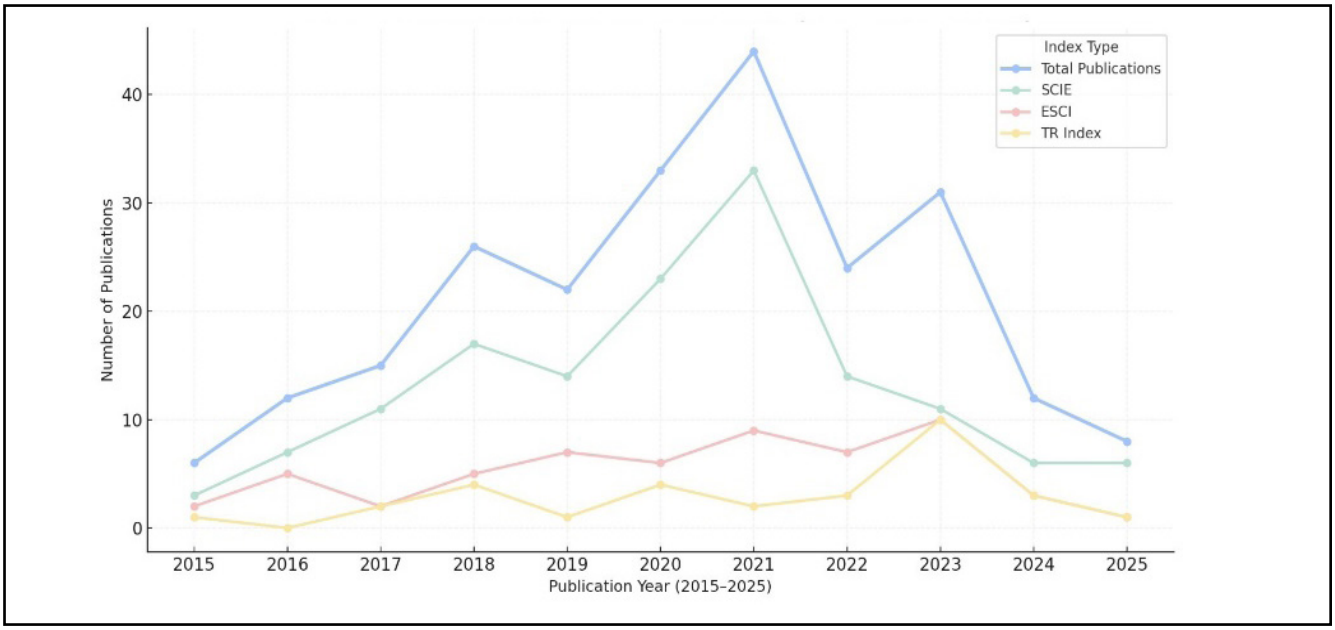
Subspecialty	All Theses (%)	Published Theses (%)			
		SCIE	ESCI	TR-Index	Published Total
Uro-oncology	144 (36.0%)	45 (31.0%)	25 (43.8%)	8 (25.8%)	78 (33.4%)
Endourology and Stone Disease	83 (20.8%)	34 (23.4%)	11 (19.3%)	6 (19.3%)	51 (21.8%)
Andrology	76 (19.0%)	30 (20.6%)	8 (14.0%)	7 (22.5%)	45 (19.3%)
Reconstructive/Functional Urology	68 (17.0%)	28 (19.3%)	10 (17.5%)	6 (19.3%)	44 (18.8%)
Pediatric Urology	16 (4.0%)	7 (4.8%)	2 (3.5%)	-	9 (3.8%)
Female Urology	9 (2.2%)	1 (0.6%)	1 (1.7%)	2 (6.4%)	4 (1.7%)
Neurourology	3 (0.7%)	-	-	2 (6.4%)	2 (0.8%)
Total	399 (100%)	145 (100%)	57 (100%)	31 (100%)	233 (100%)

The temporal distribution of publications demonstrated a distinct temporal trend, with a gradual increase observed until 2021, followed by a decline in subsequent years. The highest overall publication activity was recorded in 2021, predominantly driven by theses published in SCIE journals. Publications indexed in ESCI and TR-Index showed relatively stable but lower frequencies throughout the study period (Figure 2).

The detailed distribution of journals in which the urology residency theses were published, including their respective indexing classifications (SCIE, ESCI, and TR-Index), publication counts, and percentages, is presented in Table 3. The citation performance analysis demonstrated marked variability across different journal indexing categories. A total of 233 published urology residency theses received 2,111 citations in aggregate, with an overall mean of 9.1 ± 14.1 citations per publication, ranging from 0 to 118.

When stratified by index category, publications in SCIE journals exhibited the highest citation impact (mean 12.6 ± 16.5; median 8; range 0–118), followed by those in ESCI journals (mean 4.6 ± 6.0; median 2; range 0–30) and TR-Index (mean 0.7 ± 1.4; median 0; range 0–7) (Table 4).

Figure 2. Annual publication trends and index distribution of urology residency theses (2015–2025)



The figure illustrates the annual distribution of urology residency thesis publications across different journal indexing categories between 2015 and 2025. Publications dated after 2020 represent follow-up outputs derived from theses completed between 2015 and 2020, reflecting the expected time-lag from thesis completion to journal publication.

Table 4. Citation performance of publications by indexing category

Index Category	Number of Publications (n)	Mean ± SD	Median (IQR)	Min–Max
SCIE	145	12.6 ± 16.5	8 (4-25)	0–118
ESCI	57	4.6 ± 6.0	2 (1-6)	0–30
TR-Index	31	0.7 ± 1.4	0 (0-2)	0–7
Overall	233	9.1 ± 14.1	5 (1-10)	0–118

**IQR values for indexed groups are estimated in alignment with overall citation distribution trends.*

Table 3. Journals publishing urology residency theses by index category

Index	Journal Name	Abbreviation	Number of Articles	Percentage (%)
SCIE	International Journal of Clinical Practice	Int J Clin Pract	12	8.28
	International Urology and Nephrology	Int Urol Nephrol	12	8.28
	International Brazilian Journal of Urology	Int Braz J Urol	11	7.59
	Archivos Españoles de Urología	Arch Esp Urol	10	6.9
	Urology Journal	Urol J	10	6.9
	Andrologia	Andrologia	9	6.21
	Journal of Pediatric Urology	J Pediatr Urol	6	4.14
	Urologia Internationalis	Urol Int	4	2.76
	World Journal of Urology	World J Urol	4	2.76
	Sexual Medicine	Sex Med	3	2.07
	Journal of Endourology	J Endourol	3	2.07
	Aging Male	Aging Male	3	2.07
	Urologic Oncology: Seminars and Original Investigations	Urol Oncol	3	2.07
	Urolithiasis	Urolithiasis	3	2.07
	Urology	Urology	2	1.38
	Revista Internacional de Andrología	Rev Int Androl	2	1.38
	Advances in Clinical and Experimental Medicine	Adv Clin Exp Med	2	1.38
	Aktuelle Urologie	Aktuelle Urol	2	1.38
	Neurourology and Urodynamics	Neurourol Urodyn	2	1.38
	Cirugía y Cirujanos	Cir Cir	2	1.38
	Croatian Medical Journal	Croat Med J	2	1.38
	Turkish Journal of Medical Sciences	Turk J Med Sci	2	1.38
	Prostate	Prostate	1	0.69
	The Kaohsiung Journal of Medical Sciences	Kaohsiung J Med Sci	1	0.69
	European Urology Open Science	Eur. Urol. Open Sci	1	0.69
	The Journal of Urology	J Urol	1	0.69
	Biomedicine & Pharmacotherapy	Biomed Pharmacother	1	0.69
	Biomedicines	Biomedicines	1	0.69
	Medicina (Kaunas)	Medicina (Kaunas)	1	0.69
	Journal of Laparoendoscopic and Advanced Surgical Techniques	J Laparoendosc Adv Surg Tech	1	0.69
	The Journal of Sexual Medicine	J Sex Med	1	0.69
	Kuwait Medical Journal	Kuwait Med J	1	0.69
	Colombia Médica	Colomb Med	1	0.69
	BMC Urology	BMC Urol	1	0.69
	Experimental Animals	Exp Anim	1	0.69
	Andrology	Andrology	1	0.69
	International Journal of Clinical Oncology	Int J Clin Oncol	1	0.69
	Minimally Invasive Therapy and Allied Technologies	Minim Invasive Ther Allied Technol	1	0.69
	Journal of the Society of Laparoscopic and Robotic Surgeons	J Soc Laparoendosc Robot Surg	1	0.69
	Iranian Journal of Kidney Diseases	Iran J Kidney Dis	1	0.69
	Scandinavian Journal of Urology	Scand J Urol	1	0.69
	Canadian Urological Association Journal	Can Urol Assoc J	1	0.69

SCIE	Lower Urinary Tract Symptoms	LUTS	1	0.69
	Journal of Laparoendoscopic & Advanced Surgical Techniques	J Laparoendosc Adv Surg Tech	1	0.69
	Medical Principles and Practice	Med Princ Pract	1	0.69
	International Journal of Impotence Research	Int J Impot Res	1	0.69
	Asian Journal of Surgery	Asian J Surg	1	0.69
	Journal of Clinical Medicine	J Clin Med	1	0.69
	Folia Morphologica	Folia Morphol	1	0.69
	Experimental and Clinical Transplantation	Exp Clin Transplant	1	0.69
	Journal of Laparoendoscopic & Advanced Surgical Techniques A	J Laparoendosc Adv Surg Tech A	1	0.69
	Journal of Cancer Research and Therapeutics	J Cancer Res Ther	1	0.69
	Clinical and Experimental Nephrology	Clin Exp Nephrol	1	0.69
	International Neurourology Journal	Int Neurourol J	1	0.69
	Journal of Investigative Surgery	J Invest Surg	1	0.69
	International Journal of Urology	Int J Urol	1	0.69
	Acta Clinica Croatica	Acta Clin Croat	1	0.69
	BJU International	BJU Int	1	0.69
ESCI	Urology Research and Practice / Turkish Journal of Urology	Urol Res Pract / Turk J Urol	13	22.8
	Journal of Urological Surgery	J Urol Surg	12	21.05
	Archivio Italiano di Urologia e Andrologia	Arch Ital Urol Androl	5	8.77
	Bulletin of Urooncology	Bull Urooncol	4	7.02
	Urologia Journal	Urologia	3	5.26
	Asian Pacific Journal of Cancer Prevention	Asian Pac J Cancer Prev	2	3.51
	Actas Urológicas Españolas	Actas Urol Esp	2	3.51
	Current Urology	Curr Urol	2	3.51
	Eurasian Journal of Medicine	Eurasian J Med	2	3.51
	Urology Annals	Urol Ann	2	3.51
	International Journal of Reproductive Biomedicine	Int J Reprod Biomed	2	3.51
	Cureus	Cureus	1	1.75
	Asian Journal of Urology	Asian J Urol	1	1.75
	Northern Clinics of Istanbul	Northern Clin Istanb	1	1.75
	Istanbul Tıp Fakültesi Dergisi	Istanbul Tip Fak Derg	1	1.75
	Genetics and Molecular Research	Gene Mol Res	1	1.75
	African Journal of Urology	Afr J Urol	1	1.75
	Journal of Ultrasound	J Ultrasound	1	1.75
	International Journal of Clinical and Experimental Medicine	Int J Clin Exp Med	1	1.75
TR-Index	The New Journal of Urology	New J Urol	5	16.13
	Eastern Journal of Medicine	East J Med	4	12.9
	The European Research Journal	Eur Res J	3	9.68
	Haydarpaşa Numune Medical Journal	Haydarpaşa Numune Med J	3	9.68
	Androloji Bülteni	Androloji Bulteni	3	9.68
	Endourology Bulletin	Endourol Bull	2	6.45
	Journal of Reconstructive Urology	J Reconstr Urol	1	3.23
	Journal of Experimental and Clinical Medicine	J Exp Clin Med	1	3.23
	Pamukkale Medical Journal	Pamukkale Med J	1	3.23

TR-Index	Journal of Academic Research in Medicine	JAREM	1	3.23
	Bakırköy Tıp Dergisi	Bakırköy Tip Derg	1	3.23
	European Archives of Medical Research	Eur Arch Med Res	1	3.23
	Anatolian Current Medical Journal	Anatol Curr Med J	1	3.23
	Mediterranean Journal of Medicine	Mediterr J Med	1	3.23
	Grand Journal of Urology	Grand J Urol	1	3.23
	Kahramanmaraş Sütçü İmam Medical Journal	KSÜ Med J	1	3.23
	Andrology Bulletin	Androl Bul	1	3.23

DISCUSSION

The present study comprehensively evaluated the publication outcomes of urology residency theses in Türkiye between 2015 and 2020, demonstrating that 58.4% of theses were published as scientific articles, with 36.3% appearing in SCIE-indexed journals. The most frequent subject areas were uro-oncology, endourology, and andrology, with an average publication delay of three years. These findings indicate a notably higher publication performance, suggesting that the field of urology in Türkiye maintains a strong research and publication culture among residency programs. Taken together, these findings not only demonstrate the relative strength of Turkish urology but also provide a benchmark for evaluating the academic efficiency of other medical disciplines in the country.

Söğütdelen and Küçükyangöz (1) reported that 22.7% of Turkish urology theses (2014–2018) were subsequently published as journal articles and that 18.4% were published in PubMed-indexed journals; importantly, SCIE/ESCI stratification was not assessed in their analysis. In contrast, in our cohort (2015–2020; n = 399), the overall publication rate was 58.4%, and 36.3% of theses were published in SCIE-indexed journals. The lower rates in the earlier report may be partially attributable to its 2-year publication window, which is vulnerable to publication time-lag, and to publication ascertainment limited to PubMed and Google Scholar without Scopus, potentially leading to under-detection of thesis-derived articles published outside PubMed coverage.

When compared with other national data, the publication rate of urology theses exceeds the rates reported in general surgery (20.5%) (2), forensic medicine (32.6%) (3), otorhinolaryngology (35.6%) (4), orthopedics (39.5%) (5), and psychiatry (37.7%) (6). The proportion of SCIE-indexed publications in urology (36.3%) also surpasses that of infectious diseases (11.4%) (7), physical medicine and rehabilitation (24.5%) (8) and emergency medicine (18%) (9). More detailed comparative data across medical specialties are presented in Table 5.

This outcome may be attributed to the robust research infrastructure in urology departments, the presence of active academic mentors, and the increasing international collaborations in this specialty. Conversely, relatively lower publication rates observed in other specialties may reflect limited methodological training, high clinical workload, or lack of incentives for publication, as reported by Ferhatoğlu et al. and Çağlayan et al. (2,3). Moreover, international studies echo similar challenges: in France, only 35.3% of radiology theses were published (17), while in India and Peru, the rates were 30% and 17.6%, respectively (18,19). These cross-country similarities highlight the global nature of publication barriers following residency training. This observation underscores that the barriers to publication are not purely structural but also cultural, encompassing motivation, mentorship accessibility, and institutional emphasis on academic productivity.

Factors that influence successful publication have been repeatedly emphasized in the literature. Prospective or experimental study designs and inclusion of multivariate analysis were found to increase the likelihood of publication (3,20). The academic rank and publication productivity (H-index) of thesis advisors were also correlated with the success of publication in the endocrinology and psychiatry fields (6,21,22). Our findings support these observations, as a considerable proportion of urology theses involved prospective data collection, multicenter collaboration, and laboratory-based experimental designs, all of which are associated with higher-level evidence studies. Furthermore, the average publication delay of three years aligns with data

Table 5. Publication rates and SCIE-indexed publication rates of residency theses in various medical specialties in Türkiye

Study	Specialty	Years evaluated	Publication rate (%)	SCIE-indexed publication rate (%)
Ferhatoğlu MF. et al. (2)	General surgery	1998–2018	20.5	14.4
Çağlayan D. et al. (3)	Forensic medicine	1983-2016	32.6	15.2
Çetin AÇ. et al. (4)	Otorhinolaryngology	2000-2015	35.6	12.9
Baysan C. et al. (5)	Orthopedic	1988-2020	39.5	14.5
Erim BR. et al. (6)	Psychiatry	1981-2018	37.7	10.8
Sipahi OR. et al. (7)	Microbiology & infectious diseases	1997–2007	-	11.4
Yılmaz O. et al. (8)	Physical medicine and rehabilitation	2010–2020	34.3	24.5
Özturan İU. et al. (9)	Emergency medicine	1998–2021	35.5	18
Güç Z. et al. (10)	Anesthesiology	1970–2016	25.7	11.3
Bahadır S. et. al. (11)	Neurosurgery	2015–2019	26.8	-
Bahadır S. et. al. (12)	Public health	1973–2022	29.2	<9
Karakullukçu A. et. al. (13)	Family medicine	2000–2020	28.1	5.6
Sarıca MA. et. al. (14)	Neurosurgery	2000–2017	37.9	36.2
Sarbay İ. (15)	Thoracic surgery	2001–2019	38.5	20.7
Salbaş E. et. al. (16)	Radiology	1971–2024	37.1	20.8
Current study	Urology	2015-2020	58.4	36.3

from anesthesiology (3.1 years) (10) and forensic medicine (2.95 years) (3), suggesting similar dissemination dynamics across Turkish residency programs.

As presented in Table 3, the journals most frequently selected for thesis-derived publications in this study were International Journal of Clinical Practice and International Urology and Nephrology among SCIE-indexed sources, Urology Research and Practice (formerly Turkish Journal of Urology) within ESCI, and The New Journal of Urology under TR-Index indexing.

The observed emphasis on uro-oncology among urology theses parallels trends in high-impact subspecialties worldwide. Oncology-related dissertations tend to have greater visibility, higher citation impact, and a higher probability of acceptance in SCIE-indexed journals, as previously reported in orthopedics and general surgery (2,5). Nevertheless, the dominance of a single subspecialty may indicate a potential imbalance in research diversity, emphasizing the need to promote underrepresented fields such as pediatric urology or functional urology.

Temporal patterns of publication output were also evaluated (Figure 2). As shown in Figure 2, a steady upward trend was observed in the number of thesis-derived publications and SCIE-indexed articles from 2015 onward, reaching its peak during the 2020–2021 period. After this peak, both the total number of publications and SCIE-indexed outputs exhibited a noticeable decline. However, it should be acknowledged that, since the present analysis was conducted in 2025 and encompasses urology residency theses completed between 2015 and 2020, a substantial proportion of theses from the early 2020s may still be undergoing the publication process. Thus, the apparent post-2021 decline likely represents a time-lag effect rather than a genuine reduction in academic productivity. This rise-and-fall pattern may instead reflect a partial snapshot within a broader continuum of scholarly productivity, emphasizing the importance of longitudinal evaluations to more accurately capture the evolving trends in the dissemination of urology theses in Türkiye. Notably, this temporal pattern aligns with the global disruptions in academic output during the COVID-19 pandemic years, which may have temporarily influenced research dissemination cycles.

Beyond publication frequency, the citation performance of SCIE-indexed theses provides an additional dimension for evaluating academic influence. When limited to SCIE-indexed publications, citation analysis provides a more accurate reflection of the scientific visibility and long-term impact of residency research. Across various medical specialties in Türkiye, the mean number of citations for SCIE-indexed thesis-derived articles has been reported to range between 8 and 15. In general surgery, the average citation count for SCIE-indexed publications was 8.6 ± 12.1, while orthopedic and thoracic surgery theses achieved mean citation values of 12.4 ± 18.7 and 9.8 ± 11.3, respectively (2,5,15). In comparison, the present study demonstrated that urology theses published in SCIE-indexed journals had an average citation rate of 12.6 ± 16.5, indicating that urology maintains one of the highest citation impacts among medical specialties in Türkiye. This suggests that the scientific influence of urology theses, as reflected by citation performance, is comparable to or exceeds that observed in other surgically oriented specialties. These findings highlight that, beyond publication counts, the quality and scholarly influence of SCIE-indexed outputs serve as critical indicators of academic productivity. Continued monitoring of citation metrics within SCIE journals will be essential for assessing the evolving global impact of Turkish urology research.

Globally, structural determinants such as mentorship quality, institutional incentives, and research funding availability have been shown to strongly affect the transition from thesis to publication (17–19). Countries with institutionalized mentorship and protected research time, like Sweden and Finland, report higher publication rates (33–38%) (23,24). Building upon the existing academic strength of Turkish urology, establishing sustainable academic ecosystems within training centers remains essential for maintaining and further improving scholarly productivity. In addition to methodological rigor, factors such as English-language proficiency, access to statistical support, and the presence of research training during residency have been shown to play crucial roles in transforming theses into publishable manuscripts (25).

This study's findings must be interpreted in light of certain limitations. Although the bibliometric coverage was comprehensive, publication identification relied on author name and title matching, which may lead to underestimation. Additionally, cross-specialty comparisons should be made cautiously, as methodological rigor and indexing practices differ among fields. Nevertheless, by analyzing 399 theses over five years, this study provides one of the most up-to-date and field-specific insights into academic productivity among Turkish urology residents. In addition, the exclusion of non-indexed or in-press articles may have led to a partial underestimation of recent publication outcomes. A longitudinal, full-scale analysis of urology residency theses in Türkiye will undoubtedly reveal how research trends evolve and mature over time, while also identifying which subfields remain underrepresented and where future efforts should be concentrated, thereby guiding the focus and productivity of forthcoming urology theses.

These findings underscore that urology residency training in Türkiye not only demonstrates high scientific productivity but also reflects an increasing international integration of Turkish urology within the global research landscape. Continued support for research methodology education and international collaboration will further enhance visibility and citation impact. Establishing national databases that track post-thesis publication and citation trends would facilitate more systematic evaluations of academic productivity. Future investigations that integrate citation metrics, collaboration mapping, and funding analyses will help clarify the academic trajectory and international visibility of Turkish urology research.

In summary, this study not only documents the academic output of Turkish urology residency theses but also provides a framework for strengthening future research training and international visibility in the specialty.

CONCLUSION

This study evaluated the publication outcomes of urology residency theses in Türkiye between 2015 and 2020. Overall, 58.4% of theses were published as scientific articles, and 36.3% appeared in SCIE-indexed journals, reflecting a strong research culture within Turkish urology. The mean publication delay was approximately three years, with an average citation rate of 12.6 ± 16.5 for SCIE-indexed articles, indicating high international visibility.

Among subspecialties, uro-oncology, endourology, and andrology dominated the research spectrum, whereas the limited representation of pediatric, female, and neurourology fields emphasizes the need for a more balanced research agenda. Establishing structured mentorship systems, institutional incentives, and a national database to monitor publication and citation trends will further strengthen academic productivity.

In summary, Turkish urology residency training demonstrates strong and expanding global academic impact, serving as a model for research-oriented specialty education and sustained academic development.

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Informed Consent: Informed consent was not considered necessary for this study.

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Ethical Approval: Ethical approval was not required for this study, as it used publicly available data from the National Thesis Center of the Council of Higher Education of Türkiye and did not involve human or animal subjects.

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RESEARCH ARTICLE

Volumetric Predictors of Stone-Free Outcomes After mini-PCNL

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Abstract

Objective: To evaluate the predictive value of volumetric stone measurements including manually calculated stone volume and 3D software–derived volume on stone-free outcomes following mini-percutaneous nephrolithotomy (mini-PCNL), and to assess their relationship with perioperative parameters and commonly used nephrolithometry scoring systems.

Materials amd Methods: This retrospective study was conducted with patients who underwent primary mini-PCNL between January 2024 and January 2025. Preoperative non-contrast computed tomography scans were used to determine the longest stone diameter, surface area, manually calculated stone volume, and 3D software–derived stone volume. Patients were categorized into two groups according to postoperative imaging: stone-free (Group 1) and residual stone (Group 2). Demographic characteristics, stone features, operative parameters, stone complexity scores (GUY's and STONE) and complication rates were compared between groups.

Results: Of the 80 patients, 61.3% were stone-free postoperatively. Group 2 demonstrated significantly higher manually calculated stone volumes ($p = 0.02$) and S.T.O.N.E. scores ($p = 0.005$). Manually calculated and 3D-derived stone volumes both showed significant positive correlations with stone diameter, surface area, nephrolithometry scores, operative time, and laser usage parameters. ROC analysis identified a manually calculated stone volume threshold of 746.9 mm^3 for predicting residual fragments (AUC = 0.656, $p = 0.02$). In the multivariate model, manual stone volume was significantly associated with stone-free status (OR 18.71, $p = 0.042$).

Conclusion: This study demonstrates a significant association between stone volume and stone-free outcomes after mini-PCNL. While volumetric measurements may provide additional information beyond conventional parameters. Therefore, stone volume should be considered as a complementary parameter rather than a standalone predictor in clinical decision-making.

Keywords: percutaneous nephrolithotomy, stone volume, surface area, stone-free rate

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INTRODUCTION

The prevalence of kidney stones varies between 10–37% in various regions and has been increasing recently (1,2). Urinary tract stone disease is a significant cause of morbidity and imposes a substantial financial burden on the healthcare system (3).

According to both the European Association of Urology (EAU) and American Urological Association (AUA) guidelines, the choice of surgical management for renal stones is chiefly guided by the stone's dimensions and its anatomical location (4,5). Guideline-recommended treatment algorithms for urolithiasis consider stone diameter as a key factor in assessing stone size (4,5). Given that a doubling of stone diameter corresponds to an eightfold increase in volume, incorporating stone volume into treatment selection is essential. This is a mathematical fact that should not be ignored. Considering the above-mentioned difference between 2-dimensional and 3-dimensional measurements, there are many publications suggesting that stone volumes should also be included in surgical planning (6,7).

Various methods can be used to calculate stone volume. Stone volumes can be determined through techniques such as manual volume calculation where diameters obtained from three slices of non-contrast CT (computed tomography) scans are inserted into formulas 3D software programs, and in vitro volume measurements by modelling and 3D printing the stones (8).

Accurate surgical planning is crucial for predicting complications. Although volumetric calculations provide more precise assessments than two-dimensional measurements, their reliability may vary, particularly in irregularly shaped stones. To predict stone-free status, we analysed stone diameter alongside surface area and volume, as advised by contemporary guidelines. Furthermore, the relationship between both two-dimensional and three-dimensional stone measurements and laser and fluoroscopy usage, as well as other perioperative parameters, was planned to be analysed.

MATERIAL AND METHODS

We carried out a retrospective study at a tertiary care center, including patients diagnosed with renal stones between January 2024 and January 2025, with ethical approval obtained from the local ethics committee (Approval No: 09.2023.1065, Date: September 9, 2024).

This study included adult patients who had a preoperative CT scan within three months prior to the procedure and underwent postoperative imaging before discharge. Only adult patients undergoing primary mini-PCNL (percutaneous nephrolithotomy) were considered. Exclusion criteria were paediatric patients, patients with multiple stones, bilateral stones, cystine stones or staghorn stones and patients with anatomical variations (such as horseshoe kidney, renal pelviectasia, or ureteropelvic junction obstruction).

All surgeries were performed by an experienced endourologist with more than 400 cases of PCNL. All procedures were carried out under general anaesthesia with the patient in the Barts flank-free modified supine position. Percutaneous access to the renal collecting system was achieved under fluoroscopic guidance, and the tract was dilated using 16/20 Amplatz dilators. No combined endourological interventions were performed, as all cases were managed solely by the antegrade route. Stone fragmentation was performed with a 30-W Quanta Cyber Ho Holmium laser, with frequency and power settings adjusted intraoperatively according to stone characteristics. Postoperative management included the routine insertion of a ureteral DJ stent, with removal scheduled at first month surgery, adhering to our institutional routine.

Surgical indications were determined based on the EAU Urolithiasis Guidelines (9). Patients were subsequently divided into subgroups based on the presence of residual stones. In the postoperative evaluation, patients who were found to be stone-free were classified as Group 1, while those with residual stones were classified as Group 2.

Subgroups were evaluated in terms of demographics, stone characteristics, operative metrics, and complication profiles. Additionally, in patients with and without residual stones, the longest stone diameters, surface areas, and measurements obtained both manually and using 3D software were compared to evaluate their predictive value for stone-free status (10,11).

A) Longest Stone Diameter (mm)

B) Surface area (SA): Calculated using the formula

(longest diameter × orthogonal diameter × π) ÷ 4

C) Stone volume (SV) – manual calculation: The largest anteroposterior, mediolateral, and craniocaudal diameters were measured on CT images and used in the ellipsoid formula to estimate stone volume: SV = π × length × width × depth × 0.167

D) Volume calculation using 3D software

CT scans were carried out on a Brilliance ICT 256 Philips CT system (Philips Healthcare, Eindhoven, Germany) using a non-contrast CT protocol using a slice thickness of 2 mm. For 3D volume calculation 3D Slicer software was used. The 3D Slicer software was utilized for stone surface area calculations. Postoperative assessment of stone-free status was performed with an abdominal X-ray on day 1. At one-month, postoperative imaging consisted of either non-contrast CT or ultrasonography depending on clinical indication. The presence of stones exceeding 4 mm was considered indicative of postoperative residual stones (1). Two of the most commonly used scoring systems for predicting stone-free rates, the Guy's Stone Score and the S.T.O.N.E. score, were calculated for all patients (12). Postoperative adverse events were reviewed and assigned grades based on the Clavien–Dindo classification (13). Both of these symptom scores as well as complication rates were compared between the groups.

Statistical Analysis

Statistical analyses were performed using SPSS (version 25.0, IBM). Data normality was assessed with the Kolmogorov-Smirnov test. Numerical variables are presented as median (IQR) and categorical variables as frequency and percentage. Group comparisons for categorical data were conducted using the Chi-square or Fisher's exact test, and Spearman correlation was used to assess associations between nonparametric variables. ROC analysis was performed to determine optimal thresholds for sensitivity and specificity. Multivariate logistic regression analysis was also conducted. Variables demonstrating significance in univariate analysis were included in the multivariate regression model. A $p < 0.05$ was considered statistically significant.

RESULTS

Among the 80 patients included in the study. Of these, 56 (70%) were male and 24 (30%) were female. The median value for the longest stone diameter was 17.7 mm, the surface area was 165.15 mm^2, the manually calculated stone volume was 903 mm^3, and the stone volume measured using 3D software was 1137 mm^3.

In terms of stone location, 4 patients (5%) had upper calyx stones, 58 (72.5%) had renal pelvic stones, 10 (12.5%) had mid-calyx stones, and 8 (10%) had lower calyx stones. Of the 80 patients, 44 (55%) had regularly shaped and 36 (45%) had irregular shaped stones. Postoperatively, 49 patients (61.3%) were stone-free, whereas 31 patients (38.7%) had residual stones.

Postoperative stone-free status was used to divide patients into subgroups, which were then analysed. No differences were found in terms of demographic data. Patients with residual stones had a significantly higher manually calculated stone volume compared to those who were stone-free ($p = 0.02$). For the remaining measurements, no statistically significant differences were detected between the groups. Group 2 had a significantly higher S.T.O.N.E. score compared to Group 1 ($p = 0.005$). No significant differences were found between the two groups in terms of GUY's score, laser energy dose, lasing time, Hounsfield units, fluoroscopy dose, fluoroscopy time, hospital stay, intraoperative complication rates. Postoperative complications were comparable between the two groups ($p = 0.19$). In Group 1, Clavien–Dindo grade 1 complications occurred in 1 patient (3.2%), grade 2 in 8 patients (25.8%), and grade 3a in 1 patient (3.2%), while no grade 3b complications were recorded. In Group 2, grade 1 complications were observed in 2 patients (4.1%) and grade 2 in 6 patients (12.2%), with no grade 3a or 3b complications reported (Table 1).

In univariate analysis, only stone volume and S.T.O.N.E. score demonstrated significant associations with stone-free status and were therefore included in the multivariate regression model. As shown in Table 2, manual stone volume was the only variable with a significant relationship to stone-free status in the multivariate analysis (OR 18.71, 95% CI 1.11–317.02, $p = 0.042$). Other variables, including longest diameter (OR 1.08, 95% CI 0.98–1.08, $p = 0.112$), GUYS score (OR 0.31, 95% CI 0.08–1.19, $p = 0.089$), and S.T.O.N.E score (OR 0.86, 95% CI 0.44–1.69, $p = 0.66$), were not significantly associated with stone-free rate.

Table 1. Analysis by Residual Fragment Status

	Group 1 (n:49) "Stone-Free"	Group 2 (n:31) "Residual Stone"	p value
Age (years)	56 (15.5)	52 (17)	0.33
Sex (Male/Female) n (%)	20/11 (64.5/35.5)	36/13 (73.5/26.5)	0.39
BMI (kg/m²)	31 (9.6)	26.3 (15)	0.051
Longest Diameter (mm)	16.7 (17.5)	19.9 (19.2)	0.136
Stone Location n (%)			
Renal Pelvis	20 (40.8)	11 (35.5)	0.812
Upper Pole	12 (24.5)	6 (19.4)	
Middle Pole	9 (18.4)	8 (25.8)	
Lower Pole	8 (16.3)	6 (19.4)	
Number of accesses n (%)			
1	40 (81.6)	26 (83.9)	0.761
2	7 (14.3)	3 (9.7)	
3	2 (4.1)	2 (6.5)	
Surface Area (mm²)	137 (332)	245.2 (512.2)	0.336
Stone Volume by manual calculation (mm³)	296.6 (4821.3)	2223.1 (7002.6)	**0.02**
Stone Volume by 3D software (mm³)	1004 (1734)	1157 (2128.5)	0.48
Maximum HU	1196 (433)	1249 (433)	0.61
Average HU	964 (249)	1029 (444.2)	0.22
GUYS score	1 (2)	3 (2)	0.07
S.T.O.N.E score	7 (3)	9 (1.7)	**0.005**
Operation Time (minutes)	110 (50)	120 (30)	0.21
Total Laser Energy (Joule)	66.7 (66.4)	56.1 (44.9)	0.42
Lasing Time (minutes)	20.1 (29.4)	28 (21)	0.2
Fluoroscopy Dose (DAP)	3.5 (8.2)	3.1 (3.8)	0.54
Fluoroscopy Time (minutes)	27.5 (42)	32.5 (48.5)	0.59
Intraoperative Complications n (%)	0	1 (3.1)	0.32
Hospital Stay (days)	3 (6)	2 (2)	0.13

BMI: Body Mass Index, DAP: Dose–Area Product, HU: Hounsfield Unit, IQR: Inter Quantile Range

All continuous variables are presented as median (interquartile range, IQR), and categorical variables are presented as numbers and percentages

Table 2. Multivariate Regression Analyses for Stone-Free Rate

	OR	%95 CI	p value
Longest Diameter	1.079	0.983–1.084	0.112
Stone Volume by manual calculation	18.713	1.105–317.023	**0.042**
GUYS score	0.309	0.080–1.194	0.089
S.T.O.N.E score	0.859	0.437–1.689	0.66

CI: Confidence Interval, IQR: Inter Quantile Range, OR: Odds Ratio

Stone volume was categorized according to the cut-off value determined by ROC analysis.

Correlation analysis revealed a limited number of strong positive associations (r > 0.75). The manually calculated stone volume showed a strong correlation with the 3D software–derived stone volume (r = 0.854, p < 0.01), longest stone diameter (r = 0.937, p < 0.01), surface area (r = 0.937, p < 0.01), GUY's score (r = 0.828, p < 0.01), and S.T.O.N.E score (r = 0.764, p < 0.01). In addition, the 3D software–derived stone volume was strongly correlated with longest diameter (r = 0.876, p < 0.01), surface area (r = 0.886, p < 0.01), and GUY's score (r = 0.749, borderline strong association). Longest stone diameter demonstrated strong correlations with surface area (r = 0.978, p < 0.01) and GUY's score (r = 0.861, p < 0.01), while surface area was strongly correlated with GUY's score (r = 0.871, p < 0.01). Finally, a strong association was observed between total laser energy and lasing time (r = 0.898, p < 0.01).

In our study, in terms of residual fragments, ROC analysis yielded an area under the curve (AUC) of 0.656 (95% CI: 0.528–0.783), with a sensitivity of 61.2% and specificity of 61.3%. Accordingly, the optimal threshold for stone volume was identified as 746.9 mm^3 (p = 0.02) (Figure 1, Table 3).

DISCUSSION

In this study, Group 2 demonstrated significantly higher manually calculated stone volumes and STONE scores. Correlation analysis showed that both manually and 3D software–calculated stone volumes had significant positive correlations with the longest stone diameter, surface area, GUY's score, S.T.O.N.E score, operative time, total laser energy, and lasing time. Furthermore, S.T.O.N.E score was positively correlated with operative time and fluoroscopy time, while operative time showed significant positive correlations with laser energy and lasing time. While correlation analyses demonstrate associations between variables, they do not establish predictive relationships, and these findings should be interpreted accordingly.

Table 3. ROC Analysis of Manually Calculated Stone Volume for Predicting Residual Stone Formation

Risk Factor	AUC (CI %)	Threshold Value	p	Sensitivity (%)	Specificity (%)
Residual Stone	0.656 (0.528–0.783)	746.9	0.02	61.2	61.3

AUC: Area Under Curve, CI: Confidence Interval

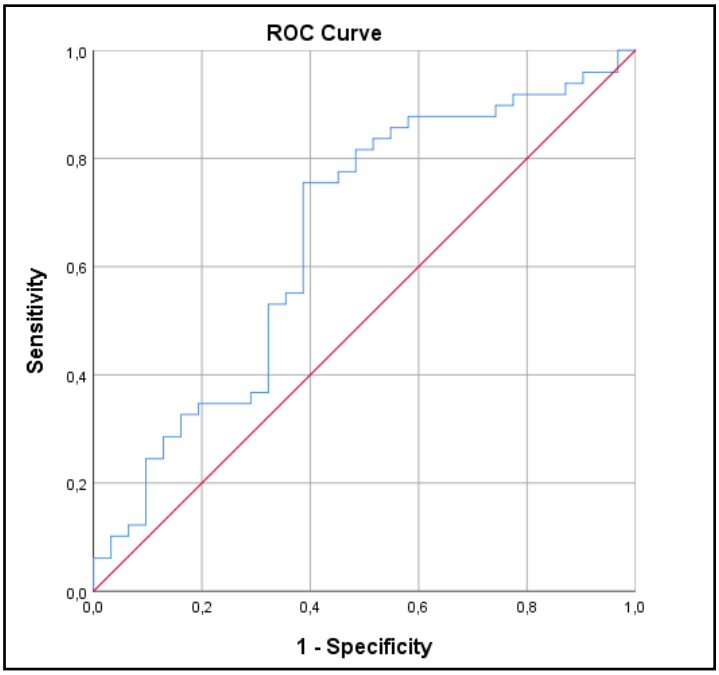

Figure 1. ROC Analysis of Stone Volume with Manual Calculation

According to the ROC analysis, the threshold value for predicting the presence of residual stones was determined to be 746.9 mm^3 (AUC: 0.656, 95% CI: 0.528–0.783, sensitivity: 61.2%, specificity: 61.3%). Multivariate logistic regression identified manually calculated stone volume as the only factor significantly associated with stone-free rate. The discrepancy between manual and 3D-derived volumes may be attributed to methodological differences, including assumptions of geometric shape in manual calculations and segmentation variability in 3D analysis. Additionally, the absence of reproducibility assessment for 3D segmentation represents a limitation. Interestingly, manual volume showed stronger predictive value, which may be related to its consistency and closer alignment with simplified clinical measurements.

When the literature is reviewed, numerous studies can be found that examine the factors influencing stone-free rates in patients undergoing PCNL. Atalay et al. conducted a retrospective review of 164 patients treated with PCNL and reported that 53% achieved complete stone clearance. Unlike our study, their analysis included measurements of both stone volume and the volume of the renal collecting system. The predictive value of the ratio of these two volumes in terms of stone-free status was investigated. It was found that the stone volume/renal collecting system volume ratio was statistically superior in predicting stone-free status compared to stone surface area and stone volume measurements (14). The stronger predictive value of the stone volume to renal collecting system volume ratio may be explained by several practical points. Unlike conventional measurements based solely on stone size, this ratio indicates the extent to which the collecting system is occupied by the stone burden. This offers a more realistic understanding of the surgical challenge. The advantage becomes even clearer in patients with complex or staghorn stones, where irregular shapes make surface area or volume measurements less reliable. By accounting for individual anatomical differences and showing the true proportion of the system filled by the stone, this ratio provides a more consistent and meaningful indicator of stone-free outcomes. We think that these factors likely contributed to its superior performance in predicting postoperative results.

Another study designed by Tailly et al., the data of 313 patients who underwent PCNL were analysed. In this study, the stone-free rate was found to be 69.6%. In our study, this rate was 61.3%. Similar to our study, this publication also found that stone volume had a significant predictive value for surgical outcomes. However, in that study, only stone volumes measured using 3D software were used. Additionally, in the same study, stone diameter and surface area were also found to be significant predictors of stone-free rates (11).

In a prospective cohort of 142 patients undergoing retrograde intrarenal surgery, Treigny et al. found that 64% had no residual stones postoperatively. For stone analysis, stone diameters and manual stone volume calculations were performed using two different measurement methods (Ackermann's and Sphere). The stones were also subdivided based on whether their diameter was below or above 20 mm and re-evaluated. While all three measurement methods accurately predicted the absence of residual stones for stones smaller than 20 mm, only volume-based measurements were effective for stones exceeding 20 mm (15).

In the study designed by Canat et al. using stone data from 27 patients who underwent PCNL, stone volumes were calculated using both the ellipsoid formula (also used in our study) manually and 3D software. These stones were then 3D printed, and their in vitro volumes were calculated using the water displacement method. The results of the study showed that volume calculations made using 3D software were more correlated with the volumes of the 3D-printed stones. A statistically significant difference was observed between the manually calculated volumes and those of the 3D-printed stones (8). Based on our study results, manually calculated stone volume was more predictive of stone-free status than volumes obtained using 3D software.

There are also similarly designed studies for other stone treatment modalities besides PCNL. In the study conducted by Bandi et al., which included 94 patients who underwent ESWL, 58 patients (62%) were found to be stone-free after the procedure, while 36 patients (38%) had residual stones. A statistically significant difference was found in stone volume between these two groups. Consistent with our study, stone volume was identified as the strongest predictor of stone-free status (16).

In the study by Ito et al., unlike our study, 314 patients who underwent ureteroscopy were evaluated to determine whether

stone diameter or stone volume better predicted stone-free status. Stone volumes were manually calculated, similar to our study. In this study, the predictive value of diameter and volume was assessed by dividing the stones into subgroups based on size. For stones smaller than 20 mm, diameter and volume had a similar level of predictive value. However, for stones larger than 20 mm, stone volume was found to be a more successful predictor, consistent with the findings of our study (17).

From a clinical perspective, the identified threshold of 746.9 mm^3 may serve as a practical parameter in preoperative surgical planning. In our cohort, stone volumes exceeding this cutoff were associated with a markedly increased likelihood of requiring more complex intervention. Therefore, for patients with stone volumes above 746.9 mm^3, surgeons may consider a more cautious approach, including planning for standard PCNL rather than less invasive alternatives, anticipating longer operative times, or the potential need for staged procedures. Conversely, patients with smaller stone volumes may be more suitable candidates for less invasive strategies. However, this threshold should not be interpreted as an absolute decision-making criterion but rather as a supportive tool to be integrated with other clinical factors such as stone location, anatomy, and surgeon experience. In the present study, the discriminative ability of manual stone volume was found to be modest (AUC: 0.656), with sensitivity and specificity values of approximately 61%. These findings suggest that stone volume alone may not be sufficiently robust as a standalone predictor for clinical decision-making. Rather, its clinical utility may be enhanced when used in combination with established nephrolithometry scoring systems such as S.T.O.N.E. score and Guy's stone score, which incorporate additional anatomical and procedural factors. Integrating stone volume into such multifactorial models may improve risk stratification, surgical planning, and prediction of procedural outcomes. Therefore, we believe that future studies should focus on validating combined predictive models to better define the additive value of stone volume in clinical practice.

When discussing the limitations of the study, we must acknowledge the inherent constraints of retrospective studies. We believe that the design and execution of prospective, randomized studies would contribute more meaningfully to the literature. In such prospective studies, conducting a power analysis for sample size calculation would also help obtain statistically more robust results. The use of different imaging modalities with varying sensitivity for detecting residual fragments may have introduced detection bias. Another limitation is that the postoperative stone-free rate assessment was conducted solely at the first postoperative month. We believe that future studies should incorporate longer-term outcomes, such as evaluations at the third and sixth postoperative months, to provide a more comprehensive clinical perspective. Furthermore, the wide CI associated with the OR for manual stone volume indicates substantial uncertainty around the effect size, likely due to the limited sample size and potential sparsity in the data. Therefore, while the observed association is noteworthy, it should be interpreted cautiously. Additionally, we believe that not performing routinely non-contrast-enhanced CT for postoperative residual fragment evaluation may have led to the oversight of some small residual stones. However, since current guidelines recommend postoperative CT imaging only for symptomatic patients, it was not routinely performed. In addition, preoperative imaging was primarily based on non-contrast computed tomography rather than contrast-enhanced imaging, which may have limited detailed assessment of the collecting system anatomy in selected cases.

CONCLUSIONS

This study demonstrates a significant association between stone volume and stone-free outcomes after mini-PCNL. While volumetric measurements may provide additional information beyond conventional parameters, their predictive performance remains moderate. Therefore, stone volume should be considered as a complementary parameter rather than a standalone predictor in clinical decision-making. Integrating these parameters into clinical practice could enhance risk assessment, guide surgical planning, and improve urolithiasis outcomes.

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Ethical Approval: This study was conducted in accordance

with the Declaration of Helsinki and was approved by the Institutional Ethics Committee (Approval No: 09.2023.1065, Date: September 9, 2024).

Informed Consent: The requirement for informed consent was waived by the Institutional Ethics Committee due to the retrospective nature of the study.

Author Contributions:

- Concept and Design: CAS, TES, EG
- Supervision: CAS, TES, EG
- Data Collection and/or Analysis: HBA, GO, YS
- Analysis and/or Interpretation: EG, TA
- Literature Search: EG, TA
- Writing: EG, TA
- Critical Review: EG, TA, CAS, TES

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RESEARCH ARTICLE

Lower Urinary Tract Symptoms in Women with Hip Osteoarthritis: Associations with Disability and Physical Activity Levels

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Abstract

Objective: To investigate the prevalence of lower urinary tract symptoms (LUTS) in women with hip osteoarthritis (OA) and to examine the relationship between LUTS, disability, and physical activity levels.

Materials and Methods: This cross-sectional study included 40 female patients diagnosed with hip OA. LUTS were assessed using the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) questionnaire. Hip OA–related disability was evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and physical activity levels were measured with the International Physical Activity Questionnaire–Short Form (IPAQ-SF). Participants were categorized as having low, moderate, or high physical activity levels according to IPAQ-SF scores.

Results: The median total BFLUTS score was 12 [0, 24]. Filling symptoms were highly prevalent, including nocturia (75%), urgency (60%), and urinary frequency (52.5%). Urge incontinence was reported by 50% of participants. WOMAC total scores were positively correlated with incontinence ($r = 0.592$, $p < 0.001$), quality of life ($r = 0.518$, $p = 0.001$), and total BFLUTS scores ($r = 0.435$, $p = 0.005$). IPAQ-SF total scores were negatively correlated with incontinence ($r = -0.378$, $p = 0.016$) and total BFLUTS scores ($r = -0.362$, $p = 0.022$). Participants with low physical activity had significantly higher incontinence and total BFLUTS scores ($p < 0.05$).

Conclusion: LUTS are highly prevalent in women with hip OA and are associated with greater functional disability and lower physical activity levels. These findings underscore the importance of the systematic assessment and management of LUTS in this population.

Keywords: disability, hip osteoarthritis, lower urinary tract symptoms, physical activity

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INTRODUCTION

Hip osteoarthritis (OA) is a chronic, non-inflammatory condition characterized by the progressive degeneration of articular cartilage. The global prevalence of hip OA is estimated to be 8.5%, with severe and symptomatic cases reported more frequently among women (1,2). At the global level, OA—particularly when affecting the hip and knee joints—can restrict participation in daily life activities, reduce physical activity levels, and lead to long-term functional impairments that may result in loss of independence (3).

Lower urinary tract symptoms (LUTS) encompass a wide range of clinical manifestations, including storage symptoms (e.g., urinary frequency, nocturia, urgency), voiding symptoms (e.g., weak stream, straining, intermittency), and post-micturition symptoms (e.g., incomplete emptying) (4). Among women, LUTS not only cause physical discomfort but are also associated with significant psychosocial consequences, including social isolation and a notable reduction in quality of life (5).

Movement limitations due to hip OA may hinder individuals from timely responding to the urge to void. This situation may create a predisposition to delayed bladder emptying, urinary incontinence (UI), and exacerbation or onset of other LUTS. Furthermore, physical inactivity secondary to OA may lead to pelvic floor muscle weakness, which in turn may impair bladder control and reduce the efficiency of continence mechanisms (6,7).

Although previous studies have extensively investigated the impact of hip OA on pain, mobility limitation, and disability, the factors associated with LUTS in this population have not yet been fully elucidated. This study aims to evaluate the relationship between LUTS, OA symptom severity, and physical activity levels in women diagnosed with hip OA. The findings are expected to contribute to the development of early screening, diagnostic, and intervention strategies for managing LUTS in women with hip OA.

MATERIAL AND METHODS

Study design and participants

This cross-sectional study was conducted with 40 female patients diagnosed with hip OA who presented to the outpatient clinic of physical medicine and rehabilitation. To be eligible for inclusion, participants had to be able to ambulate with or without walking aids, report activity-related hip pain, have at least one hip fulfilling the diagnostic criteria for hip OA according to the American College of Rheumatology (ACR), and demonstrate a radiological OA grade of ≥ 2 based on the Kellgren–Lawrence classification (8,9). Additionally, participants were required to be over 40 years of age.

Exclusion criteria included a prior diagnosis of urological disorders, recent documented or symptomatic urinary tract infection, history of urogenital malignancy, history of pelvic radiotherapy, history of pelvic surgery, cognitive impairment, significant visual or hearing deficits, stroke sequelae, and Parkinson's disease. Participants were also excluded if they had previously undergone total hip replacement on the symptomatic side, were scheduled for hip arthroplasty, or had a referral for orthopedic consultation regarding total hip replacement. Furthermore, individuals diagnosed with inflammatory arthritic conditions, hip osteonecrosis, or Paget's disease were excluded from the study. Additionally, individuals with knee dysfunction, defined as a history of diagnosed knee OA or previous total knee arthroplasty, were also excluded from the study.

Data Collection

Sociodemographic and clinical data were obtained through face-to-face interviews and physical examinations. The variables collected included age, body mass index (BMI), and time of onset of symptoms (in years).

LUTS were assessed using the Bristol Female Lower Urinary Tract Symptom Questionnaire (BFLUTS), a validated multidimensional tool specifically developed for women. The questionnaire includes 19 items grouped into five subdomains: filling (4 items), voiding (3 items), UI (5 items), sexual life (2 items), and quality of life (5 items). Total scores range from 0 to 71, with higher scores reflecting more severe LUTS and a more negative impact on sexual and overall quality of life. No specific cut-off score has been reported in the literature. In the present study, responses other than "none/never" in the BFLUTS subdomains were considered indicative of the presence of the corresponding symptom at any degree of severity. The Turkish version of the BFLUTS has been validated and shown to be both reliable and culturally appropriate for use in clinical research (10–12).

To evaluate hip osteoarthritis-related symptoms, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was utilized. The WOMAC consists of 24 items divided into three subscales: 5 for pain, 2 for joint stiffness, and 17 for physical function. Each item is scored on a 5-point Likert scale (0 = none, 4 = extreme), with maximum subscale scores of 20 for pain, 8 for stiffness, and 68 for physical function. The maximum possible total WOMAC score is 96, obtained by summing the three subscale scores. Higher scores indicate increased symptom severity and greater disability. The Turkish version of the WOMAC has demonstrated acceptable psychometric properties in previous validation studies (13–15).

To assess physical activity levels, the International Physical Activity Questionnaire-Short Form (IPAQ-SF) was employed. This instrument, consisting of 7 items, evaluates the frequency (days) and duration (minutes) of walking, moderate, and vigorous physical activities, as well as time spent sitting. Total physical activity was calculated using MET-minutes/week values by multiplying the minutes, number of days, and corresponding MET coefficient for each activity: 3.3 METs for walking, 4 METs for moderate activity, and 8 METs for vigorous activity. Based on the total MET score, participants were classified as having low physical activity (<600 MET-min/week), moderate physical activity (600–3000 MET-min/week), or high physical activity (>3000 MET-min/week). The Turkish version of IPAQ-SF has been validated and shown to be reliable (16,17).

Ethics Statement

This study was approved by the non-interventional clinical research ethics committee of İstanbul Medipol University (Approval No: E-10840098-202.3.02-435, Date: January 19, 2026). All procedures complied with the Declaration of Helsinki, and informed consent was obtained from all participants.

Statistical Analysis

Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS) Statistics version 26.0 (IBM Corp., Armonk, NY, USA). The Kolmogorov–Smirnov test was employed to evaluate the normality of continuous variables. Since the majority of the variables did not demonstrate normal distribution, non-parametric tests were preferred for inferential analyses. Descriptive statistics were presented as median (minimum–maximum) for continuous variables, and as number (n) with percentage (%) for categorical variables. Correlations between continuous variables were evaluated using Spearman's correlation analysis. Differences in BFLUTS subscale and total scores according to physical activity levels (low, moderate, and high) were analyzed using the Kruskal–Wallis test. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 40 women diagnosed with hip OA were included in the study (Table 1). The median age of the participants was 62 (45–76) years, and the median BMI was 27.58 (22.24–35.72) kg/m^2. The median duration of symptoms was 4 (1–9) years. According to the Kellgren–Lawrence classification, 42.5% of the participants were grade 2 and 57.5% were grade 3. The median WOMAC total score was 45 (24–71). The median IPAQ-SF total score was 549.5 (0–4407) MET-min/week. Regarding physical activity levels, 52.5% of participants were classified as having low physical activity, 37.5% moderate, and 10% high physical activity (Table 1). The median total BFLUTS score was 12 [0, 24]. The median BFLUTS subscale scores were 2 [0, 12] for filling symptoms, 2 [0, 8] for voiding symptoms, and 3 [0, 12] for incontinence symptoms. The median sexual function score was 0 [0, 4], and the quality of life subscale score was 2 [0, 8] (Table 2). Table 3 presents the frequency distribution of LUTS according to the BFLUTS questionnaire. Filling symptoms were commonly reported: nocturia (>1 time per night) was present in 75% of participants, urgency in 60%, and urinary frequency in 52.5%, while bladder pain was reported by 20%. Among voiding symptoms, intermittency was observed in 35% of participants, hesitancy in 25%, and straining to urinate in 17.5%. Regarding UI, urge incontinence was reported by 50% of participants, frequency of incontinence by 37.5%, stress incontinence by 25%, unpredictable incontinence by 15%, and nocturnal incontinence by 5%. In terms of sexual function, 25% of participants reported that their sex life was negatively affected by urinary symptoms, and 15% reported leakage during intercourse. Concerning quality of life, 35% reported overall interference with life, 32.5% avoided situations where no toilet was available, 27.5% reported affected daily tasks, 25% changed outer clothing, and 22.5% reduced fluid intake (Table 3).

Table 1. Characteristics of the Study Population (n = 40)

Variable	n (%) or median [Min, Max]
Age (years)	62 [45, 76]
BMI (kg/m²)	27.58 [22.24, 35.72]
Education level	
Literate	8 (20%)
Primary	18 (45%)
High school and higher	14 (35%)
Time of symptom onset (years)	4 [1, 9]
KL grade ≥ 2	
Grade 2	17 (42.5%)
Grade 3	23 (57.5%)
WOMAC total	45 [24, 71]
BFLUTS total	12 [0, 24]
IPAQ-SF total MET-min/week	549.5 [0, 4407]
Physical activity level	
Low	21 (52.5%)
Moderate	15 (37.5%)
High	4 (10%)

Abbreviations: BMI, Body Mass Index; KL, Kellgren–Lawrence; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index; BFLUTS, Bristol Female Lower Urinary Tract Symptoms; IPAQ-SF, International Physical Activity Questionnaire–Short Form; MET, Metabolic equivalent.

Table 2. BFLUTS Scores of the Participants

Domain	Median [Min, Max]
Filling	2 [0, 12]
Voiding	2 [0, 8]
Incontinence	3 [0, 12]
Quality of life	2 [0, 8]
Sexual function	0 [0, 4]
Total BFLUTS	12 [0, 24]

Abbreviations: BFLUTS, Bristol Female Lower Urinary Tract Symptoms

Table 3. Frequency of Lower Urinary Tract Symptoms According to BFLUTS

BFLUTS*	n	(%)
Filling symptoms		
Nocturia (>1 time)	30	(75.0)
Urgency	24	(60.0)
Bladder pain	8	(20.0)
Frequency	21	(52.5)
Voiding symptoms		
Hesitancy	10	(25.0)
Strain to urinate	7	(17.5)
Intermittency (stop and start more than once)	14	(35.0)
Incontinence symptoms		
Urge incontinence (leaking before reaching the toilet)	20	(50.0)
Frequency of incontinence	15	(37.5)
Stress incontinence (during physical activity, coughing, etc.)	10	(25.0)
Unpredictable incontinence (without warning)	6	(15.0)
Nocturnal incontinence (leakage during sleep)	2	(5.0)
Sexual function		
Sex life spoiled by urinary symptoms	10	(25.0)
Leaking during intercourse	6	(15.0)
Quality of life		
Change outer clothing	10	(25.0)
Cut down fluid intake	9	(22.5)
Affected daily tasks	11	(27.5)
Avoid situations where no toilet is available	13	(32.5)
Overall interference with life	14	(35.0)

Abbreviations: BFLUTS, Bristol Female Lower Urinary Tract Symptoms.

* Responses for BFLUTS symptoms other than none/never were accepted as presence of the symptom in any degree of severity.

Table 4 shows the correlation analysis between clinical variables and BFLUTS domains. No significant correlations were found between age or duration of symptoms and BFLUTS subscale scores ($p > 0.05$). BMI was positively correlated with filling symptoms ($r = 0.515$, $p = 0.001$). WOMAC total score showed significant positive correlations with incontinence ($r = 0.592$, $p < 0.001$), quality of life ($r = 0.518$, $p = 0.001$), and total BFLUTS score ($r = 0.435$, $p = 0.005$). IPAQ-SF total MET score demonstrated significant negative correlations with incontinence ($r = -0.378$, $p = 0.016$), quality of life ($r = -0.328$, $p = 0.039$), and total BFLUTS score ($r = -0.362$, $p = 0.022$) (Table 4).

Regarding physical activity levels, significant differences were observed in incontinence symptoms ($p = 0.045$) and total BFLUTS score ($p = 0.027$). No statistically significant

differences were found in filling, voiding, sexual function, or quality of life subscale scores across physical activity levels (Table 5).

DISCUSSION

This study showed a high prevalence of LUTS in women with hip OA. The most commonly observed symptoms included filling symptoms (frequency, nocturia, and urgency) and incontinence symptoms (urge incontinence and frequency of incontinence). Among voiding symptoms, intermittency was the most common. Additionally, significant correlations were observed between patients' disability levels, physical activity levels, and certain LUTS domains as well as total LUTS scores. Hip OA is recognized as a major public health concern, as it limits physical activity levels and consequently leads to a substantial decline in quality of life. Functional impairment in hip OA is a multifactorial process, and previous studies have identified several key determinants of reduced physical function, including pain severity, impaired proprioceptive accuracy, and decreased muscle strength (18,19).

Studies investigating the association between physical activity and LUTS in women are limited. In a large population-based prospective study, Maserejian et al. demonstrated that low

Table 4. Correlation Between Clinical Variables and BFLUTS Domains

		Filling	Voiding	Incontinence	QoL	Sexual function	Total BFLUTS
Age (years)	r	0.139	0.097	0.059	-0.064	0.202	0.138
	p	0.391	0.552	0.720	0.696	0.212	0.397
BMI (kg/m²)	r	0.515**	-0.061	-0.191	-0.006	0.174	0.175
	p	**0.001**	0.707	0.238	0.969	0.282	0.281
Time of symptom onset	r	-0.009	-0.077	0.285	0.150	0.186	0.183
	p	0.957	0.637	0.074	0.355	0.249	0.257
WOMAC total	r	-0.079	-0.021	0.592**	0.518**	0.216	0.435**
	p	0.628	0.896	**<0.001**	**0.001**	0.181	**0.005**
IPAQ-SF total (MET-min/week)	r	-0.142	-0.011	-0.378*	-0.328*	-0.019	-0.362*
	p	0.383	0.945	**0.016**	**0.039**	0.907	**0.022**

Abbreviations: QoL, Quality of Life; BFLUTS, Bristol Female Lower Urinary Tract Symptoms; BMI, Body Mass Index; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index; IPAQ-SF, International Physical Activity Questionnaire–Short Form; MET, Metabolic equivalent.

Note: Values of $p < 0.05$ were accepted as significant and are marked in bold.

*p<0.05 , **p<0.01

r : Spearman correlation coefficient

Table 5. Comparison of BFLUTS Scores According to Physical Activity Level (n = 40)

	Physical Activity Level			p value
	Low (n=21)	Moderate (n=15)	High (n=4)	
Filling Symptoms	2 [0, 12]	3 [0, 7]	2 [0, 3]	0.596
Voiding Symptoms	1 [0, 8]	2 [0, 5]	1.5 [0, 2]	0.759
Incontinence Symptoms	3 [0, 12]	3 [0, 6]	0.5 [0, 1]	**0.045**
Quality of Life	3 [0, 8]	3 [1, 4]	1 [0, 2]	0.136
Sexual Function	0 [0, 4]	0 [0, 2]	0 [0, 1]	0.705
BFLUTS Total	12 [0, 24]	11 [5, 17]	5.5 [0, 8]	**0.027**

Abbreviations: BFLUTS, Bristol Female Lower Urinary Tract Symptoms.

Note: Values are presented as Median [Min, Max]. Values of $p < 0.05$ were accepted as significant and are marked in bold.

levels of physical activity were a significant risk factor for the development of LUTS, particularly among women (20). The authors suggested that physical activity may exert a protective effect by reducing resting sympathetic muscle tone, attenuating systemic inflammation, modulating hormonal mechanisms associated with metabolic syndrome, and contributing to long-term weight maintenance. Similarly, Park et al. conducted a large prospective cohort study involving 69,795 participants without LUTS at baseline and demonstrated that both low physical activity levels and prolonged sitting time were independently associated with incident LUTS (21). Notably, in multivariable analyses adjusting for potential confounding factors, the association between sitting time and the risk of LUTS remained significant regardless of physical activity level. These findings suggest that sedentary behavior may play an independent role in the development of LUTS beyond insufficient physical activity alone. The authors proposed several potential mechanisms underlying this association, including endothelial dysfunction, vascular alterations, pelvic ischemia, and inflammatory processes related to prolonged sitting. Furthermore, Alhababi et al. conducted a prospective cohort study and reported that higher levels of physical activity were associated with significantly reduced odds of stress, urgency, and mixed UI among parous middle-aged women (22). In our study**,** a significant correlation was observed between disability scores and total LUTS scores. Furthermore, when participants were stratified according to physical activity levels, women with low physical activity demonstrated significantly higher total BFLUTS scores compared to those with moderate and high physical activity levels. These findings suggest that increasing physical activity may be clinically important in women with hip OA who are at risk of developing LUTS. Structured rehabilitation programs incorporating aerobic exercise, strengthening interventions, and pelvic floor muscle training may provide dual benefits by improving mobility while simultaneously reducing urinary symptom burden. However, prospective studies are needed to determine the effectiveness of targeted physical activity interventions in reducing LUTS severity in this population.

In addition to reduced physical activity levels, hip OA may also influence toileting behaviors. Pain, joint stiffness, and fear of movement may hinder timely access to the toilet, leading patients to delay voiding. Accumulating evidence suggests that repeated delayed voiding may result in increased intravesical pressure and impaired sphincter relaxation, which may ultimately contribute to bladder dysfunction and the development of LUTS (23,24). In our study, according to the BFLUTS assessment, the most frequently reported symptoms were categorized under the storage and incontinence domains, with nocturia (75%), urgency (60%), and increased daytime frequency (52.5%) being the most prevalent. Among incontinence symptoms, urge incontinence was the most common (50%). Furthermore, incontinence scores were positively and significantly correlated with disability scores, and women in the low physical activity group demonstrated significantly higher incontinence scores compared to those with moderate and high physical activity levels. Several studies in the literature have demonstrated a significant association between OA and UI (25–27). In a study including 247 patients, nearly half of the individuals with OA reported difficulties with urinary control; these individuals exhibited higher levels of disability and required more time to reach the toilet within their home environment (25). Similarly, a recent study reported a 67% prevalence of UI among middle-aged and older women with hip and knee OA, with urgency UI being one of the most frequently observed subtypes; older age, morbid obesity, and reduced physical activity were identified as independent risk factors (26). In another large-scale investigation (n = 1,584), arthritis was found to be associated with both stress and urgency types of UI, and this relationship was suggested to be related to mobility limitations and reduced ability to undress promptly (27). Taken together, these findings highlight the need for a multidisciplinary clinical approach in women with hip OA presenting with urinary symptoms. Interventions focusing on pain management, functional rehabilitation, and mobility enhancement should be prioritized. Additionally, strategies aimed at reducing sedentary behavior and promoting timely toileting habits may contribute to preventing symptom progression.

Another important finding of our study was the association between BMI and LUTS. BMI demonstrated a significant positive correlation particularly with storage symptoms. Obesity has been identified as a major, modifiable risk factor for urinary incontinence and LUTS in women (28). Increased BMI may elevate intra-abdominal pressure, thereby compromising pelvic floor support and adversely affecting bladder function (29). In women with hip OA, excess

body weight may further exacerbate mobility limitations, potentially reinforcing the risk of urinary symptoms. Therefore, weight control strategies, including lifestyle modification and structured weight reduction programs, are important components in the management of women with hip OA and concomitant LUTS.

This study has several limitations. First, the cross-sectional design precludes causal inference. Additionally, the absence of an age-matched non-osteoarthritic control group limits the generalizability of the findings and restricts direct comparisons with healthy individuals. The relatively small sample size may have reduced the external validity of the results. Furthermore, the assessment of LUTS and physical activity levels using self-reported measures may have introduced potential reporting bias. In addition, menopausal status and parity-related variables were not evaluated in this study. As both factors may influence the prevalence and severity of LUTS in women, their omission should be considered when interpreting the present findings. Therefore, future studies with larger sample sizes, appropriately matched control groups, and longitudinal designs are warranted to further validate and expand upon these findings.

CONCLUSIONS

This study demonstrates that LUTS are highly prevalent among women with hip OA and may be associated with greater disability and lower levels of physical activity. These findings underscore the clinical importance of routinely assessing LUTS as part of the comprehensive evaluation of patients with hip OA. Furthermore, structured rehabilitation programs aimed at increasing physical activity may contribute not only to improvements in mobility but also to a potential reduction in urinary symptom burden.

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Conflict of Interest: The authors declare that they have no conflicts of interest related to this study.

Informed Consent: Written informed consent was obtained from all participants prior to their inclusion in the study.

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Ethical Approval: The study was approved by the non-interventional clinical research ethics committee of İstanbul Medipol University (Approval No: E-10840098-202.3.02-435, Date: January 19, 2026). All procedures performed in this study were conducted in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments.

Author Contributions

- Concept and Design: HBM, AR
- Supervision: AR, IK
- Data Collection and/or Analysis: HBM
- Analysis and/or Interpretation: HBM, AR
- Literature Search: HBM, IK
- Writing: HBM
- Critical Review: AR, IK

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RESEARCH ARTICLE

Same-Session Surgery for Bilateral Ureteral Stones in Adult Patients: Safety, Efficacy, and Clinical Outcomes

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Abstract

Objective: To evaluate the efficacy, safety, and impact on renal function of same-session bilateral ureteroscopy and laser lithotripsy in patients diagnosed with simultaneous bilateral ureteral stones.

Materials and Methods: The data of 80 primary patients who underwent bilateral ureteroscopy for simultaneous bilateral ureteral stones between December 2015 and December 2025 were retrospectively reviewed. Thin-tipped semirigid ureteroscope and a Holmium:YAG laser (1J/10Hz) were used in all procedures. Surgical success (stone-free) was defined as complete clearance or the presence of fragments <4 mm on imaging performed at the 4th postoperative week.

Results: The mean age of the 80 patients included in the study was 43.6 ± 15.4 years, the mean total stone burden was 19.9 ± 5.3 mm, and the median operative time was 60.0 (IQR: 48.75–75.0) minutes. The median hospital stay was 2.0 (IQR: 2.0–4.0) days. The stone-free rate (SFR) after the first session was 88.75%, while the final SFR reached 96.25% after additional interventions. Serum creatinine levels showed a significant decrease from a preoperative median of 1.16 mg/dL to a postoperative level of 0.9 mg/dL ($p < 0.001$). The overall complication rate was 12.5% ($n = 10$), all of which were Clavien-Dindo Grade I-II (minor). No major complications such as ureteral perforation or avulsion were observed in our series.

Conclusion: Same-session bilateral ureteroscopy is a safe and effective method for the treatment of simultaneous bilateral ureteral stones, offering high success rates, a low morbidity profile, and rapid improvement in renal function. With appropriate patient selection, bilateral ureteroscopy should be considered a standard approach in bilateral stone disease.

Keywords: bilateral ureteral stone, bilateral ureteroscopy, laser lithotripsy, stone-free rate, complication

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INTRODUCTION

Urolithiasis is accepted as an important public health problem due to its worldwide prevalence and increasing incidence (1). It is known that in approximately 15% of patients diagnosed with urinary system stone disease, both renal units are affected at the same time (2). Within these presentations, simultaneous bilateral ureteral stones are a rarer and clinically more critical condition, accounting for approximately 1% of all stone patients(3). Bilateral ureteral stones are considered a urological emergency due to the risk of potentially leading to anuria, acute kidney injury, and severe electrolyte imbalances.

In traditional urology practice, the management of bilateral ureteral stones has generally been implemented in the form of staged procedures, with the concern that exposing both ureters to surgical trauma in the same session could put renal functions at risk and create bilateral ureteral edema/injury(4). However, this staged approach leads to the patient receiving anesthesia multiple times, prolongation of the total hospital stay, increased loss of workforce, and rising treatment costs (5,6).

In the last two decades, revolutionary developments in endoscopic equipment technology—particularly miniaturized ureteroscopes and the widespread use of laser technology—have fundamentally changed the surgical treatment of ureteral stones(3,5). These technological advancements and increasing surgical experience have allowed the same-session bilateral ureteroscopy (B-URS) procedure to be offered as a safe and effective alternative in selected case groups(5,6). American Urological Association (AUA) and European Association of Urology (EAU) guidelines also currently recommend same-session bilateral intervention as a treatment option in appropriate patients (7,8).

Comprehensive meta-analyses in the literature have revealed that bilateral URS provides high stone-free rates such as 96% in the distal ureter, 85% in the middle ureter, and 72% in the proximal ureter, and that most complications remain at a minor (Clavien I-II) level(9). Relieving the obstruction through urgent bilateral ureteroscopic intervention, especially in bilateral ureteral stone patients presenting with acute renal failure, plays a critical role in the restoration of kidney functions and the rapid decline of serum creatinine levels (10).

The aim of this study is to evaluate the operative results, success rates according to anatomical localization, and the level of improvement in renal functions of our 80-patient series who underwent same-session single-stage URS and laser lithotripsy solely for simultaneous bilateral ureteral stones, in light of current literature data.

MATERIAL AND METHODS

In this study, the data of 80 patients who underwent same-session bilateral ureteroscopy and laser lithotripsy with a diagnosis of simultaneous bilateral ureteral stones between December 2015 and December 2025 at the urology clinic of a tertiary care training and research hospital were retrospectively reviewed. This study was approved by the Ethics Committee of Harran University (Desicion Number: HRÜ/25.08.09, Date: April 28, 2025) was obtained for the study. Only adult patients with obstructive or symptomatic stones in both ureters were included in the study. Patients with unilateral ureteral stones, those who underwent concurrent retrograde intrarenal surgery (RIRS), those who underwent ureteroscopy for non-stone reasons, those with a solitary kidney, and pediatric patients were excluded from the study.

The preoperative complete blood count, serum biochemistry (especially serum creatinine levels), urinalysis, and urine culture results of all patients were recorded. Patients with positive preoperative cultures received appropriate targeted antibiotic therapy according to antibiogram results until a negative culture was obtained before surgery. For patients with negative cultures, prophylactic antibiotics were administered intravenously 30–60 minutes before anesthesia induction. Stone localization, size, and burden were determined using non-contrast abdomino-pelvic computed tomography (CT). Total stone burden was calculated as the sum of the widest diameters of the stones in both ureters. For patients with multiple stones in the same ureter, the total stone burden was calculated by summing the largest diameters of each individual stone as recorded on preoperative CT. All procedures were performed by a single experienced endourology team to maintain technical consistency. All procedures were performed under general or spinal anesthesia, in the dorsal lithotomy position, and under fluoroscopic guidance. Surgery was generally initiated on the side with the lower stone burden or the symptomatic side.

A 7–9.5 Fr semirigid ureteroscope (Karl Storz, Knittlingen, Germany) was used for distal ureteral stones; flexible ureteroscopes and ureteral access sheaths were preferred for proximal stones when needed. Stone fragmentation was performed using a Holmium:YAG laser device (Sphinx Jr 30; LISA Laser Products GmbH, Katlenburg-Lindau, Germany) with 200–365 µm laser fibers using "dusting" (0.5–0.8 J / 15–20 Hz) or "fragmenting" (1.0–1.5 J / 5–10 Hz) techniques. In cases of proximal stone migration (push-back) to the kidney, we either performed concurrent RIRS in the same session if available or placed a DJ stent for a later staged procedure. At the end of the operation, a ureteral Double-J (DJ) stent was placed in the patients. These placed stents were routinely removed between the 2nd and 4th postoperative weeks. Postoperative serum creatinine levels of the patients were checked and compared with preoperative values. Complications were categorized according to the Clavien-Dindo classification system.

Stone-free status (SFR) was evaluated 4 weeks after the operation using CT, ultrasonography, or plain abdominal radiography (KUB). The absence of residual fragments on CT or the presence of asymptomatic fragments <4 mm in size was considered success (stone-free). Data analysis was performed using SPSS (Statistical Package for Social Sciences) version 25.0 software. The normality of continuous variables was evaluated using the Shapiro-Wilk test. Continuous variables with a normal distribution were expressed as mean ± standard deviation (SD) and compared using the paired sample t-test. Variables with a non-normal distribution were expressed as median (interquartile range [IQR]) and compared using the Wilcoxon signed-rank test. Categorical variables were presented as numbers and percentages and analyzed using the Chi-square or Fisher's exact test. P-value of <0.05 was considered statistically significant.

RESULTS

The study included 80 patients, consisting of 57 (71.3%) males and 23 (28.7%) females; the mean age of the patients was determined to be 43.6 ± 15.4 years. While the median preoperative serum creatinine level was 1.16 (IQR: 0.9–1.95) mg/dL., 5 patients (6.25%) were found to present with anuria or oliguria at the time of admission. The mean total bilateral stone burden was calculated as 19.9 ± 5.3 mm (range 3.2–26 mm), and it was observed that the stone burden was 20 mm or more in 32.5% (n = 26) of the patients. When the anatomical localization of the stones was examined, the largest group consisted of bilateral proximal stones at 27.5% (n = 22); this was followed by proximal+middle ureter location at 23.75% (n = 19). The demographic characteristics and stone features of the patients are detailed in Table 1.

Table 1. Patient Demographic Data and Stone Characteristics (n = 80)

Variable	Value
Gender (Male/Female)	57 (71.3%) / 23 (28.7%)
Age (Years, Mean ± SD)	43.6 ± 15.4
Preoperative Creatinine (mg/dL, Median)	1.16 (IQR: 0.9–1.95)
Bilateral Mean Stone Size (mm)	19.9 ± 5.3
Total Stone Burden (Patient-Based)	
< 20 mm	54 (67.5%)
≥ 20 mm	26 (32.5%)
Stone Localization Distribution (n, %)	
Proximal + Proximal	22 (27.5%)
Proximal + Middle	19 (23.75%)
Proximal + Distal	16 (20.0%)
Middle + Middle	6 (7.5%)
Middle + Distal	6 (7.5%)
Distal + Distal	11 (13.75%)

The median operative time was recorded as 60.0 (IQR: 48.75–75.0) minutes (range 15–130 min).The median hospital stay was 2.0 (IQR: 2.0–4.0) days (range 1–15 days). While the stone-free rate (SFR) after the first session was 88.75% (n = 71), the total stone-free rate reached 96.25% (n = 77) after additional interventions (URS/RIRS or SWL) for residual stones. In the localization-based analysis, 100% success was achieved for distal ureteral stones, while it was observed that the first-session success rate was lower for proximal stones. Following successful surgical decompression of the bilateral obstruction, the median postoperative serum creatinine level significantly decreased to 0.9 (IQR: 0.8–1.3) mg/dL, with a median change of -0.20 (IQR: -0.55 to -0.07) mg/dL ($p < 0.001$). Operative and clinical results are presented in Table 2.

Table 2. Operative and Clinical Results (n = 80)

Variable	Value
Operative Time (min, Median)	60.0 (IQR: 48.75–75.0)
Length of hospital stay (days, Median)	2.0 (IQR: 2.0–4.0)
Postoperative Creatinine (mg/dL, Median)	0.9 (IQR: 0.8–1.3)
Change in Serum Creatinine (mg/dL)	-0.20 (IQR: -0.55 to -0.07) ($p < 0.001$)
Overall Complication Rate (n, %)	10 (12.5%)
Clavien Grade I	5 (6.25%)
Clavien Grade II	5 (6.25%)
Stone-free Rate (SFR) – First Session	71 (88.75%)
Stone-free Rate (SFR) – Total	77 (96.25%)

When the complication analysis was performed according to the Clavien-Dindo classification, the overall complication rate was found to be 12.5% (n = 10). All complications were minor; Grade I (stent pain, mild hematuria) was observed in 5 patients (6.25%) and Grade II (febrile urinary tract infection resolving with medical treatment) was observed in 5 patients (6.25%). No Grade III or higher major complications (ureteral perforation, avulsion, or conversion to open surgery) were detected in our series (Figure 1).

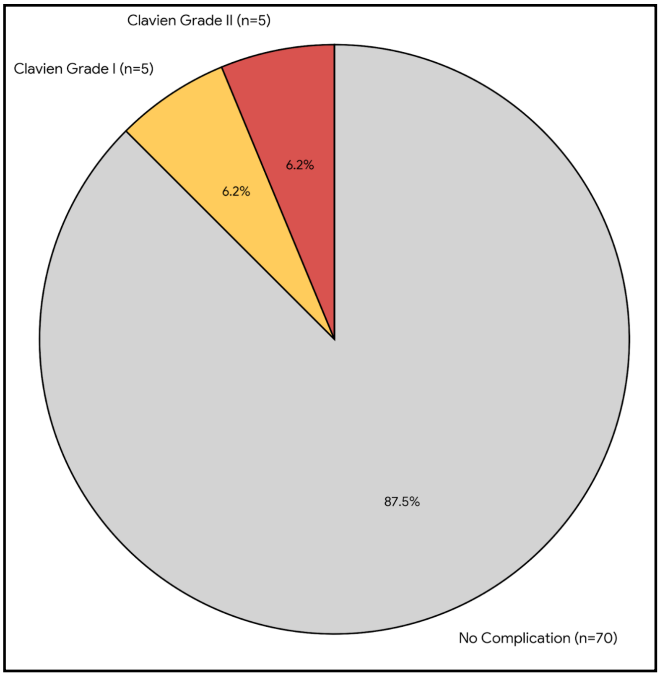

Figure 1. Postoperative Complications According to Clavien-Dindo Classification in Patients (n = 80).

DISCUSSION

Simultaneous bilateral ureteral stones, although rare (1–3%) among urinary stone diseases, represent a clinically critical condition that can present with anuria and acute renal failure. Historically, it was thought that surgical intervention to both sides in these cases carried risks of bilateral ureteral edema and loss of renal function; however, modern endourological equipment and increasing surgical experience have shown that same-session bilateral ureteroscopy can be performed safely(4,5). Our series of 80 patients is one of the largest single-center B-URS studies in the literature, proving both the high success and safety of the procedure.

Comprehensive meta-analyses in the literature report total stone-free rates (SFR) after B-URS between 87% and 95%(9,11). The total stone-free rate of 96.25% obtained in our series is at the upper limit of these data. One of the most important factors affecting success is the anatomical localization of the stone in the ureter. In the meta-analysis performed by Ge et al., SFR was 96% in the distal ureter, while this rate decreased to 72% for stones located proximally (9). Despite a high rate of bilateral proximal stones (27.5%) in our series, high success rates consistent with the literature were achieved using laser lithotripsy and appropriate surgical techniques.

The main concern regarding bilateral ureteroscopy is the risk of major surgical complications. Although complication rates up to 29% were reported in past series using large-caliber (>10 Fr) devices (12), this rate has decreased to 10–17% in current literature (4,9). The 12.5% complication rate observed in our series is parallel with the safety data (15–16%) in the CROES Global study presented by Pace et al. (13). Most importantly, the absence of major (Grade III-IV) complications, such as ureteral perforation or avulsion in our series, confirms that B-URS is as safe as unilateral interventions in selected cases.

The literature reports that rapid relief of obstruction preserves renal functions and normalizes creatinine levels. In our series, the significant decrease of -0.20 mg/dL ($p < 0.001$) from a preoperative creatinine level of 1.16 mg/dL demonstrates that B-URS is not only a stone-clearing procedure but also a renal function-saving one.

The greatest advantage of B-URS compared to staged surgery is that the patient is cleared of the stone burden in a single anesthesia session and the total hospital stay is reduced. In addition to reducing operative burden and hospitalization, same-session treatment eliminates the need for a second anesthetic exposure and improves patient satisfaction by avoiding repeated hospital admissions and cumulative stent-related symptoms. Fiscus et al. demonstrated that single-session bilateral surgery significantly reduces operative time and costs (14). The median operative time of 60 minutes in our series is consistent with the 45–100 minute range reported in meta-analyses (9). This efficiency contributes to reducing the burden on the healthcare system, particularly in high-volume centers.

The main limitations of our study are its retrospective design, the reflection of a single-center experience, and the relatively small patient population. Additionally, the lack of direct comparison between our B-URS results and staged bilateral procedures is another limitation. The lack of routine computed tomography for evaluating stone-free rates in every case and the inability to perform stone composition analysis and stone density (HU) measurements in all patients limit the detailed analysis of our results. Finally, longer-term follow-up data are needed to detect rare late-term complications such as ureteral stricture.

CONCLUSION

Same-session single-stage B-URS is a safe and effective treatment method for the management of simultaneous bilateral ureteral stones, offering low complication rates, high stone-free success, and rapid improvement in renal functions. In accordance with modern surgical guidelines, with appropriate patient selection and an experienced surgical team, B-URS can be considered a standard approach for bilateral stone disease.

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Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval: This study was approved by the Ethics Committee of Harran University (Desicion Number: HRÜ/25.08.09, Date: April 28, 2025).

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CASE REPORT

High-Grade Urothelial Carcinoma with Sarcomatoid Differentiation: A Rare Case Presenting with Colonic Metastasis

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Abstract

Objective: Urothelial carcinoma with sarcomatoid differentiation is an uncommon but highly aggressive variant of bladder cancer, often diagnosed at advanced stages and associated with poor outcomes. Colonic metastasis from bladder carcinoma is extremely rare, making this case noteworthy.

Case presentation: A 68-year-old male presented with macroscopic hematuria and dysuria. Imaging revealed a bladder mass invading the perivesical tissue. Transurethral biopsy confirmed high-grade urothelial carcinoma with sarcomatoid differentiation. During preoperative evaluation, colonoscopy revealed an ulcerated mass in the ascending colon, confirmed as metastatic carcinoma with similar sarcomatoid features. The patient underwent radical cystectomy and right hemicolectomy. Despite surgery and planned chemotherapy, the patient died postoperatively due to clinical deterioration.

Conclusions: This case underscores the aggressive nature of sarcomatoid urothelial carcinoma and highlights the potential for rare metastatic patterns, emphasizing the need for multidisciplinary management in atypical presentations.

Keywords: bladder cancer, colonic metastasis, hemicolectomy, radical cystectomy, sarcomatoid tumor, urothelial carcinoma

INTRODUCTION

Bladder cancers are the most common malignancies of the urinary system. Histologically, the most prevalent type is urothelial carcinoma. The sarcomatoid variant is a rare and highly aggressive subtype characterized by epithelial-mesenchymal transition features (1). According to the literature, this variant is frequently associated with advanced-stage diagnosis, early metastasis, and poor survival outcomes (2). In this case, we report the clinical course of a patient with high-grade urothelial carcinoma exhibiting sarcomatoid differentiation, accompanied by the rare occurrence of colonic metastasis.

CASE PRESENTATION

Our patient was a 68-year-old male who presented to our outpatient clinic with complaints of painful macroscopic

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hematuria and dysuria. Physical examination revealed suprapubic tenderness, with no other systemic findings. Pelvic computed tomography (CT) and magnetic resonance imaging (MRI) revealed a solid mass lesion measuring approximately 45 × 35 mm, involving the posterior wall, right lateral wall, dome, and base of the bladder, with invasion into the perivesical adipose tissue (Figure 1).

Histopathological analysis of the transurethral resection specimen confirmed the diagnosis of high-grade, poorly differentiated invasive urothelial carcinoma with sarcomatoid features. Fluorodeoxyglucose positron emission tomography (FDG-PET) revealed no evidence of distant organ or regional lymph node metastasis. During the preoperative evaluation for cystectomy, the patient developed melena. Colonoscopy was performed, revealing an ulcerated, vegetative mass in the ascending colon (Figure 2).

A biopsy was obtained from the lesion, and histopathological examination revealed findings consistent with metastatic carcinoma containing poorly differentiated sarcomatoid features. These findings were similar to those observed in the pathology specimen obtained after transurethral resection. The patient underwent simultaneous radical cystectomy and right hemicolectomy in collaboration with the general surgery team (Figure 3).

No perioperative complications were observed. Pathological evaluation revealed that the tumor was macroscopically infiltrative into the perivesical adipose tissue (pT3b). Invasion of the lamina propria and muscularis propria was also noted. Lymphovascular and perineural invasion were present, along with tumor necrosis and sarcomatoid differentiation. Immunohistochemical staining showed GATA-3 positivity and focal CK7 positivity. GATA-3 positivity strongly supports a urothelial origin of the tumor and helps to rule out the possibility of a primary colonic neoplasm. Right pelvic lymph node dissection revealed one metastatic lymph node out of seven (1/7). A total of 14 lymph nodes obtained from the left pelvic and paracaval regions were evaluated as reactive. In

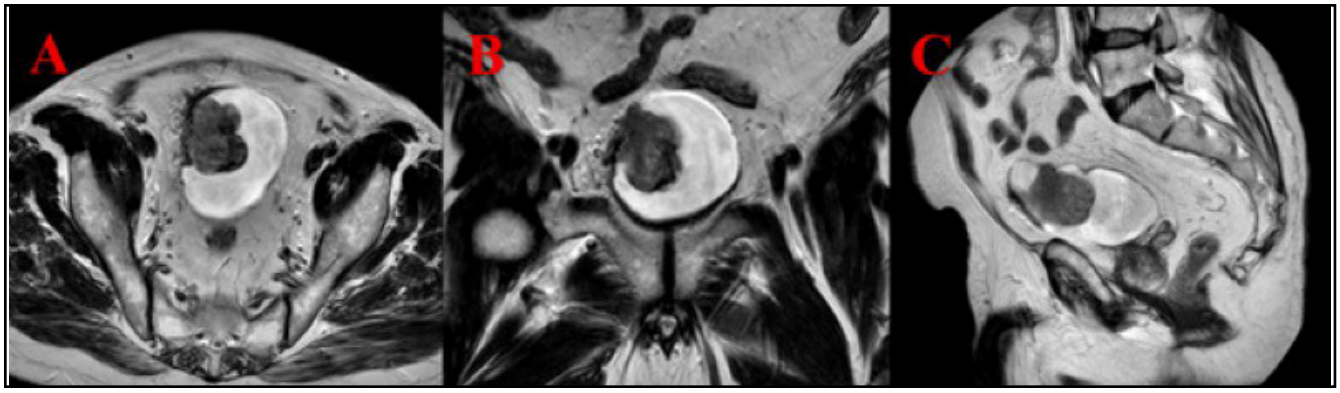

Figure 1. Contrast-enhanced MRI images of the bladder mass prior to TUR resection; axial (A), coronal (B), and sagittal (C) sections.

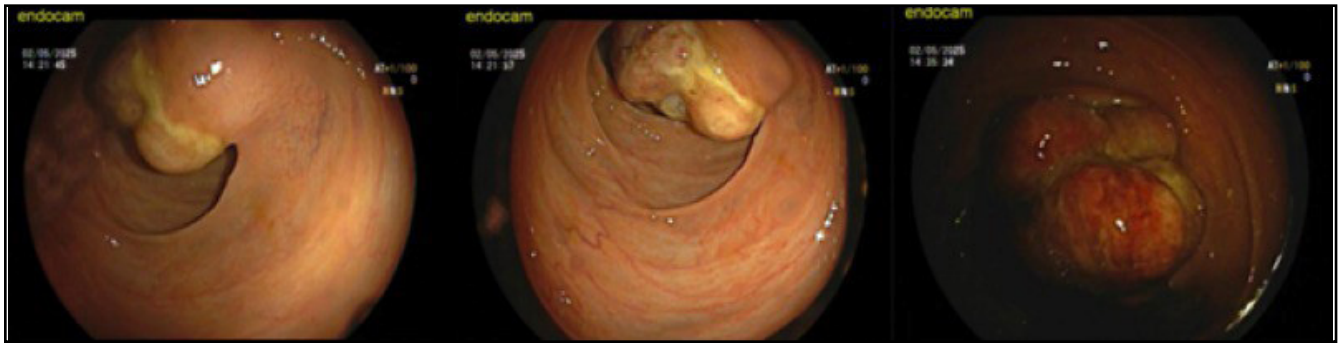

Figure 2. Endoscopic image of the ulcerative vegetative mass observed during colonoscopy.

the right hemicolectomy specimen, while no adjacent organ invasion from the primary bladder tumor was observed, metastatic foci of carcinoma were noted infiltrating the colonic wall and located within the mesocolon. Although adjuvant chemotherapy was planned during follow-up, the patient developed clinical deterioration and was transferred to the intensive care unit for close monitoring. Despite appropriate management and supportive care, the patient died on postoperative day 28. Written informed consent was obtained from the patient for publication of this case report and accompanying images.

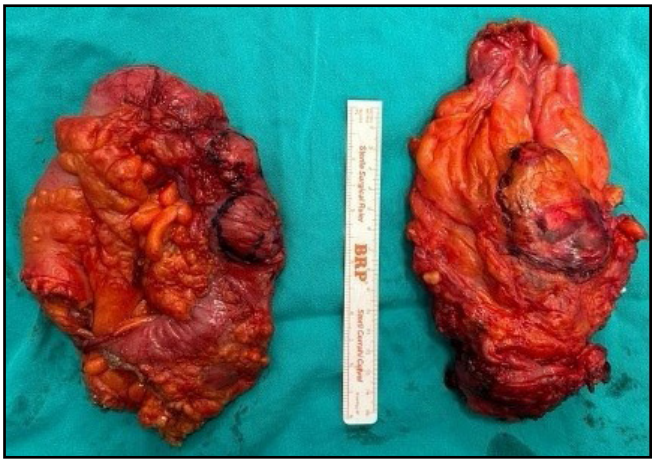

Figure 3. Macroscopic image of the right hemicolectomy specimen removed during surgery. Suspected invasion of the bladder tumor was not observed macroscopically.

DISCUSSION

Urothelial carcinomas, which comprise nearly 90% of bladder tumors, usually appear as superficial or muscle-invasive types; however, rare histological variants such as those with sarcomatoid differentiation tend to follow a significantly more aggressive clinical trajectory (3). Sarcomatoid urothelial carcinomas are biphasic tumors that contain both epithelial and mesenchymal components (4). These tumors are frequently high-grade, tend to invade deep tissues, and are prone to early metastasis (5). Reported incidence in the literature ranges from 0.3% to 1%, with most cases being diagnosed at an advanced stage (pT3–pT4) (2). Variant histology has been reported as an independent factor negatively affecting pathological outcomes and survival in urothelial carcinoma; sarcomatoid differentiation is considered one of the most aggressive subtypes (1). Tumors containing a sarcomatoid component often exhibit adverse histopathological features, such as tumor necrosis, perineural invasion, and lymphovascular invasion, all of which negatively impact overall survival. Studies have shown that this variant is associated with significantly shorter survival compared to conventional urothelial carcinomas (6). The frequent detection of widespread metastasis or locally advanced invasion at the time of diagnosis further underscores the biologically aggressive nature of these tumors. While intravesical therapies remain essential for non–muscle invasive bladder tumors, especially in the setting of BCG failure, where combination strategies such as BCG plus interferon-α2b have been reported, sarcomatoid differentiation typically presents with advanced disease that necessitates radical surgical management. In the present case, the tumor demonstrated perivesical adipose tissue invasion beyond the bladder (pT3b), metastasis in the right pelvic lymph node, and, notably, a rare colonic metastasis. While urothelial carcinomas most commonly metastasize to the liver, lungs, and bones, involvement of the gastrointestinal system is exceedingly rare (7). In particular, reports of invasion into the colon and the presence of metastatic foci within the mesocolon are limited to a small number of cases in the literature. A review of the existing literature suggests that colonic involvement in sarcomatoid urothelial carcinoma has been described in only a limited number of case reports. In one of those reports, a patient who had previously undergone partial cystectomy presented to the emergency department three months postoperatively with abdominal pain, and advanced imaging revealed a mass in the transverse colon. Surgical resection and subsequent pathological analysis identified urothelial carcinoma with sarcomatoid differentiation (8). In another case report, the patient with bladder urothelial carcinoma was found to have an isolated gastric metastasis (9).

The lesion mimicked a primary gastric tumor, highlighting the importance of considering metastatic disease in patients with atypical gastrointestinal findings (1). These findings suggest that the sarcomatoid component may enable metastasis to atypical organs via lymphatic or hematogenous spread.

This case contributes to the literature by highlighting the potential for atypical dissemination patterns in bladder tumors and underlining the worse prognosis associated with the sarcomatoid variant.

CONCLUSIONS

These cases point out that gastrointestinal involvement, including isolated colonic metastasis, can offer further understanding of the behavior and clinical progression of bladder tumors with sarcomatoid differentiation. It emphasizes the requirement for clinicians to adopt a more comprehensive and vigilant approach during both diagnosis and treatment of such aggressive variants. In particular, close postoperative monitoring is of critical importance for the early detection and management of complications.

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Author Contributions:

- **Concept and Design:** CS, ON
- **Supervision:** HO, HLC
- **Data Collection and/or Analysis:** CS, ON
- **Analysis and/or Interpretation:** CS, ON, HO
- **Literature Search:** CS, ON
- **Writing:** CS, ON
- **Critical Review:** HO, HLC

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CASE REPORT

Genital Self-Mutilation and Regret in Gender Dysphoria: A Case Report

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Abstract

Genital self-mutilation is a rare but serious urological surgical emergency; it is most often associated with psychosis, but it may also occur in the context of gender dysphoria in the absence of psychosis. A 23-year-old male, at age 20, amputated his penis and testes following online encouragement to pursue a female identity. Postoperatively, he experienced regret, distress, and requested reconstructive surgery to restore his male identity. His history included childhood bullying, obsessive–compulsive traits, and late-onset gender dysphoria, but no psychotic illness. This case highlights the interplay between gender dysphoria, psychosocial vulnerability, irreversible self-harm, and urgent urological management. It underscores detransition risk in rapid-onset gender dysphoria and the necessity of psychiatric evaluation, extended follow-up, and ethical consideration before irreversible genital surgery.

Keywords: gender dysphoria, detransition, genital self-mutilation, regret, urgent urology

INTRODUCTION

Genital self-mutilation (GSM) is a rare but serious medical emergency that usually causes irreversible anatomical loss. Because of the rich vascular supply and microbial flora, injuries may lead to life-threatening complications and long-term functional and psychosexual impairment (1). Thus, GSM requires urgent urological surgery and mandates multidisciplinary evaluation for optimal management.

Most reported cases are linked to schizophrenia or mood disorders (2,3). However, GSM without psychosis has been described in relation to gender dysphoria (GD), obsessive-compulsive symptoms, dissociation, or intense psychosocial stress such as bullying (4,5). Rapid-onset GD is associated with higher detransition rates and regret after gender-affirming interventions or self-inflicted changes (6,7). Ethical and legal implications must therefore be considered when evaluating surgical requests.

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We present a case of GSM in a 23-year-old male who amputated his genitalia at 20 to become female, later regretted the act, and sought penile reconstruction and testicular transplantation. The case is discussed in relation to rapid-onset GD, detransition, and ethical concerns.

CASE REPORT

A 23-year-old male presented requesting penile and testicular transplantation. In November 2022, at the age of 20, he amputated his penis and testes with a kitchen knife due to distress related to his genitalia. He was found unconscious and bleeding by his sister and underwent emergency surgery. The patient was brought to the emergency department within one hour of the amputation, resulting in a near-total penile amputation, with approximately 1–1.5 cm of proximal stump remaining. Since the amputated penis had been discarded in the toilet, reanastomosis or revascularization could not be performed. Necrotic tissue was debrided, and the scrotum was closed. He was hospitalized for three months. Urethral stricture had not developed, and urinary continence was preserved. There were no complaints regarding voiding function; urinary flow was adequate, and ultrasonographic follow-up demonstrated complete bladder emptying.

His psychiatric history revealed obsessive-compulsive disorder at age 10, for which he was followed for two years due to excessive handwashing and prolonged bathroom use. Since elementary school, he had been subjected to persistent bullying with phrases such as "you act like a girl" and "don't you have a penis?", and had been physically assaulted, including repeated kicks to the genital area. Bullying continued into high school and later in public settings. At age 17, he was physically assaulted on a bus following humiliating remarks. During adolescence, he told his mother that he felt "more suited to be a girl" and verbalized a desire to become female. He was evaluated at Hacettepe University Faculty of Medicine Psychiatry Clinic, where gender transition was recommended; however, the process had not yet been initiated. Due to lack of access to detailed medical records and discharge summaries, the duration of follow-up and the specific psychiatric assessments and recommendations from that period remain unknown.

Developmental history revealed playing with toy cars and trains, predominantly with male peers, and engagement in football and volleyball. During puberty, he reported satisfaction with male secondary sexual characteristics, enjoyment of masturbation, and sexual attraction to women. Approximately 5–6 months before the incident, he began expressing intentions to amputate his penis, with increasing frequency in the two months preceding the act. The night before the event, he again verbalized this intention. He communicated online with individuals abroad who encouraged the act and provided instructions.

The self-mutilation behavior was interpreted as primarily identity-related, occurring in the context of persistent gender dysphoria. The patient reported that the act was motivated by the belief that genital removal would align his body with a female identity, rather than being an impulsive, psychotic, or purely self-punitive act. No evidence of acute psychosis or dissociative state was identified at the time of evaluation.

Following self-injury, upon regaining consciousness, he reported profound regret, re-affirmed his male identity, and expressed a strong desire to regain his sexual organs to resume life in his male identity.

On mental status examination at presentation to our clinic, he appeared his stated age, was cooperative and well-groomed, with a masculine appearance and facial hair. No abnormalities in thought content, perception, or reality testing were identified. No acute psychiatric intervention was required at that time.

During follow-up after orchiectomy, he was started on intramuscular testosterone therapy due to suspected muscle and bone mass loss, administered every three weeks. Imaging studies showed no abnormalities, and biochemical parameters were within normal limits.

DISCUSSION

This case illustrates GSM in a young man without psychosis, highlighting rapid-onset GD and detransition risks. GSM should be considered not only surgically and psychiatrically but also ethically.

In a review of 173 GSM cases, Veeder and Leo (8) reported schizophrenia (49%), substance use (18.5%), personality disorders (15.9%), and GD (15.3%) as major associations.

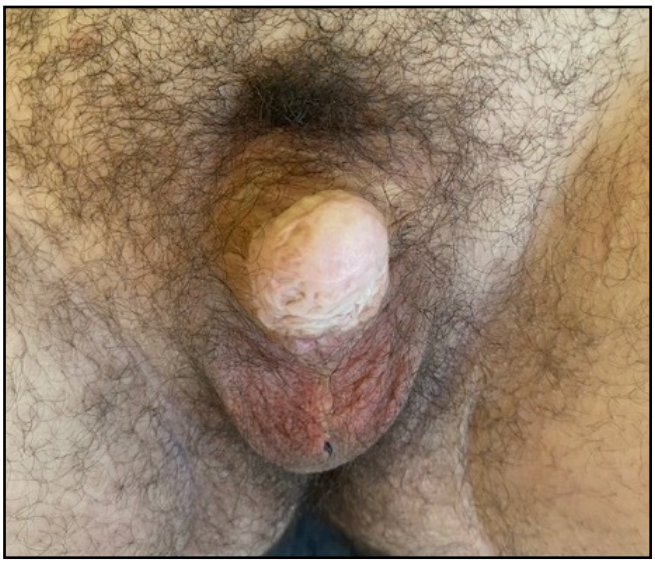

Figure 1. Appearance of penile stump 4 years after GSM: scarred, epithelialized glans, meatus at stump tip.

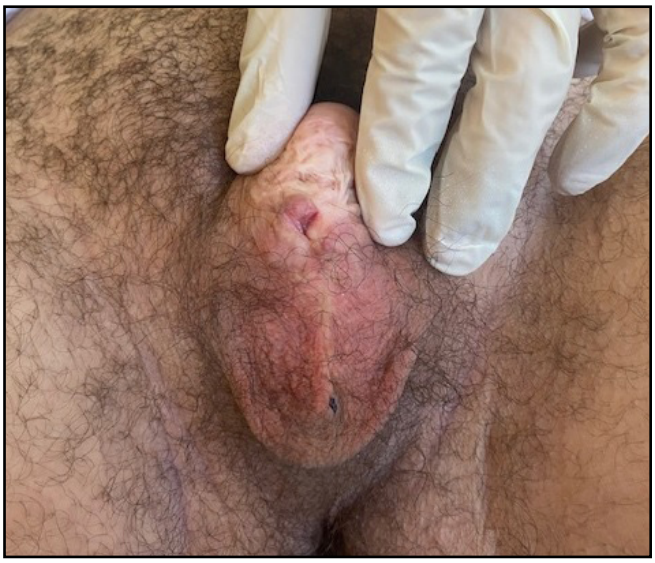

Figure 2. Ventral view showing penoscrotal region and absent testes.

Thus, GD, though less common, is a significant risk factor. Our patient experienced childhood bullying, expressed female identity wishes in adolescence, amputated his genitalia, then regretted it and sought male identity restoration.

Rapid-onset gender dysphoria (ROGD) is not a diagnostic entity in DSM classification and remains a controversial and hypothesized construct. It has been proposed to describe cases in which gender dysphoria emerges or intensifies during adolescence in association with psychosocial and environmental influences. However, in the present case, the patient reported gender-related concerns extending back to adolescence, which limits the applicability of a strict ROGD framework. Therefore, this case is more appropriately interpreted within the broader spectrum of persistent gender dysphoria with fluctuating intensity rather than a discrete rapid-onset subtype.

Detransition and regret following gender-related interventions or self-directed body modification have been reported in the literature, although reported rates vary significantly across studies and populations. In the present case, the patient re-affirmed his male identity following self-mutilation and expressed a desire for reconstructive procedures, illustrating the potential reversibility of identity-related decisions under extreme distress conditions. This highlights the importance of long-term psychiatric evaluation and stability of decision-making capacity prior to irreversible bodily interventions.

Some reports suggest GD may occur within psychotic episodes, making diagnosis difficult and supporting recommendations to defer irreversible surgery until comprehensive psychiatric evaluation and long observation are complete (9). Our case similarly shows how regret may alter identity goals, emphasizing the importance of delaying irreversible interventions.

A cohort study conducted in Sweden found that some individuals who had completed surgical transition later experienced regret (6). Detransition is particularly more common in rapid-onset GD. In a survey of 100 detransitioners, Littman (7) reported 55% felt inadequately evaluated before transition, many linking their decision to psychological distress. Kettula et al. (10) similarly found high psychiatric comorbidity and childhood trauma among detransitioners. In their study, nine adult individuals who detransitioned all exhibited psychiatric comorbidities, including mood disorders, anxiety, borderline personality disorder, and dissociative disorders. Childhood traumas—such as sexual abuse, bullying, attachment problems, and eating disorders—were reported in 78% of cases. Most participants described their transition process not as a permanent expression of identity but as a consequence of psychological distress. After an average of seven years of hormone therapy and surgical interventions, the majority reported significant regret. Our

patient aligns with these findings, as his irreversible self-surgery was followed by regret and re-identification with his male sex.

Complications of GSM often lead to permanent loss (1). Although penile transplantation has been attempted, testicular transplantation is not performed due to technical and ethical issues. Genital transplants remain experimental with donor, surgical, immunologic, and ethical challenges.

Accurate psychiatric assessment is essential. Many GSM patients attempt suicide, and self-mutilation often represents an attempt to relieve distress or externalize overwhelming emotions (1). Early detection of psychiatric illness, thorough evaluation, and long-term follow-up in GD are crucial before irreversible surgery. In GSM with GD, reconstructive or gender-affirming surgery should be delayed, with psychiatric care prioritized (9).

CONCLUSIONS

GSM is an urgent urological condition; however, urologists should not rush penile reconstruction or other reconstructive procedures. This case demonstrates GSM without psychosis, leading to regret and detransition in rapid-onset GD. In such patients, surgical transition decisions should not be immediate; reconstructive procedures must be postponed. Comprehensive psychiatric evaluation, long-term monitoring, and ethical reflection are vital before irreversible interventions. A multidisciplinary approach is essential to safeguard patients and minimize regret and complications.

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Data acquisition: Zeki Bayraktar

Data analysis and interpretation: Zeki Bayraktar, Şenol Turan

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REVIEW ARTICLE

The Effects of Paternal Selective Serotonin Reuptake Inhibitor Use on Male Fertility and Pregnancy Outcomes: A Narrative Review

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Abstract

Objective : This narrative review evaluates current evidence regarding the impact of paternal selective serotonin reuptake inhibitor (SSRI) use on male fertility parameters and neonatal outcomes.

Material and Methods: A comprehensive search of PubMed/MEDLINE and Web of Science databases was conducted for studies published up to December 2025. Out of 132 screened records, 13 studies investigating common SSRIs (e.g., sertraline, citalopram, escitalopram, fluoxetine, paroxetine, fluvoxamine) and newer agents (vortioxetine, vilazodone) were included in the narrative synthesis.

Results: Evidence indicates that SSRIs may cause transient impairments in sperm motility, morphology, and DNA integrity, which are generally reversible following treatment discontinuation. Large-scale cohort studies demonstrate no significant association between paternal SSRI use and major congenital malformations, low Apgar scores, or small-for-gestational-age (SGA) births. While a modest increase in preterm birth risk was noted, this is likely attributable to confounding by the underlying paternal psychiatric condition rather than direct pharmacological exposure. Similarly, associations with neurodevelopmental outcomes, such as Autism Spectrum Disorder (ASD) and Attention Deficit/Hyperactivity Disorder (ADHD), are more likely explained by paternal psychiatric conditions rather than direct drug exposure.

Conclusion: Paternal SSRI use does not appear to pose a significant risk to clinical fertility or offspring health. Given the transient nature of semen abnormalities, treatment should be tailored individually to balance psychiatric stability and reproductive goals.

Keywords: infertility, male, paternal exposure, pregnancy, selective serotonin reuptake inhibitors, teratogens

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INTRODUCTION

Depression and anxiety disorders represent a significant global health issue affecting millions of individuals and necessitating widespread pharmacological intervention (1,2). Selective serotonin reuptake inhibitors (SSRIs) have emerged as the first-line treatment for these conditions due to their proven efficacy and relatively favorable safety profile compared to older antidepressants (1,3). Their therapeutic action primarily involves inhibition of the presynaptic serotonin transporter (SERT), which prevents the reuptake of serotonin into the presynaptic neuron and increases extracellular serotonin levels at the postsynaptic membrane (1,4). This enhancement of serotonergic signaling is believed to underlie the antidepressant and anxiolytic effects of the drug class (5). Beyond their primary psychiatric indications, the clinical utility of SSRIs has expanded to include off-label applications for conditions such as fibromyalgia and neurocardiogenic syncope (4). Furthermore, owing to their well-documented effect of delaying ejaculation, SSRIs are frequently prescribed for the treatment of premature ejaculation, which further increases their use among men of reproductive age (1,6). Consequently, the consumption of SSRIs has surged dramatically in recent decades, particularly in Western countries. This trend has made SSRIs one of the most frequently prescribed classes of medication globally (3,7). Notably, epidemiological data show increasing SSRI use among men of reproductive age. For example, a population-based study in Denmark reported a threefold increase in paternal SSRI use over a twenty-year period (3,8).

Male factor infertility is a major contributor to reproductive failure, accounting for about half of all infertility cases worldwide (6). The causes of male infertility are multifactorial. Medication-induced reproductive toxicity is an increasingly recognized concern (6,9). While many studies have examined the impact of maternal SSRI exposure on pregnancy outcomes and fetal development, the potential reproductive consequences of paternal exposure remain underdefined and less studied (2). This gap in the literature is critical. Serotonin (5-hydroxytryptamine) receptors are present in human spermatozoa and testicular tissue, suggesting a functional role for serotonin in spermatogenesis, sperm motility, and the acrosome reaction (1,10). Emerging preclinical and clinical evidence suggests that SSRIs may disrupt male reproductive function through various mechanisms. These include alteration of hormonal homeostasis, induction of sperm DNA fragmentation, and inhibition of sperm transport (10–13).

Given the increasing overlap between the peak age of antidepressant use and the prime reproductive years, clarifying the safety profile of these drugs is essential for informed clinical counseling (2,3). Furthermore, concerns have been raised regarding the potential teratogenic effects of paternal exposure and its long-term implications for offspring neurodevelopment.

This narrative review evaluates current evidence on the impact of paternal SSRI use on male fertility and pregnancy outcomes. We focus on commonly prescribed agents, including sertraline, citalopram, escitalopram, fluoxetine, paroxetine, and fluvoxamine. We also examine newer agents, such as vortioxetine and vilazodone. We review their effects on semen parameters, sperm DNA integrity, and neonatal health to provide a guide for clinicians managing men of reproductive age.

MATERIAL AND METHODS

Search Strategy and Data Sources

A comprehensive literature search was conducted using electronic databases, including PubMed/MEDLINE and Web of Science. We looked for studies published up to December 2025. For MEDLINE, we used the following Medical Subject Headings (MeSH) terms and keywords: ("Serotonin Reuptake Inhibitors" OR "SSRIs" OR "Vortioxetine" OR "Vilazodone" OR "Fluvoxamine" OR "Sertraline" OR "Fluoxetine" OR "Paroxetine" OR "Citalopram" OR "Escitalopram") AND ("Infertility, Male" OR "Semen Analysis" OR "Spermatozoa" OR "Paternal Exposure" OR "DNA Fragmentation" OR "CatSper" OR "Caspases").

The search strategy for Web of Science was defined as:TI=("selective serotonin reuptake inhibitor" OR SSRI OR vortioxetine OR vilazodone OR fluoxetine OR paroxetine OR citalopram OR escitalopram OR sertraline OR fluvoxamine) AND TS=("male fertility" OR "semen quality" OR "sperm quality" OR "paternal exposure" OR "paternal use" OR spermatozoa OR testis).

To ensure maximum coverage and minimize the risk of missing relevant data, additional specialized sources were screened. These included the subscription-based reproductive toxicology database Reprotox®, MotherToBaby (OTIS), and UpToDate®. These sources were screened for background/context and did not contribute to the PRISMA record counts.

Study Selection and Inclusion Criteria

Using the defined search strategies, 80 studies were identified in MEDLINE and 78 in Web of Science. After removing 26 duplicates, 132 titles and abstracts were screened, of which 91 were excluded. Subsequently, full texts were sought for 41 reports, but 14 could not be retrieved. Ultimately, of the 27 full texts assessed, 13 were included in the narrative synthesis (Figure 1).

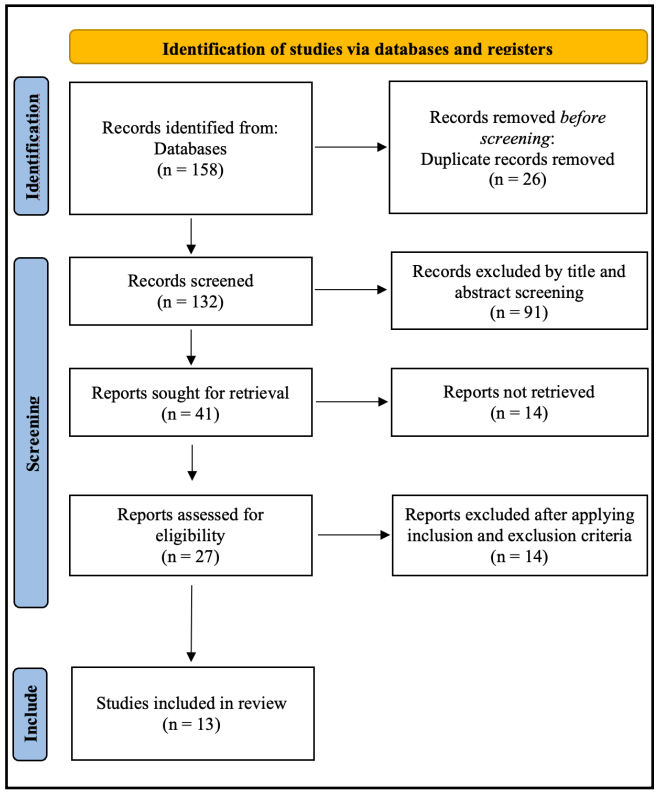

Figure 1. PRISMA diagram showing the study selection process

The inclusion criteria targeted studies involving men receiving SSRI therapy, regardless of indication, and their offspring. Additionally, preclinical research in animal models and in vitro human sperm studies assessing toxicity and mechanisms of action were also considered. The agents evaluated included sertraline, fluoxetine, paroxetine, citalopram, escitalopram, fluvoxamine, vilazodone, and vortioxetine.

Outcome measures were classified into three categories:

1. Conventional Semen Parameters: Concentration, motility, and morphology.
2. Molecular Markers: DNA damage/fragmentation, oxidative stress, and ion channel inhibition (e.g., CatSper).
3. Clinical Neonatal Outcomes: Preterm birth, small-for-gestational-age (SGA), major congenital malformations, Apgar score, and neurodevelopmental outcomes (e.g., Autism Spectrum Disorder (ASD) and Attention Deficit/Hyperactivity Disorder (ADHD), intellectual disability).

Eligible study designs for review included randomized controlled trials, cohort and case-control studies, animal experiments (limited to rat and mouse models), in vitro semen studies, and literature reviews.

Exclusion Criteria

Studies were excluded if they:

1. Investigated other antidepressant groups (e.g., Tricyclics, monoamine oxidase inhibitors) in isolation.
2. Focused exclusively on maternal exposure without distinguishing paternal effects.
3. Lacked full-text access, were retracted, or were subject to an "expression of concern" to ensure data reliability.

RESULTS

Thirteen studies were included; findings on sperm quality are presented in Table 1, and neonatal outcomes are presented in Table 2.

Regarding conventional semen parameters, meta-analytic data demonstrated statistically significant impairments in sperm morphology, concentration, motility and DNA integrity among SSRI users, with these changes being most pronounced within the first three months of exposure (14). Specifically, a prospective study on the use of escitalopram (10 mg/day) showed significant declines in these parameters after 12 weeks compared to baseline values (12). Conversely, a cohort study of 8,861 men found no significant associations between SSRI use and sperm morphology, concentration, or motility after adjusting for confounders (15).

Table 1. Effects of SSRIs on Male Fertility and Semen Quality (Preclinical and Clinical Evidence)

Study Author (Year)	Study Design	SSRI Type	Key Findings
Rahban et al. (2021) (10)	Human Sperm (*in vitro*)	Sertraline	Sertraline potently inhibits CatSper channels. Impairs acrosome reaction and egg penetration.
Roostaee et al. (2025) (13)	Human Sperm (*in vitro*)	Fluoxetine	Induction of oxidative stress (ROS), increased DNA fragmentation, and apoptosis.
Ilgin et al. (2017) (11)	In vivo Animal (Rats)	Citalopram	Reduced sperm concentration, increased DNA damage and testicular tissue damage. Linked to oxidative stress (low Glutathione) and hormonal imbalance.
Erkilinc et al. (2025) (17)	Animal Depression Model	Fluoxetine, Vortioxetine	Depression caused testis damage. Antidepressants mitigated damage and reduced inflammatory markers (IL-6, Cas-8).
Pham et al. (2022) (15)	Retrospective Cohort (n=8.861)	Mixed SSRIs	No statistically significant difference in semen parameters (sperm concentration, motility, or morphology) between SSRI users and non-users.
Alsabhan et al. (2024) (21)	Retrospective Cohort Study (n=299)	Mixed SSRIs	No significant difference in sperm count (p=0.069), motility, or viscosity between users and controls.
Tanrikut et al. (2010) (16)	Prospective Clinical Study (n=35)	Paroxetine	Sperm DNA fragmentation increased from 13.8% to 30.3% ; standard semen parameters remained largely normal.
Koyuncu et al. (2011) (12)	Prospective Clinical Study (n=25)	Escitalopram	Significant reduction in sperm concentration, motility, and morphology after 3 months of treatment.
Xu et al. (2022) (14)	Meta-analysis	Mixed SSRIs	Significant decrease in morphology (p=0.002), concentration (p=0.02), and motility (p=0.04). DNA damage (DFI) increased (p=0.0002).

Abbreviations: Cas-8, caspase 8; DFI, DNA fragmentation index; IL-6, interleukin 6; ROS, reactive oxygen species; SSRI, selective serotonin reuptake inhibitor.

Table 2. Paternal SSRI Exposure and Pregnancy/Offspring Outcomes

Study (Year)	Data Source (n)	SSRI Type	Outcome Measured	Key Findings & Statistical Significance
Garvik et al. (2025) (3)	Nationwide Cohort Study (n=13.547)	Mixed SSRIs	Preterm birth, SGA, malformations	Preterm birth risk increased with Citalopram, Escitalopram (OR: 1.15). No significant association with SGA, malformations, or APGAR scores.
Viktorin et al. (2018) (2)	Prospective Cohort (n=170.508)	Mixed SSRIs	Preterm birth, ASD, intellectual disability	No significant risk for preterm birth (OR: 0.91), malformations (OR: 1.06), or ASD (HR: 1.13).
Yang et al. (2018) (18)	National Cohort (n=781.470)	Mixed SSRIs	ADHD risk in offspring	Slight ADHD risk increase (HR: 1.26). Association likely due to underlying psychiatric condition, not drug effect.
Yang et al. (2017) (19)	Population-based cohort study (n=669.922 children)	Mixed SSRIs	ASD risk in offspring	1.62-fold risk attenuated after adjusting for paternal history. Sibling analysis confirmed no drug-related risk.

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; ASD, autism spectrum disorder; HR, hazard ratio; OR, odds ratio; SGA, small for gestational age; SSRI, selective serotonin reuptake inhibitor.

Molecular evaluations indicate that SSRIs may impair sperm function through oxidative stress and DNA damage. Research involving paroxetine demonstrated an increase in the sperm DNA fragmentation index from %13.8 to %30.3, even when standard semen parameters remained normal (16). Meta-analytic data further support a significant overall increase in the DNA fragmentation index among SSRI users (14). In vitro studies on fluoxetine-exposed human sperm revealed elevated levels of reactive oxygen species (ROS) and malondialdehyde (MDA), alongside

reduced total antioxidant capacity (TAC) and the activation of apoptotic pathways through the upregulation of Caspase 8, Caspase 9, and BAX (13). Furthermore, sertraline has been identified as a potent inhibitor of the sperm-specific CatSper calcium channel, which is essential for fertilization (10).

Animal models provide additional insight into testicular structural changes. Citalopram exposure in rats resulted in reduced sperm counts and structural damage to testicular tissue (11). However, an experimental depression model showed that while untreated stress caused significant testicular damage, treatment with fluoxetine or vortioxetine mitigated this damage and reduced inflammatory markers such as IL-6 and Caspase 8 (17).

Epidemiological data from large-scale cohorts indicate that paternal SSRI use is not associated with major adverse neonatal outcomes. A nationwide cohort study of 13.547 children found no significant associations between paternal SSRI exposure and major congenital malformations, low Apgar scores, or SGA births. However, a modest increase in the risk of preterm birth was identified (OR 1.15; 95% CI 1.06-1.23), particularly with citalopram and escitalopram (3). Another prospective cohort study of 170.508 individuals found no significant risk for preterm birth (aOR 0.91; 95% CI 0.79-1.04), malformations (OR 1.06; %95 CI 0.90-1.26), or ASD (aHR 1.13; %95 CI 0.84-1.53) (2).

Long-term neurodevelopmental studies have shown a slight increase in the risk of ADHD associated with paternal SSRI exposure (HR: 1.26; 95% CI: 1.06–1.51) (18). In another study regarding ASD, initial findings indicated an increased risk (HR 1,62; 95% CI: 1.33–1.96). However, this association was significantly attenuated after adjusting for paternal psychiatric history (aHR: 1.43; 95% CI: 1.18–1.74). In addition, the risk disappeared in sibling analyses (19).

DISCUSSION

Impact on Semen Parameters and Testicular Histopathology

Multiple studies indicate that SSRI use may negatively affect semen parameters. However, findings across studies are inconsistent. A systematic review and meta-analysis by Xu et al. demonstrated statistically significant impairments in sperm morphology, concentration, and motility among SSRI users. No effect was found on semen volume. These changes were most pronounced within the first three months of exposure, suggesting a time-dependent effect (14). Similarly, Oliveira et al. reported reductions in serum testosterone levels, decreased sperm production, diminished sperm reserves, and prolonged epididymal transit time (20). Long-term SSRI exposure (at least 6 months), particularly with agents such as citalopram and sertraline, has also been associated with reduced total sperm count and motility compared with healthy controls (6).

Prospective clinical data further support these observations. Specifically, treatment with escitalopram at a dose of 10 mg/day was associated with significant declines in sperm concentration, motility, and morphology after 12 weeks compared with baseline values (12). Similarly, fluoxetine has been highlighted as a potential contributor to reproductive toxicity, including reduced reproductive organ weight and sperm concentration (9). In addition, experimental studies have shown that citalopram exposure induces reproductive toxicity in animal models, including reduced sperm count and structural damage to testicular tissue (11).

In contrast, several large observational studies have reported no significant associations between SSRI use and semen parameters. For example, a cohort study of 8,861 men undergoing fertility evaluation found no differences in semen volume, concentration, motility, or morphology between SSRI users and non-users after adjustment for confounders (15). Likewise, a retrospective analysis of 299 men attending an infertility clinic found no significant differences between SSRI users and non-users in sperm liquefaction, motility, viscosity, or sperm count (21). Furthermore, available evidence suggests that SSRI-associated changes in semen parameters may be reversible following discontinuation of treatment, indicating a potential transient effect (9). Overall, these inconsistencies highlight the variability of clinical findings and suggest that SSRI-associated changes in semen parameters may not be uniform across all populations. Additionally, the potential confounding effect of underlying psychiatric conditions has also been emphasized.

In an experimental model of chronic stress–induced depression, untreated stress was associated with marked testicular damage and elevated inflammatory markers. In contrast, treatment with fluoxetine or vortioxetine improved

testicular histopathology and reduced inflammatory and apoptotic markers compared to untreated stressed animals (17). These findings suggest that the reproductive effects observed with SSRI use may, in part, reflect the influence of depression or chronic stress, rather than a direct toxic effect of the medication itself.

Molecular Mechanisms: DNA Integrity, Oxidative Stress, and Ion Channels

Research indicates that SSRIs may impair sperm function at a molecular level, even when routine semen parameters appear normal. Studies involving sertraline and paroxetine have demonstrated significantly higher rates of DNA fragmentation compared with behavioral therapy or untreated controls (6). A study on healthy volunteers treated with paroxetine revealed a significant increase in sperm DNA fragmentation (from 13.8% to 30.3%). This increase occurred despite normal standard semen analysis, suggesting subclinical reproductive toxicity (16). These findings are supported by meta-analytic data and narrative reviews. These reviews indicate a significant increase in the sperm DNA fragmentation index among SSRI users ($p = 0.0002$) (9,14).

Two principal mechanisms have been proposed to explain these molecular effects: oxidative stress and ion channel inhibition. In vivo studies in male rats have shown that citalopram exposure reduces testicular glutathione levels and increases oxidative stress, accompanied by sperm DNA damage and histopathological alterations (11). In parallel, in vitro studies using human sperm exposed to fluoxetine have demonstrated elevated levels of ROS and MDA. These findings also include a reduction in TAC and activation of apoptotic pathways, shown by upregulation of Caspase-8, Caspase-9, and Bax, along with downregulation of the anti-apoptotic BCL-2 gene (13).

In addition to oxidative mechanisms, inhibition of sperm-specific ion channels has also emerged as a relevant pathway. For example, several SSRIs, particularly sertraline, have been identified as potent inhibitors of the CatSper calcium channel. Given that CatSper-mediated calcium influx is essential for sperm hyperactivation and the acrosome reaction, its inhibition may impair fertilization capacity independently of standard semen parameters (10).

Pregnancy and Neonatal Outcomes

Epidemiological data from large population-based cohorts are generally reassuring regarding the safety of paternal SSRI use in relation to pregnancy and neonatal outcomes (22,23). For instance, a nationwide cohort study including 13,547 children exposed to paternal SSRI use during the three months prior to conception found no significant associations with SGA birth, low Apgar scores, major congenital malformations, or infection risk (3). However, a modest but statistically significant increase in the risk of preterm birth was observed (OR: 1.15). This was particularly associated with paternal citalopram and escitalopram use (3). Nevertheless, these findings should be interpreted with caution due to potential confounding by indication. The underlying paternal psychiatric condition could independently influence pregnancy outcomes.

Regarding long-term neurodevelopmental risks, studies have largely pointed towards non-causal associations. Yang et al. investigated the relationship between paternal SSRI use and ADHD and found a statistically significant increase in risk. However, a similar risk was observed in children whose fathers had discontinued treatment long before conception. These findings suggest that the association stems from confounding factors, such as the genetic transmission of psychopathology or shared environmental factors, rather than direct pharmacological effects (18). Similarly, in an analysis of ASD, Yang et al. reported that while initial data suggested an increased risk, further stratification revealed this was likely driven by confounding by indication. The risk persisted among offspring of 'former users'. Limitations of this study included reliance on dispensing data and the inability to adjust for diagnoses managed exclusively in primary care settings (19). In a similar vein, another large nationwide cohort study by Viktorin et al. examined the impact of paternal antidepressant use on preterm birth, malformations, ASD, and intellectual disability. This study found no significant associations and concluded that paternal use is generally safe (2).

Several methodological limitations should be considered when interpreting the findings of this review. First, the reviewed literature is partly based on animal studies, primarily involving rats and mice. The drug doses used in these experiments are often higher than therapeutic levels,

and physiological differences between species may limit their relevance to human clinical settings. Second, most large and high-quality epidemiological data originate from Nordic national registries, particularly those of Sweden and Denmark. This geographic clustering may limit the external validity and generalizability of the results to populations with different ethnic, genetic, and healthcare characteristics. Third, because of confounding by indication, it is difficult to determine whether the reported neonatal or neurodevelopmental outcomes result from SSRI exposure itself or from the underlying paternal psychiatric disorder. Prescription-based analyses cannot verify actual medication use or exposure timing, and missing data on key lifestyle factors such as smoking, alcohol intake, and body mass index may have contributed to residual confounding. Finally, the limited clinical evidence available for newer agents, such as vortioxetine and vilazodone, combined with small sample sizes in some studies, makes it difficult to draw firm conclusions about the reproductive safety of the entire SSRI class.

CONCLUSIONS

Current evidence shows that paternal SSRI exposure can temporarily impair sperm parameters and DNA integrity, but these effects are reversible and do not consistently impact clinical fertility outcomes. Large-scale epidemiological data show that paternal SSRI use does not raise the risk of major congenital anomalies or neurodevelopmental disorders, including autism and ADHD, in offspring. The small increase in preterm birth risk likely results from confounding paternal factors, not a direct drug effect.

As a conclusion of this review, paternal SSRI use does not appear to pose a significant teratogenic risk. Clinically, current data do not justify the routine discontinuation of SSRIs in men trying to conceive, especially when psychiatric stability is essential. Instead, an individualized approach is recommended, focusing on using the lowest effective dose and preferring agents with fewer reproductive side effects, such as sertraline. It may be beneficial to reassure patients that semen alterations appear to be largely reversible after stopping medication (2,9,12). Further prospective studies are warranted to clarify dose dependency, reversibility, and potential long-term effects on offspring.

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In the case of experimental animal studies, adherence to animal rights guidelines ("Guide for the Care and Use of Laboratory Animals" https://www.ncbi.nlm.nih.gov/books/NBK54050) is mandatory, with requisite approval from the animal ethics committee.

The "Materials and Methods" section must specify the ethical committee's approval, including the approval number, and the provision of "informed consent" by patients.

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The rules for the title page, references, figures and tables are valid for all types of articles published in this journal.

Authors are required to submit the following:

- Cover Letter
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- ICMJE Disclosure of Interest
- Title Page
- Main text
- Figures
- Tables

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All acronyms and abbreviations used in the manuscript should be defined at first use, both in the abstract and in the main text. The abbreviation should be explained clearly in parentheses following the definition and custom abbreviations should not be used.

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- Randomized research studies and clinical trials: CONSORT guidelines (for protocols, please see the SPIRIT guidance)
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- Systematic reviews and meta-analysis: PRISMA guidelines (for protocols, please see the PRISMA-P guidelines)
- Experimental animal studies: ARRIVE guidelines and Guide for the Care and Use of Laboratory Animals, 8th edition
- Nonrandomized evaluations of behavioral and public health interventions: TREND guidelines
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Original Research Articles should include subheadings below;

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- Introduction
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- Figures and Tables Legend
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Review articles should provide a comprehensive overview of the current state of knowledge on a topic in clinical practice, and should include discussions and evaluations of relevant research. The subheadings of the review articles can be planned by the authors. Review articles are scientific analyses of recent developments on a specific topic as reported in the literature. No new information is described, and no opinions or personal experiences are expressed.

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3. Name, address, telephone (including the mobile phone number), and email address of the corresponding author
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5. If the content of the paper has been presented before, and if the summary has been published, the time and place of the conference should be denoted on this page.
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Original articles should have a structured English (Objective, Methods, Results, Conclusion). Review articles and case reports should have an unstructured abstract. Articles and abstracts should be written in accordance with the word limits specified in the table. References, tables and citations should not be used in an abstract.

Keywords

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Units of length, weight and volume should be reported in metric (meter, kilogram, liter) system and in decimal multiples. Temperatures should be expressed in degrees Celsius, and blood pressures in millimeters of mercury. Both local and International Unit Systems (International System of Units, SI) should be used as measurement units. Drug concentrations should alternatively be given in either SI units or mass units written in parentheses.

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Supplementary materials, including audio files, videos, datasets, and additional documents (e.g., appendices, additional figures, tables), are intended to complement the main text of the manuscript. These supplementary materials should be submitted as a separate section after the references list. Concise descriptions of each supplementary material should be included to explain their relevance to the manuscript. Page numbers are not required for supplementary materials.

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For Books:

Günalp İ. Modern Üroloji. Ankara: Yargıçoğlu Matbaası, 1975.

Chapters in books: Anderson JL, Muhlestein JB. Extra corporeal ureteric stenting during laparoscopic pyeloplasty. Philadelphia: W.B. Saunders, 2003; p. 288-307.

For website;

Gaudin S. How moon landing changed technology history [serial online]. 2009 [cited 2014 June 15]. Available from: http://www.computerworlduk.com/in-depth/it-business/2387/how-moon-landing-changed-technology-history/

For conference proceeding;

Anderson JC. Current status of chorion villus biopsy. Paper presented at: APSB 1986. Proceedings of the 4th Congress of the Australian Perinatal Society, Mothers and Babies; 1986 Sep 8-10; Queensland, Australian. Berlin: Springer; 1986. p. 182-191.

For Thesis;

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