

# Assessing safety and efficacy of flexible ureteroscopy and laser lithotripsy in elderly patients

## Evaluación de la seguridad y eficacia de la ureteroscopia flexible y la litotricia láser en pacientes de edad avanzada

Jeffer D. Álvarez-Villarraga<sup>1\*</sup>, Herney A. García-Perdomo<sup>2</sup>, Héctor A. Ramírez-Vásquez<sup>3</sup>, Jorge E. Palacios-Riascos<sup>4</sup>, and Andrea López-Sanmiguel<sup>5</sup>

<sup>1</sup>Departamento de Urología, Clínica DESA, Cali; <sup>2</sup>Departamento de Urología, Universidad del Valle, Cali; <sup>3</sup>Departamento de Cirugía, Clínica DESA, Cali; <sup>4</sup>Departamento de Cirugía, Clínica DESA, Cali; <sup>5</sup>Facultad de Medicina, Pontificia Universidad Javeriana, Bogotá. Colombia

### Abstract

**Objective:** The objective of the study was to determine the efficacy and safety of flexible ureteroscopy (F-URS) for the management of intrarenal or proximal ureteral lithiasis in aged patients. **Materials and methods:** In this retrospective, multicenter observational study, we collected the anonymized clinical data of patients who underwent F-URS at two institutions in Cali, Colombia between June 2015 and May 2018. The patients were divided into two groups based on age: Group A defined as aged patients (> 65 years) and Group B as patients of non-advanced age (< 65 years). **Results:** A total of 201 patients were included in this study. The average age for Group A was 75 years ( $\pm$  4.5) and for Group B was 51 years ( $\pm$  10). The anesthetic risk classification (American Society of Anesthesiology [ASA]) and comorbidities were significantly higher for Group A with an ASA II and III of 74% versus 50% in Group B. No significant differences were shown in the stone-free rates (SFRs) or significant ureteral injury (Grade III and IV). There was no difference in intraoperative or post-operative complications between both groups. **Conclusions:** Age > 65 years was not associated with a negative impact on the outcomes of F-URS for the management of intrarenal or proximal ureteral lithiasis in this cohort of patients. F-URS appears as a safe and effective procedure and should not be withheld from older patients.

**Keywords:** Ureteroscopy. Lithotripsy. Laser. Urinary calculi. Aged.

### Resumen

**Objetivo:** Determinar la efectividad y seguridad de la ureteroscopia flexible (F-URS) para el manejo de la litiasis ureteral intrarrenal o proximal en pacientes ancianos. **Materiales y métodos:** En este estudio observacional multicéntrico y retrospectivo, se recogieron los datos clínicos de los pacientes sometidos a F-URS en dos instituciones de Cali, Colombia, entre junio de 2015 y mayo de 2018. Los pacientes se dividieron en dos grupos según la edad. El grupo A se definió como pacientes de edad avanzada (> 65 años) y el grupo B como pacientes de edad no avanzada (< 65 años). **Resultados:** Un total de 201 pacientes fueron incluidos en este estudio. La edad media para el grupo A fue de 75 años ( $\pm$  4,5) y para el grupo B fue de 51 años ( $\pm$  10). La clasificación de riesgo anestésico (ASA) y las comorbilidades fueron significativamente mayores para el grupo A con un ASA II y III del 74% frente al 50% en el grupo B. No se observaron diferencias significativas en las tasas libres de cálculos ni en la lesión ureteral significativa (grado III y IV). No hubo diferencias en las complicaciones anestésicas, intraoperatorias o postoperatorias entre ambos grupos.

#### \*Correspondence:

Jeffer D. Álvarez-Villarraga

E-mail: davidalvarezurologia@gmail.com

0120-789X / © 2024 Sociedad Colombiana de Urología. Publicado por Permanyer. Este es un artículo open access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Date of reception: 21-11-2023

Date of acceptance: 22-01-2024

DOI: 10.24875/RUC.23000122

Available online: 22-03-2024

Urol. Colomb. 2024;33(1):15-19

[www.urologiacolombiana.com](http://www.urologiacolombiana.com)

**Conclusiones:** *La edad > 65 años no se asoció con un impacto negativo en los resultados urológicos ni en la tasa de éxito de la F-URS para el manejo de la litiasis ureteral intrarrenal o proximal en esta cohorte de pacientes. La F-URS es un procedimiento seguro y eficaz, y no debe contraindicarse en los pacientes de edad avanzada.*

**Palabras clave:** *Ureteroscopia flexible. Litotricia láser. Litiasis renal. Litiasis ureteral. Edad avanzada.*

## Introduction

Urolithiasis, a condition characterized by the formation of stones within the urinary tract, presents a significant burden on health, contributing to substantial morbidity. The primary objective of urolithiasis intervention is the complete elimination of stones while mitigating patient morbidity. Treatment options for upper ureteral stones include extracorporeal shock wave lithotripsy, ureteroscopy (URS), and percutaneous nephrolithotomy<sup>1</sup>.

The historical evolution of endoscopic techniques has markedly influenced the diagnosis and management of upper urinary tract diseases<sup>2,3</sup>. The introduction of the holmium laser: YAG has notably increased the efficacy of endoscopic lithotripsy, becoming the preferred method for such interventions due to its safety profile within the urinary tract<sup>4</sup>. However, its invasive nature bears potential risks and complications.

Urolithiasis affects individuals across all age groups. Current clinical practice guidelines often focus on a middle-aged, healthy population, leading to a lack of specific treatment recommendations for patients at the extremes of the age spectrum<sup>5</sup>. Flexible URS (F-URS) has emerged as the first-line therapy for mid or distal ureteral stones that require intervention and an optimal approach for managing non-lower pole renal stones  $\leq 2$  cm that has been unresponsive to prior interventions or  $\leq 10$  mm lower pole renal stones. Advancements in flexible ureteroscope technology have substantially enhanced its diagnostic and therapeutic utility, improving its efficacy while reducing adverse events<sup>5</sup>. Nonetheless, evidence evaluating the safety and efficacy of this procedure in the elderly population remains limited.

The extension of the human lifespan and increased life expectancy is evident in the national population pyramids<sup>6</sup>. This demographic shift leads to a growing population of older individuals, often with higher morbidity, and increased anesthetic risks during surgical procedures, potentially influencing success rates and complication rates in urological procedures.

This study aims to assess the efficacy and safety of the F-URS procedure in individuals over 65 years, in comparison to a cohort of patients under 65 years, evaluating potential age-related differences in its outcomes and safety.

## Materials and methods

The study design was a multicenter retrospective observational study. We analyzed anonymized data from the institutional medical record system of two centers in Cali, Colombia, from June 2015 to May 2018.

We included patients undergoing F-URS for the management of intrarenal or proximal ureteral stones who, based on clinical criteria and diagnosis, classified for this procedure as being the best therapeutic option. The diagnosis was confirmed by a non-contrast computerized axial tomography. Patients with missing data on study variables, active urinary tract infections, bleeding diathesis, or stones larger than 2 cm were excluded from the study. In addition, patients below 18 years old were not included in the study. For the analysis, patients were stratified into two groups: group A (n: 30) defined as aged patients (> 65 years), and Group B (n: 171) as patients of non-advanced age (< 65 years). All patients underwent F-URS under general anesthesia, with the same endoscopic equipment, a FLEXOR-2 nephroscope, with the subsequent passage of an 11 French (Fr) ureteral access sheath, and a 276-nanometer Holmium: YAG fiber to perform lithotripsy.

We collected the patient's demographic and clinical characteristics, including age, sex, anesthetic risk, comorbidities, stone characteristics, and location. These characteristics were analyzed and compared between the two groups, as well as the operative and post-operative results, such as ureteral access sheath time, double J catheter use, and stone-free rate. Stone-free rate (SFR) was defined as radiologically stone-free or without fragments larger than 2mm on a standard abdominal radiograph 4 weeks after treatment. Statistical analysis was performed with descriptive statistics using STATA with the information registered in a dataset in EXCEL. Categorical variables were expressed as numbers and percentages. Quantitative variables were expressed as medians.

## Results

Of the 216 patients identified, 201 patients were analyzed. The mean age of patients in Group A was 75

(SD  $\pm$  4.5), where 16 (53.3%) were women and 14 (46.7%) were men; in Group B, the mean age was 51 (SD  $\pm$  10) of which 66 (38.5%) were women and 105 (61.5%) were men (Table 1).

Overall, Group A patients had more comorbidities present. We found that hypertension had the highest prevalence, with a total of 63.3% in Group A, followed by diabetes mellitus (16.7%) and coronary heart disease (16.7%). No significant differences were found among the body mass index of the patients in both groups. Pre-operative Double J catheter use was more prevalent in Group A compared to Group B (50% vs. 43.2%), with a comparable mean time of around 12 weeks (Table 1).

The anesthetic risk was measured with the classification of the American Society of Anesthesiology (ASA), Group A had more patients classified in ASA 2 (50%) and ASA 3 (23.3%) compared with Group B (45% and 8.8%) (Table 1).

The stone location was predominantly on the right side for both groups, followed by single ureteral location (23.9%), pelvic (23.3%), and lower calyceal (23.3%) for Group A; and pelvic (24.6%) for Group B. The mean stone size was 13 mm for Group A and 11.8 mm for Group B (Table 2). A ureteral access sheath was used in all patients, with a longer procedural time recorded for Group A compared to Group B (41.4 min vs. 35.7 min). A post-operative Double J catheter was inserted in 83.3% of Group A patients, similar to 81.2% in Group B.

The final SFR was 76.6% for Group A and 79.5% for Group B (Table 3) with no significant statistical differences ( $p = 0.149$ ). Furthermore, no statistically significant differences were found for Grades II and IV ureteral injury between the two groups ( $p = 0.859$ ). Patients in Group A had 90% of Grade I ureteral trauma like Group B with 92.9%. No anesthetic or post-operative complications were reported. All patients recovered and were discharged home.

## Discussion

The historical development of ureteral stone management, traced from initial reports by Pérez-Castro and Hoffman-Bagley to subsequent assessments of URS's effectiveness, shows a significant evolution in treatment approaches, resulting in progressive enhancements in the SFR. F-URS has since emerged as the contemporary standard for managing urolithiasis, with the American Society of Urology recommending this approach as first-line option, particularly for non-lower

**Table 1.** Demographic and clinical characteristics

Characteristics	Group A (> 65 years)	Group B (< 65 years)
Mean age	30	75
Mean body mass index	26.89 kg/m <sup>2</sup>	26.94 Kg/m <sup>2</sup>
Sex		
Female	16 (53.3%)	66 (38.5%)
Male	14 (46.7%)	105 (61.5%)
Comorbidity		
Diabetes mellitus		
Yes	5 (16.7%)	15 (8.8%)
No	25 (83.3%)	156 (91.2%)
Hypertension		
Yes	19 (63.3%)	45 (26.3%)
No	11 (36.7%)	126 (73.7%)
Coronary heart disease		
Yes	5 (16.7%)	4 (2.3%)
No	65 (83.3%)	167 (97.7%)
Chronic kidney disease		
Yes	2 (6.7%)	1 (0.6%)
No	28 (93.3%)	170 (99.4%)
ASA classification		
ASA I	8 (26.7%)	79 (46.2%)
ASA II	15 (50.0%)	77 (45.0%)
ASA III	7 (23.3%)	15 (8.8%)
Pre-operative double J catheter		
Yes	15 (50%)	74 (43.2%)
No	15 (50%)	97 (56.7%)
Mean pre-operative catheter time	12.4 weeks	12.37 weeks

**Table 2.** Characteristics of calculi

Characteristics	Group A (> 65 years)	Group B (< 65 years)
Mean calculi size	13 mm	11.8 mm
Laterality		
Right	11 (36.7%)	76 (44.4%)
Left	14 (8.2%)	67 (39.2%)
Bilateral	5 (16.7%)	28 (16.4%)
Location		
Pelvic	7 (23.3%)	42 (24.6%)
Upper calyceal	4 (13.4%)	8 (4.7%)
Mid calyceal	2 (6.7%)	15 (8.8%)
Lower calyceal	7 (23.3%)	34 (19.9%)
Pelvic + upper calyceal	0 (0%)	5 (2.9%)
Pelvic + mid calyceal	0 (0%)	2 (1.2%)
Pelvic + lower calyceal	1 (3.3%)	6 (3.5%)
Calyceal + ureteral	1 (3.3%)	18 (10.5%)
Single ureteral	8 (26.7%)	41 (23.9%)

pole renal stones smaller than 2 cm and ureteral lithiasis. Moreover, it presents an opportunity for managing larger stones in select cases or instances of failed percutaneous nephrolithotomy<sup>7-10</sup>.

**Table 3.** Intraoperative and post-operative results

Results	Group A (> 65 years)	Group B (< 65 years)
Mean ureteral access sheath time	41.4 min	35.7 min
Post-operative double J catheter		
Yes	25 (83.3%)	139 (81.2%)
No	5 (16.7%)	32 (18.7%)
Stone free rate		
Yes	23 (76.6%)	136 (79.5%)
No	7 (23.4%)	35 (20.5%)

As the global population ages, the surge in older individuals with comorbidities demands careful consideration in surgical interventions, particularly in stone disease management. The analysis from the Clinical Research Office of the World Endourological Society confirms the low complication rates and efficacy of F-URS<sup>10,11</sup>.

Our study contributes valuable insights, indicating a comparable safety profile in managing renal and ureteral stones in older people. Despite their higher operative and anesthetic risks, our findings did not reveal significant differences in intraoperative or post-operative complications between the aged and non-aged groups.

Similarly, SFRs and significant ureteral injuries showed no significant differences between the two groups. This suggests that F-URS presents minimal peri and post-operative impact, being a viable and safe option for the management of stones in the aged population.

Our study strengthens the growing evidence for URS in older adults with stones. While our SFR mirrors the SFR of 73.9% reported by Solomon et al., their larger study population with a higher mean age provides further robust data on the efficacy of URS in aged people. These findings, along with their low complication rate of 20.7% for minor complications and 5.7% for major complications, further prove the role of URS as a safe and effective treatment option for these patients<sup>12</sup>.

Furthermore, these findings are consistent with those from Tamiya et al., who conducted an analysis on recurrent kidney stones in both young and elderly patients after URS. The final SFR of all cases was 93.3% and they found no significant differences in the SFR or the rate of surgical complications between the young group and the elder groups<sup>13</sup>.

Considering the morbidity and complication rates associated with percutaneous nephrolithotomy, especially in

older patients with comorbidities, a multi-step intervention using F-URS might offer a promising alternative for managing larger stones. This approach holds the potential to minimize surgical morbidity in the aged, aligning with the increasing need for safer surgical techniques in this demographic group<sup>14</sup>.

## Conclusions

The present study demonstrated that F-URS in aged patients is a safe and effective procedure with a minimum rate of complications and satisfactory surgical results. Age did not show to have a negative impact on intraoperative or post-operative results, and it appears to be comparable in terms of SFR. F-URS should not be withheld from older patients seeking for management of kidney and ureteral stones.

## Funding

This research has not received any specific grants from agencies in the public, commercial, or for profit sectors.

## Conflicts of interest

The authors declare no conflicts of interest.

## Ethical disclosures

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this study.

**Confidentiality of data.** The authors declare that they have followed the protocols of their work center on the publication of patient data.

**Right to privacy and informed consent.** The authors did not require approval from the Ethics Committee because it included anonymized data and informed consent was not required for this retrospective observational study.

**Use of artificial intelligence for generating text.** The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript nor for the creation of images, graphics, tables, or their corresponding captions.

## References

1. Cavildak IK, Nalbant I, Tuygun C, Ozturk U, Goktug HN, Bakirtas H, et al. Comparison of flexible ureterorenoscopy and laparoscopic ureterolithotomy methods for proximal ureteric stones greater than 10 mm. *Urol J.* 2016;13:2484-9.

2. Nazif OA, Teichman JM, Glickman RD, Welch AJ. Review of laser fibers: a practical guide for urologists. *J Endourol.* 2004;18:818-29.
3. Humphreys MR, Miller NL, Williams JC, Evan AP, Munch LC, Lingeman JE. A new world revealed: early experience with digital ureteroscopy. *J Urol.* 2008;179:970-5.
4. Ríos G, Felipe J, Trujillo U, Alberto C. Ureterorenoscopia flexible con ho : yag láser en el manejo de la litiasis del tracto urinario. *Urol Colomb.* 2009;18:83-92.
5. Assimos D, Krambeck A, Miller NL, Monga M, Murad MH, Nelson CP, et al. Surgical management of stones: American urological association/endourological society guideline, part II. *J Urol.* 2016;196:1161.
6. Ministerio De salud y Protección Social Oficina de Promoción Social. Envejecimiento Demográfico. Colombia 1951-2020 Dinámica Demográfica y Estructuras Poblacionales. Available from: <https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/DE/PS/Envejecimiento-demografico-Colombia-1951-2020.pdf> [Last accessed on 2024 Jan 08].
7. Conlin MJ, Marberger M, Bagley DH. Ureteroscopy: development and instrumentation. *Urol Clin North Am.* 1997;24:25-42.
8. Buscarini M, Conlin M. Update on flexible ureteroscopy. *Urol Int.* 2008;80:1-7.
9. López L, Freyre FG, Daels P, González M. Manejo endourológico de la litiasis renoureteral con ureterosopia flexible. *Urol Colomb.* 2012;21:54-63.
10. EAU Guidelines. Edn. In: Presented at the EAU Annual Congress, London; 2018.
11. Tseng JS, Lin WR, Sun FJ, Lin TF, Tsai WK, Chiang PK, et al. Predicting percutaneous nephrolithotomy outcomes and complications in elderly patients using guy's scoring system and Charlson comorbidity index. *Int J Gerontol.* 2018;12:239-43.
12. Solomon IP, Klein I, Friefeld Y, Zreik R, Fares G, Dekel Y. Ureteroscopy in the elderly: safety and functional results. *World J Urol.* 2023;41:2179-83.
13. Tamiya T, Takazawa R, Uchida Y, Waseda Y, Kobayashi M, Fuse H. Stone-event-free survival after ureteroscopic lithotripsy by age: comparison between young and older patients. *Urolithiasis.* 2023; 51:74.
14. Labate G, Modi P, Timoney A, Cormio L, Zhang X, Louie M, et al. The percutaneous nephrolithotomy global study: classification of complications. *J Endourol.* 2011;25:1275-80.