

Research Article

Symptoms and Impact of Double-J Stent on the Quality of Life After Percutaneous Nephrolithotomy in Vietnam

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Abstract

Background: Percutaneous Nephrolithotomy (PCNL) is a common treatment for kidney stones, and double-J (D-J) stenting is often employed post-procedure to ensure proper urine flow and avoid complications. However, double-J stents are known to cause discomfort, leading to a reduced quality of life. This study aims to evaluate the urinary symptoms and overall impact of D-J stents on quality of life following PCNL. **Methods:** This study was conducted prospectively on 200 patients who underwent PCNL and D-J stenting at Bach Mai Hospital. The Ureteral Stent Symptom Questionnaire (USSQ) was used to assess the impact on urinary symptoms, body pain, work performance, and general health. Data were collected both four weeks post-stent implantation and four weeks post-stent removal. **Results:** Among 200 patients (mean age 53.06 years), 82.5% experienced pain, predominantly in the kidney front area (77.4%) and kidney back area (54.7%). Sleep was interrupted in 77.4% of patients due to pain. Urinary symptoms included urgency (90.5%), urge incontinence (42.5%), dysuria (50.5%), and hematuria (40%). The symptoms negatively impacted work performance and sexual health. After stent removal, significant improvements were observed in all domains of the USSQ. **Conclusions:** Double-J stents are associated with significant symptoms that lower the quality of life in patients post-PCNL. Monitoring and care programs are necessary to manage these adverse effects effectively.

Keywords

Quality of Life, Double-J Stent, Percutaneous Nephrolithotomy (PCNL), Pain Management, Longitudinal Study

1. Introduction

Kidney stones are a prevalent urological condition that involves the formation and occasional passage of crystal agglomerates in the urinary tract. Globally, kidney stones have become more common during the past three decades. According to Liu et al.'s meta-analysis of 58 studies, kidney stones are 5–19.1% common in West Asia, Southeast Asia, South Asia, South Korea, and Japan. These Asian regions are referred to as a "stone belt." In most Asian countries, kidney stones have become more common in recent decades [1].

Following a rise in kidney stone prevalence, healthcare systems face a far greater cost burden [2]. The incidence of urinary stones in Vietnam is from 2-12%, of which kidney stones account for up to 40% [3]. Renal stones are presently acknowledged as a risk factor for various systemic disorders, including diabetes, cardiovascular disease, bone fractures, and chronic renal disease [1]. The medical community's perspective on nephrolithiasis has gradually shifted from viewing it as a primarily urologic illness to a chronic medical condition

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requiring long-term surveillance and management. [4].

With the advancement of minimally invasive technologies, previous treatment options such as ESWL and URS have shown inadequacies in addressing renal calculi exceeding 20 mm. Consequently, renal PCNL has regained prominence due to the ability to utilize smaller instruments and contemporary, more effective intracorporeal lithotripsy techniques [5]. PCNL had the highest stone-free rate (SFR) and lower rates of auxiliary procedures and retreatment compared to ESWL or RIRS. Percutaneous nephrolithotomy is performed through a 1-cm skin incision and thus minimizes incision size, pain, blood loss, blood transfusions and shortens hospitalization. PCNL technique standardly involves the insertion of a nephrostomy tube for drainage; however, it may cause severe post-operative discomfort [6]. Pain, bladder irritative symptoms, and fever are usually signs of early complications related to double-J stents; late complications are more troublesome. In a German study using USSQ to evaluate the effect of double-J stent, significant reductions were found for all USSQ sub-scores when comparing patients with stents (USSQ-1) and 4 weeks after stent removal (USSQ-3) [7]. In another study in Italy, significant changes were observed in the score of all domains in USSQ when comparing cases with and without a stent [8]. Despite improvements in stent designs and composition, in an effort to improve patient comfort and little or no morbidity, structured in-depth assessment of symptoms due to stents after PCNL and their impact on daily life has not previously been performed in Vietnam to our knowledge. Therefore, this study was conducted to assess symptoms and impact of Double-J stent on the quality of life after percutaneous nephrolithotomy in Vietnam.

2. Subjects and Methods

2.1. Study Subjects

We conducted a Longitudinal 1 at Bach Mai Hospital, Hanoi, Vietnam, from August 2022 to May 2023.

We selected patients who (1) were diagnosed with kidney stone according to EAU guidelines on diagnosis and conservative management of urolithiasis (2016) [9] by doctors/specialists; (2) were treated using percutaneous nephrolithotomy (PCNL); had a single double-J stent inserted and completed medical records were available at the study site; and (3) were completely informed about the study, subsequently opting to participate voluntarily by providing their consent.

The exclusion criteria specified people who (1) were treated by PCNL and inserted D-J stents on both sides or (2) had complications requiring re-operation.

2.2. Sample Size

Convenience sampling. A total of 200 patients meeting the inclusion and exclusion criteria were included in the study.

2.3. Measurements and Instruments

The questionnaire was divided into three main sections:

Socio-demographic characteristics included information on age, gender and Body Mass Index (BMI).

Clinical data included location and size of stone, operation time.

Ureteral Stent Symptom Questionnaire (USSQ) developed by Joshi et al. (2003) with 38 scoring items, which addressed six domains of health (6 sections): Urinary symptoms (U), Body Pain (P), General Health (G), Sexual matters (S), Work performance (W), Additional problems (A). In addition, at the end of the USSQ questionnaire, there is a question about General Quality of life = GQ. The AQ question is opening question. Do not calculate the point in this question. Scores were marked for each answer, and the total score was assessed for each section separately. The higher the score, the lower the quality of life; a higher score on a particular area corresponds to a greater impact of the ureteral catheter on that specific health. The more often the symptoms occur, the lower the quality of life.

2.4. Data Analysis

The data analysis was conducted using SPSS 26.0 software. We use frequency and percentage (%) to characterize qualitative variables and mean and standard deviation (SD) to characterize quantitative variables. We used paired-sample T-test, Independent T-test, Analysis of Variance (ANOVA) to compare the differences in urinary symptoms, body pain, general health, work performance, sexual matters, additional problems. The chi-square test was used for the categorical variables. A p -value ≤ 0.05 was considered statistically significant for all analyzes.

2.5. Ethical Considerations

Patients gave their written informed consent at the start of data collection. The patients' course of therapy was unaffected by their participation, and participants were free to leave the research at any moment. All research subjects' information was provided solely for research purposes and was assured to remain private. The study was approved by the Bach Mai Hospital Human Subjects Protection Committee (Code BM_2023_30, number 694/BM-DTNCYD) and followed the STROCSS 2019 criteria.

3. Result

From August 2022 to May 2023, 200 patients who underwent percutaneous nephrolithotomy (PCNL) at Bach Mai Hospital were included in the study. The demographic distribution of the participants was as follows: 35.5% female and 64.5% male, with a mean age of 53.06 ± 11.87 years (range: 22–82 years).

Table 1. Patient characteristics.

Age (years)	53.06 (22-82)
Gender, male/female	129/71
BMI (kg/m ²)	23.65 ± 3.22 (14.5 – 32)
Stone	
Sizes (mm), mean (min – max)	11 (5-16)
Left side, n (%)	97 (48.5)
Right side, n (%)	103 (51.5)
One pebble/ ≥ 2 pebbles, n (%)	109 (54.5) / 91 (45.5)
Operation time (min), mean (min – max)	56,4 ± 14,5 (40 - 130)

The patients' age ranged from 22 to 88 year old. Most of the patients were middle aged. Males were 1.8 times more than women. The proportion of patients with stones on the left side was almost equal with that patients with stones on the right side.

Table 2. Comparison of symptoms and QoL scales in patients with D-J stent and after removal.

Total number of patients	With D-J	After removal	p-value (p < 0,05)
Quality of life (QoL) (QoL)	59.15±6.01	35.28±4.15	0.000
Urinary symptoms	23.85±7.75	16.2±3.21	0.000
Body pain	13.5±2.9	7.47±1.4	0.000
Work performance	9.63±0.85	3.6± 1.09	0.000
Sexual quality of life	4.93±0.72	3.48±0.53	0.000
Visual analogue scale (VAS)	8 (2-10)	0 (0-7)	< 0,001

The total USSQ (Ureteral Stent Symptom Questionnaire) score of patients with stents significantly decreased compared to the total USSQ score of patients post-DJR (double-J stent removal) across all domains, with these differences being statistically significant (p < 0.05). Pain during voiding was the most common pain-related symptom in patients with a dou-

ble-J (D-J) stent. After the stent's removal, most of these pain-related symptoms disappeared. Dysuria was the most common urinary symptom in patients with a D-J stent. After the stent's removal, incomplete emptying became the most common urinary symptom, generally appearing occasionally.

Table 3. General health domains of patients with stent and without stent (N=200).

	Never (%)		Occasionally (%)		Sometimes (%)		Most of the time (%)		p-value (p < 0.05)
	D-J (+)	D-J (-)	D-J (+)	D-J (-)	D-J (+)	D-J (-)	D-J (+)	D-J (-)	
Vitality (tired)	62.5	80.5	31.5	15.5	6	4	0	0	0.001
Feeling calm and peaceful	0	0	35	1	65	18	0	8	0.000
Social life enjoyment	0	0	43.5	1	42	18	14.5	81	0.000
Need extra help	52	100	42	0	6	0	0	0	0.000

Patients with a stent experienced a variable degree of impact on all general health domains. After stent removal, these impacts nearly disappeared.

4. Discussion

In urological surgery, double-J (D-J) stenting causes discomfort for the majority of patients. Ureteral stents often lead to side effects such as storage and/or excretion problems, overactive bladder symptoms, hematuria, and pain. These symptoms are inevitably associated with stenting and can reduce the patient's quality of life [12, 13, 17]. To date, the pathophysiology of stent-related symptoms remains unclear [18]. These symptoms may result from smooth muscle spasms caused by local irritation of nerve tissues rich in α -1D receptors located in the bladder mucosa and the lower end of the ureter, similar to benign prostatic hyperplasia [12, 19, 20].

In a previous study, it was found that 58% of patients with stents experienced impaired job performance. Of these participants, 46.8% reported discomfort significant enough to keep them bedridden for one or more days due to D-J stenting. The study also revealed that 70% of these patients missed work time because of stent-related issues. Approximately 21%-22% of employed patients used sick leave for periods ranging from 1 to 4 days and also reported using annual leaves. Additionally, employees in 33.4% of workplaces reported making some adjustments due to their condition. The study concluded that D-J stents had statistically significant adverse effects ($p < 0.001$) on participants' work performance and quality of work [13].

Among comparative studies, Mercado et al. reported no differences between groups in terms of postoperative pain, incidence of perirenal hematomas, residual lithiasis, and urinary leakage. However, patients in the indwelling double-J stent group experienced longer hospital stays (3.7 ± 1.7 vs. 1.9 ± 0.3 days; $p < 0.001$) and greater hematocrit drops (4.9 ± 2.2 vs. $2.1 \pm 1.8\%$; $p < 0.001$) compared to the overnight-externalised ureteral stent group [19]. The removal of the double-J stent requires cystoscopy, so the surgeon should carefully consider which method to choose. Shabeena et al. discovered bacterial colonies in 47.2% (34 of 72) of D-J stents. *Escherichia coli* (20%) was the most common pathogen, followed by *Streptococcus* species (17.5%) and *Pseudomonas* (12.5%). The stents did not show colonization within the first 2 weeks, but 81.3% and 66.7% of stents were colonised after 90-120 days and 60-90 days, respectively [10]. Ketan Mehra found that over 46 (29.3%) patients had grade-1 bladder coil and 111 (70.7%) had grade-2 bladder coil. Patients with grade-2 coils experienced more pain than those with grade-1 coils ($p = 0.01$). There was a weak inverse relationship between the ureteral stent length ratio and urinary symptoms ($p = 0.004$), pain symptoms ($p = 0.04$), and quality of work ($p = 0.005$) [14].

Our study also shows that D-J stents significantly affect the clinical characteristics and quality of life of patients (Table 2).

The design of ureteral stents, including the length and diameter of the ureteral catheter, can affect postoperative symptoms [16, 21, 22]. Previous studies have shown that the tail stent model, with an average diameter close to 7F, and even as low as 3F, significantly reduces symptoms compared to standard 7F D-J stents [11, 23]. However, other studies indicate no difference in clinical symptoms when using D-J stents of different sizes and lengths. Clinical symptoms often associated with D-J stents may be due to the movement of the lower end of the catheter located in the bladder as the body moves [13, 24, 25]. A prospective randomised controlled trial comparing silicone Imajin hydro stents to Percuflex Plus stents found that silicone stents cause less patient discomfort and are recommended for patients requiring stenting due to stone disease [15].

This study has potential limitations. Firstly, it is a retrospective study with a small sample size conducted at a single centre, introducing certain selection biases. Secondly, the absence of a baseline symptom questionnaire prevents ruling out the presence of previous symptoms unrelated to the stent. We will continue to address these issues in future research.

5. Conclusion

Double-J stents severely affect patients' symptoms, thereby lowering their quality of life. They should be used only when necessary, for the shortest duration possible, and all available technological and pharmaceutical options should be employed to mitigate their effects.

Abbreviations

BMI	Body Mass Index
PCNL	Percutaneous Nephrolithotomy
D-J	Double-J
USSQ	Ureteral Stent Symptom Questionnaire
ESWL	Extracorporeal Shock Wave Lithotripsy
URS	Ureteroscopy
RIRS	Retrograde Intrarenal Surgery

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Author Contributions

Hien Nguyen Thi Thanh: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Validation, Visualization, Writing – original

draft, Writing – review & editing

Lan Anh Nguyen Thi: Methodology, Project administration, Resources, Supervision, Validation, Writing – review & editing

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Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Epi Stamatelou K, Goldfarb DS. Epidemiology of Kidney Stones. *Healthcare (Basel)*. 2023 Feb 2; 11(3): 424. <https://doi.org/10.3390/healthcare11030424>
- [2] Hyams ES, Matlaga BR. Economic impact of urinary stones. *Transl Androl Urol*. 2014 Sep; 3(3): 278-83. <https://doi.org/10.3978/j.issn.2223-4683.2014.07.02>
- [3] Le, Binh & Vu, Kim-Duy & Tra, Duong & Kien, Ngo. (2022). PERCUTANEOUS NEPHROLITHOTRIPTY PRACTICE IN VIETNAM: A SYSTEMATIC SCOPING REVIEW. *Vietnam Medical Journal*. 515. Percutaneous Nephrolithotripsy practice in Vietnam: A systematic scoping review, <https://doi.org/10.51298/vmj.v515i1.2408>
- [4] Shastri S, Patel J, Sambandam KK, Lederer ED. Kidney Stone Pathophysiology, Evaluation and Management: Core Curriculum 2023. *Am J Kidney Dis*. 2023 Nov; 82(5): 617-634. <https://doi.org/10.1053/j.ajkd.2023.03.017>
- [5] Carrion DM, Cansino JR, Quintana LM, Gómez Rivas J, Mainez Rodriguez JA, Pérez-Carral JR, Martínez-Piñero L. Prone percutaneous nephrolithotomy: its advantages and our technique for puncture. *Transl Androl Urol*. 2018 Dec; 7(6): 950-959. <https://doi.org/10.21037/tau.2018.10.04>
- [6] Bhat S, Lal J, Paul F. A randomized controlled study comparing the standard, tubeless, and totally tubeless percutaneous nephrolithotomy procedures for renal stones from a tertiary care hospital. *Indian J Urol*. 2017 Oct-Dec; 33(4): 310-314. https://doi.org/10.4103/iju.IJU_52_17
- [7] Abt D, Däzer K, Honek P, Müller K, Engeler DS, Burger M, Schmid HP, Knoll T, Sanguedolce F, Joshi HB, Fritsche HM. The German linguistic validation of the Ureteral Stent Symptoms Questionnaire (USSQ). *World J Urol*. 2017 Mar; 35(3): 443-447. <https://doi.org/10.1007/s00345-016-1875-6>
- [8] Giannarini G, Keeley FX Jr, Valent F, Milesi C, Mogorovich A, Manassero F, Barbone F, Joshi HB, Timoney AG, Selli C. The Italian linguistic validation of the ureteral stent symptoms questionnaire. *J Urol*. 2008 Aug; 180(2): 624-8. <https://doi.org/10.1016/j.juro.2008.04.022> Epub 2008 Jun 12. Erratum in: *J Urol*. 2010 May; 183(5): 2102.
- [9] EAU guidelines on diagnosis and conservative management of urolithiasis. Türk C, Petřík A, Sarica K, Seitz C, Skolarikos A, Straub M, Knoll T. *Eur Urol*. 2016; 69: 468–474. <https://doi.org/10.1016/j.eururo.2015.07.040>
- [10] Shabeena KS, Bhargava R, Manzoor MAP, Mujeeburahiman M. Characteristics of bacterial colonization after indwelling double-J ureteral stents for different time duration. *Urol Ann*. 2018 Jan-Mar; 10(1): 71-75. https://doi.org/10.4103/UA.UA_158_17
- [11] Vogt B. Challenges To Attenuate Ureteric Stent-Related Symptoms: Reflections On The Need To Fashion A New Dynamic Stent Design Consequent Upon A Case Report. *Res Rep Urol*. 2019 Oct 23; 11: 277-281. <https://doi.org/10.2147/RRU.S224068>
- [12] Camtosun A, Bicer S. The impact of Double J stent on the quality of sexual life and job performance. 2020; 47(2): 199-201.
- [13] Joshi HB, Stainthorpe A, MacDonagh RP, Keeley FX Jr, Timoney AG, Barry MJ. Indwelling ureteral stents: evaluation of symptoms, quality of life and utility. *J Urol*. 2003 Mar; 169(3): 1065-9; discussion 1069. <https://doi.org/10.1097/01.ju.0000048980.33855.90>
- [14] Mehra K, Manikandan R, Dorairajan LN, Sreenivasan Kodakkattil S, Kalra S. Effect of Ureteral Stent Length and Position of Stent Coil in Bladder on Stent-Related Symptoms and Quality of Life of Patients. *Cureus*. 2020 Nov 24; 12(11): e11669. <https://doi.org/10.7759/cureus.11669>
- [15] Wiseman O, Ventimiglia E, Doizi S, Kleinclaus F, Letendre J, Cloutier J, Traxer O. Effects of Silicone Hydrocoated Double Loop Ureteral Stent on Symptoms and Quality of Life in Patients Undergoing Flexible Ureteroscopy for Kidney Stone: A Randomized Multicenter Clinical Study. *J Urol*. 2020 Oct; 204(4): 769-777. <https://doi.org/10.1097/JU.0000000000001098>
- [16] Song MG, Seo TS, Lee CH, Kim KA, Kim JS, Oh SC, Lee JK. Comparison of Two Types of Double-J Ureteral Stents that Differ in Diameter and the Existence of Multiple Side Holes along the Straight Portion in Malignant Ureteral Strictures. *Cardiovasc Intervent Radiol*. 2015 Jun; 38(3): 702-8. <https://doi.org/10.1007/s00270-014-0963-5> Epub 2014 Aug 27.
- [17] Lu J, Lu Y, Xun Y, Chen F, Wang S, Cao S. Impact of Endourological procedures with or without double-J stent on sexual function: a systematic review and meta-analysis. *BMC Urol*. 2020 Feb 14; 20(1): 13. <https://doi.org/10.1186/s12894-020-0582-1>
- [18] Hori T, Makino T, Kawahara T, Urata S, Miyagi T. Effectiveness of Double-J Metallic Mesh Ureteral Stents for Malignant Ureteral Obstruction: A Retrospective Study. *In Vivo*. 2023 Mar-Apr; 37(2): 806-810. <https://doi.org/10.21873/invivo.13145>
- [19] Mercado A, Fernández MI, Recabal P, Fleck D, Ledezma R, Moya F, Sepúlveda F, Vilches R, Reyes D, Marchant F. Immediate postoperative morbidity in patients with indwelling double-J stent versus overnight-externalized ureteral catheter after tubeless percutaneous nephrolithotomy: a prospective, randomized study. *Urolithiasis*. 2013 Jun; 41(3): 253-6. <https://doi.org/10.1007/s00240-013-0555-x> Epub 2013 Mar 23.

- [20] Ozyer U, Dirim A. Tandem ureteral stents in the management of double-J stent dysfunction in gynecological malignancies. *Diagn Interv Imaging*. 2017 Sep; 98(9): 601-608. <https://doi.org/10.1016/j.diii.2017.07.005> Epub 2017 Aug 10.
- [21] Cauda V, Chiodoni A, Laurenti M, Canavese G, Tommasi T. Ureteral double-J stents performances toward encrustation after long-term indwelling in a dynamic in vitro model. *J Biomed Mater Res B Appl Biomater*. 2017 Nov; 105(8): 2244-2253. <https://doi.org/10.1002/jbm.b.33756> Epub 2016 Jul 26.
- [22] Zeng X, Xiao B, Hu W, Liu C, Xie H, Xie L, Yang W, An F, Cui Z, Zhu F, Zhang Z, Bi J, Li Y, Li J. A modified triangular Double-J stent for retrograde intrarenal surgery improvement of free-stone rate, and quality of life: a randomized controlled, multiple centers, perspective trial. *World J Urol*. 2023 Jun; 41(6): 1653-1658. <https://doi.org/10.1007/s00345-023-04392-1> Epub 2023 Apr 13.
- [23] Dunn MD, Portis AJ, Kahn SA, Yan Y, Shalhav AL, Elbahnasy AM, Bercowsky E, Hoenig DM, Wolf JS Jr, McDougall EM, Clayman RV. Clinical effectiveness of new stent design: randomized single-blind comparison of tail and double-pigtail stents. *J Endourol*. 2000 Mar; 14(2): 195-202. <https://doi.org/10.1089/end.2000.14.195>
- [24] Cozma C, Georgescu D, Popescu R, Geavlete B, Geavlete P. Double-J stent versus percutaneous nephrostomy for emergency upper urinary tract decompression. *J Med Life*. 2023 May; 16(5): 663-667. <https://doi.org/10.25122/jml-2022-0334>
- [25] Qi Y, Kong H, Xing H, Zhang Z, Chen Y, Qi S. A randomized controlled study of ureteral stent extraction string on patient's quality of life and stent-related complications after percutaneous nephrolithotomy in the prone position. *Urolithiasis*. 2023 Apr 28; 51(1): 79. <https://doi.org/10.1007/s00240-023-01451-5>