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Original Research Article

Comparison of the Clinical Efficacy of Tamsulosin and Solifenacin in Patients with Double-J Stent-Related Symptoms

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Abstract

Background: Double-J (DJ) ureteral stent–related symptoms significantly reduce patients' quality of life after endourological procedures. Common symptoms include hematuria, urinary urgency, frequency, dysuria, flank pain, and irritative lower urinary tract symptoms. Although ureteral stents are essential for maintaining urinary drainage and promoting postoperative recovery, these adverse effects often require pharmacological management. α-Adrenergic blockers and antimuscarinic agents, particularly tamsulosin and solifenacin, are commonly prescribed because they are effective, convenient once-daily therapies, and relatively inexpensive. Therefore, comparing their efficacy in alleviating DJ stent-related symptoms is clinically important.

Objectives: To comparatively evaluate the therapeutic efficacy of tamsulosin and solifenacin in ameliorating symptoms associated with indwelling Double-J ureteral stents.

Methodology: This quasi-experimental study includes total of 50 patients who received ureteral stents after ureteroscopic lithotripsy were included and purposively allocated into two treatment groups. Group A comprised 25 patients who received tamsulosin, while Group B included 25 patients treated with solifenacin. Participant selection was performed according to predefined inclusion and exclusion criteria using a purposive sampling technique.

Results: The mean age of participants was 40.08 ± 7.798 years in Group A and 37.84 ± 10.063 years in Group B. Male patients predominated in both treatment groups. Assessment performed on the third postoperative day (T1) demonstrated no statistically significant intergroup differences in total International Prostate Symptom Score (IPSS), irrigative IPSS subscore, Quality of Life (QOL) score, or Visual Analogue Scale (VAS) pain score ($P > 0.05$). However, subsequent evaluation revealed a statistically significant improvement in the tamsulosin group compared with the solifenacin group. The mean total IPSS, irrigative IPSS subscore, and QOL score were 5.28, 3.15, and 2.50, respectively, in Group A, compared with 6.40, 4.10, and 2.90 in Group B ($P < 0.05$). Furthermore, the severity of stent-related flank pain was significantly lower among patients receiving tamsulosin than among those treated with solifenacin (mean VAS score: 2.45 vs. 2.64; $P < 0.05$).

Conclusion: The present investigation was undertaken to compare the clinical effectiveness of tamsulosin and solifenacin in mitigating symptoms associated with indwelling DJ ureteral stents. The findings indicate that tamsulosin provides superior symptomatic relief compared with solifenacin, thereby representing a more effective pharmacological option for the management of DJ stent-related symptoms.

Keywords: Endourological procedures, Double-J ureteral stent, Tamsulosin, Solifenacin.

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Introduction

Modern endourological surgical procedures represent a massive milestone within current clinical practice worldwide. Over the past several decades, the Double-J (DJ) or pigtail ureteral stent has transitioned into an indispensable component of the practicing urologist's surgical armamentarium [1,2]. Since its foundational description by Zimskind and colleagues in 1967 [3], this device has been defined as a multi-holed synthetic hollow tube placed within the ureteral lumen using either retrograde cystoscopic or antegrade percutaneous techniques, specifically designed to protect and maintain upper urinary tract luminal patency [4]. Ureteral stents are routinely indicated across a broad spectrum of medical circumstances where unimpeded upper tract drainage is crucial. Critical emergency scenarios consist of relieving acute benign or malignant mechanical obstructions, frequently complicated by sepsis or acute renal insufficiency. Elective settings include pre- or post-

extracorporeal shockwave lithotripsy (ESWL) to facilitate stone fragment clearance, intraoperative visualization of the ureters during challenging pelvic interventions, and routine placement following ureteroscopic interventions to prevent obstructive edema and maintain long-term luminal caliber. Additionally, they are key in managing post-traumatic or iatrogenic urinary leaks and ureteral fistulas [5,6].

Despite their established role and clinical utility, indwelling ureteral stents are associated with notable post-surgical complications, substantial morbidity, and a clear negative impact on patient health-related quality of life. The experience of stent-associated discomfort exhibits significant inter-patient variability but is estimated to affect more than 80% of individuals in an unpredictable style [7]. Existing literature characterizes these symptom frequencies with specific estimates: incomplete emptying is reported by roughly 76% of patients, urinary urgency by 57–60%, increased urinary frequency by 50–60%, dysuria by 40%, flank pain during micturition by 19–32%, suprapubic pain by 30%, and intermittent gross hematuria by 25% [8,9].

To objectify these parameters, Joshi and co-investigators (2002) pioneered standardized metrics to measure stent-associated symptoms [10]. They evaluated the clinical burden of these symptoms using validated instruments, such as the International Prostate Symptom Score (IPSS), the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) questionnaire, and generic Quality of Life indices. To establish a more disease-specific instrument, they later validated the Ureteral Stent Symptom Questionnaire (USSQ), a multi-dimensional tool containing 38 individual elements across six domains: pain indices, voiding habits, professional work capacity, sexual health, global physical status, and miscellaneous problems [11].

This investigation was conducted to determine the comparative efficacy of Tamsulosin versus Solifenacin monotherapy in reducing double-J stent-related discomfort within our institution.

Material & Method

This retrospective study was conducted at Parul Sevashram hospital, Parul institute of Medical science and research, Vadodara, Gujarat from Jan 2023 to July 2025.

This quasi-experimental comparative study was conducted within the Department of Urology at Parul Sevashram hospital, Parul institute of Medical science and research, Vadodara, Gujarat from Jan 2023 to July 2025. The initial cohort consisted of 60 adult patients diagnosed with upper urinary tract stone disease scheduled for definitive elective endourological interventions. Following the application of strict inclusion and exclusion criteria, 50 patients were successfully tracked through final assessment. The inclusion criteria were limited to individuals aged between 18 and 40 years who required unilateral DJ stent placement immediately following uncomplicated ureteroscopic pneumo-lithotripsy (URS) for ureteral calculi.

All surgical interventions were performed standardized using an 8.5 French rigid ureteroscope (Karl Storz, Tuttlingen, Germany). Stone fragmentation was achieved using a pneumatic lithotripter probe. Following successful calculus clearance, a 6 French, 26 cm polyurethane Double-J stent was placed in an retrograde manner over a guide wire under direct fluoroscopic visualization to verify appropriate proximal and distal loop formation. Postoperative positioning and the absence of large residual fragments were checked using plain abdominal radiographs (X-ray KUB) within 24 hours.

The indwelling urethral Foley catheter was routinely removed on the first postoperative day. Patients who met standard discharge criteria on the third postoperative day were allocated using purposive sampling into two parallel medical arms. All participants received standard antibiotic prophylaxis consisting of oral Levofloxacin (500 mg once daily for 7 days). In addition, Group A (n = 25) was prescribed Capsule Tamsulosin (0.4 mg once daily, administered at bedtime), while Group B (n = 25) received Tablet Solifenacin (5 mg once daily, administered in the morning). Both cohorts maintained their respective medication regimens continuously until final stent removal, which was scheduled three weeks postoperatively.

Clinical assessments were conducted at two intervals: the initial evaluation on the third postoperative day prior to discharge (T1 assessment) to establish early post-surgical baselines, and a final exit evaluation on the day of cystoscopic stent extraction (T2 assessment). Subjective and objective symptom burdens were tracked using the validated International Prostate Symptom Score (IPSS)—analyzed as both a cumulative total and isolated irritative sub-scores—along alongside a Visual Analogue Scale (VAS) for flank pain, and the standardized single-item Quality of Life Score (QOLS).

Continuous parametric values are stated as Mean ± Standard Deviation (SD) and evaluated via Student's independent t-test. Categorical variables are stated as frequencies and percentages, compared using Fisher's exact test. A probability value of $P < 0.05$ was defined as the threshold for statistical significance.

Result

Out of the initial 60 enrolled individuals, 50 completed the complete 3-week follow-up protocol and final assessments. Three patients were excluded due to premature self-discontinuation of medications or missed follow-up visits. Group A (Tamsulosin arm) comprised 25 participants, while Group B (Solifenacin arm) included 25 participants.

The baseline demographic data showed high homogeneity between the groups, ensuring validity for subsequent clinical endpoints.

Table 1: Baseline age distribution across the treatment cohorts

Statistical Parameter	Group A (Tamsulosin) (n = 25)	Group B (Solifenacin) (n = 25)
Mean Age ± SD (Years)	40.08 ± 7.798	37.84 ± 10.063
95% Confidence Interval	34.35 – 42.81	35.05 – 42.63
Between-Group P-value	**0.9446 (Non-Significant)**	

Analysis of age characteristics (Table 1) revealed a mean age of 40.08 ± 7.798 years in Group A and 37.84 ± 10.063 years in Group B. Independent t-test verification confirmed that this minor variance lacked statistical significance (p = 0.9346), demonstrating well-matched baseline ages.

Table 2: Gender demographics and distribution between cohorts

Gender Category	Group A (Tamsulosin) n (%)	Group B (Solifenacin) n (%)
Male	18 (72.00%)	19 (76.00%)
Female	7 (28.00%)	6 (24.00%)
Total Ratio	25 (100.0%)	25 (100.0%)

Gender characteristics (Table 2) showed a male predominance in both arms.

Specifically, Group A contained 18 male patients (72.00%) and 7 female patients (28.00%), while Group B contained 19 male patients (76.00%) and 6 female patients (24.00%). This distribution reflects standard epidemiological pattern trends for urinary calculus disease within the local population.

Early Postoperative Baseline Homogeneity (T1 Assessment): Evaluations conducted on the 3rd postoperative day confirmed that both patient cohorts experienced comparable early symptom distress levels prior to starting continuous daily monotherapy.

No statistically significant variations were identified across any monitored metrics (P > 0.05).

Table 3: Multi-parameter score findings at early baseline evaluation (T1 Assessment)

Monitored Clinical Metric	Group A (Tamsulosin) Mean ±SD	Group B (Solifenacin) Mean ±SD
Cumulative Total IPSS	11.72 ± 2.716	9.75 ± 2.521
Irrigative Subgroup Score	8.50 ± 1.594	7.77 ± 1.889
Quality of Life Index (QOLS)	3.55 ± 1.080	3.53 ± 0.962
Visual Analogue Scale (VAS) - Pain	4.18 ± 1.322	3.95 ± 1.253
Statistical Significance	All values demonstrate P > 0.05 (Non-Significant)	

Early post-surgical evaluation data (Table 3) showed equivalent values between cohorts.

Cumulative baseline IPSS stood at 11.72 ± 2.716 for the tamsulosin cohort versus 9.75 ± 2.521for the solifenacin cohort (p = 0.2008). The isolated irrigative urinary tracking components mirrored this pattern, measuring 8.50 ± 1.594in Group A against 7.77 ± 1.889 in Group B (p = 0.3774). Baseline QOLS (3.55 ± 1.080vs. 3.53 ± 0.962, p = 0.6833) and initial VAS pain indices (4.18 ± 1.322 vs. 3.95 ± 1.253, p = 0.7865) similarly confirmed no early statistical variance between the treatment arms.

Table 4: Exit evaluation metrics at the point of stent extraction (T2 Assessment)

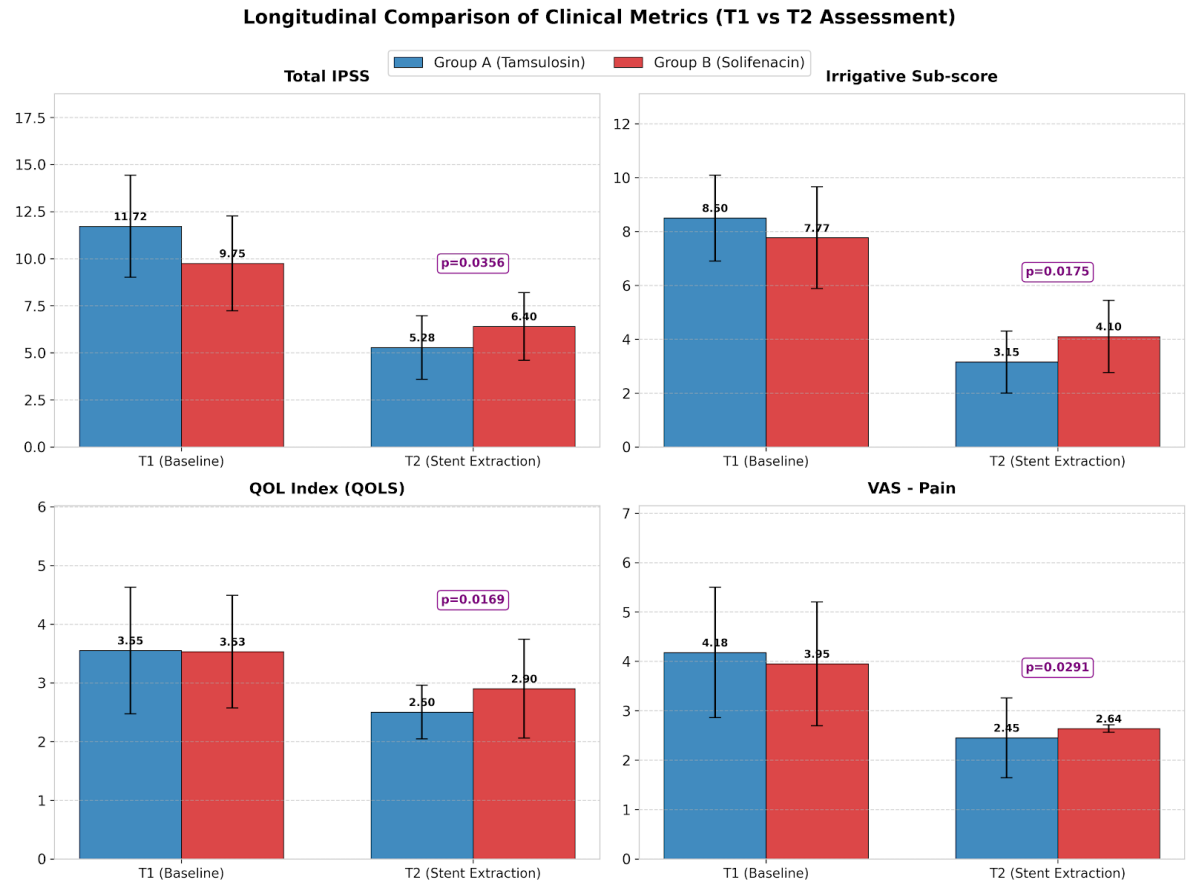
Evaluated Clinical Parameter	Group A (Tamsulosin) Mean ± SD	Group B (Solifenacin) Mean ± SD	P-value
Cumulative Total IPSS	5.28 ± 1.694	6.40 ± 1.79	**0.0356**
Irrigative Sub-Score	3.15 ± 1.153	4.10 ± 1.347	**0.0175**
Quality of Life Index (QOLS)	2.50 ± 0.457	2.90 ± 0.842	**0.0169**
Visual Analogue Scale (VAS) - Pain	2.45 ± 0.807	2.64 ± 0.075	**0.0291**

Following three weeks of sustained monotherapy (Table 4), exit assessments demonstrated significant performance disparities.

The final cumulative IPSS value achieved marked

absolute reduction in the alpha-blocker cohort down to 5.28 ± 1.694, significantly lower than the antimuscarinic group mean of 6.40 ± 1.79 (p = 0.0356).

The irrigative sub-score parameters demonstrated a matching trend, with Group A achieving a lower score of 3.15 ± 1.153compared to 4.10 ± 1.347for Group B (p = 0.0175).



Graph 1: Graphical Comparison of Participants (T1 vs T2 Assessment)

Patient health-related quality of life indices directly reflected these updates. At the time of stent extraction, the global QOLS index for the tamsulosin cohort was significantly better than that of the solifenacin cohort, measuring 2.50 ± 0.457 versus 2.90 ± 0.842 (p = 0.0169). Additionally, tamsulosin provided significantly better relief for stent-related lumbar flank pain, as demonstrated by lower exit VAS pain scores compared to the solifenacin group (2.45 ± 0.807 vs. 2.64 ± 0.075 ,p = 0.0257).

Discussion

Although double-J ureteral stenting remains a standard component of modern endourological practice, the associated patient morbidity presents a persistent clinical challenge. This study evaluated the comparative clinical efficacy of alpha-blocker therapy (Tamsulosin) versus antimuscarinic therapy (Solifenacin) in managing stent-related symptoms. The findings indicate that while both therapeutic options provide clinical benefit, Tamsulosin monotherapy achieves a significantly greater reduction in both lower urinary tract symptoms and stent-related flank pain compared to Solifenacin.

The demographic features of our study population align with established clinical patterns, showing a distinct male predominance that reflects regional epidemiological trends for stone disease. The high level of baseline homogeneity between the treatment groups at the early post-surgical assessment (T1) ensures that the subsequent variations observed at the exit assessment (T2) can be attributed to the respective pharmacological mechanisms rather than confounding baseline differences.

Our final exit assessment (T2) showed that patients receiving Tamsulosin experienced significantly lower overall symptom scores (IPSS) and improved irritative sub-scores compared to those treated with Solifenacin. These results align with previous observations by Shalaby and colleagues (2013), who reported a comparable therapeutic advantage for alpha-blockers over antimuscarinics in reducing lower urinary tract symptoms [12]. Similarly, a comprehensive meta-analysis by He et al. (2015) confirmed that alpha-adrenoreceptor antagonists

consistently lowered absolute urinary symptom indices across diverse patient cohorts [13].

The physiological mechanism behind this response involves the high density of alpha-1 adrenergic receptors located in the distal ureter, bladder trigone, and bladder neck. By blocking these receptors, Tamsulosin minimizes local smooth muscle tone, reduces outflow resistance during voiding, and limits the mechanical irritation caused by the distal pigtail loop against the trigonal mucosa.

Conversely, our results contrast with those of El-Nahas and colleagues (2017), who reported that solifenacin provided greater relief than tamsulosin based on Ureteral Stent Symptom Questionnaire (USSQ) metrics [14]. This divergence in findings may stem from differences in the evaluation instruments used, as the IPSS focuses heavily on lower urinary tract voiding dynamics, whereas the USSQ incorporates broader domains such as sexual function and work performance.

Additionally, variations in stent design, material composition, and positioning could influence the primary mechanism of irritation, altering the relative efficacy of an antimuscarinic versus an alpha-blocker.

A major finding in our study was the significantly lower exit pain score (VAS) within the Tamsulosin cohort compared to the Solifenacin cohort (2.45 ± 0.807 vs. 2.64 ± 0.075, $p = 0.0257$). The etiology of stent-related flank pain is primarily linked to vesicoureteral reflux, where high intravesical pressures during detrusor contraction force urine retrogradely up the stented lumen into the renal pelvis.

By relaxing the bladder neck and lowering bladder outlet resistance, Tamsulosin helps maintain lower voiding pressures, thereby reducing the frequency and intensity of dynamic reflux episodes.

This physiological rationale is supported by the work of Zhou et al. (2015), whose large-scale meta-analysis involving 1,408 patients demonstrated clear reductions in pain indices in favor of alpha-blocker regimens [15].

Conclusion

The present investigation was undertaken to compare the clinical effectiveness of tamsulosin and solifenacin in mitigating symptoms associated with indwelling DJ ureteral stents. The findings indicate that tamsulosin provides superior symptomatic relief compared with solifenacin, thereby representing a more effective pharmacological option for the management of DJ stent-related symptoms.

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