



Research Article

The Role of Flexible Laser Ureterorenoscopy in the Management of Lithiaises of the Lower Calyceal Group $\geq$ 2cm

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Abstract

Introduction: Lower calyceal stones account for 35% of urinary stones. However, little is known about their clinical and therapeutic epidemiology in Gabon. **Objective:** To evaluate the feasibility and results of flexible laser ureterorenoscopy in the management of stones larger than 2 cm located in the lower calyx. **Patients and methods:** We conducted a retrospective observational study over a period from January 2021 to September 2023. This was a single-centre study carried out at the Omar Bongo Ondimba Military Teaching Hospital in Libreville. We included 89 patients with lower calyceal stones treated with flexible laser ureterorenoscopy. **Results:** All patients had urolithiasis diagnosed on the basis of clinical findings and confirmed in 100% of cases by non-contrast thin-section CT scanning of the urinary tract. The mean age of patients was 35 ± 7 years, with extremes of 16 and 62 years, and a clear female predominance (54%). All stones were located in the lower calyx, with a predominance of calcium oxalate monohydrate stones (20%). Ninety-one per cent (91%) of patients had stones between 2.3 and 3 cm in size, and 9% (9 patients) had stones larger than 3 cm. Most stones were unilateral, with only 11 patients having bilateral stones. All patients were treated with URSS-YAG laser in its various modes. In total, we performed 97 procedures with a clearance rate of 91% and 100% after one and two sessions, respectively. The average length of hospitalisation was 1.5 days. Post-operative complications were minor in 100% of cases. **Conclusion:** Based on our results, laser URS appears to be the first-line treatment for stones greater than or equal to 2 cm located in the lower calyceal group in our context.

Keywords

Flexible Laser Ureteroscopy, Lithiasis, Lower Calyceal Group $\geq$ 2 cm

1. Introduction

Urinary lithiasis is defined as a multifactorial condition characterised by the presence of stone-like concretions in the urinary

tract. It is a public health problem that affects 10% of the population in industrialised countries [1-3]. In Africa, specifically in

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Yaounde, Cameroon, the incidence of lithiasis was 17.25% in 2023 [4]. Minimally invasive surgery has become the validated gold standard for the treatment of kidney stones smaller than 2 cm. Currently, this indication is tending to expand to stones larger than 2 cm in diameter [4, 5]. In Gabon, as in most African countries, there is little data on the role of this surgical technique in the treatment of lower calyceal stones larger than 2 cm. With this in mind, and following recent publications, we initiated this study, which focuses specifically on the role of flexible laser ureterorenoscopy as the only minimally invasive technique in our therapeutic arsenal for the treatment of stones larger than 2 cm located in the lower calyceal system.

2. Patients and Methods

This was a single-centre, retrospective, non-comparative observational study on the role of flexible laser ureterorenoscopy in the management of urinary stones in the upper lower calyx measuring more than 2 cm at the Omar BONGO ONDIMBA Military Teaching Hospital over a period from January 2021 to September 2023. We included all hospitalised patients with a confirmed diagnosis of lower urinary tract stones who were treated with flexible laser ureterorenoscopy. We did not include patients whose diagnosis of lower urinary tract stones was not confirmed. We excluded patients with incomplete medical records. Success was defined as 'stone free', meaning no fragments or the presence of asymptomatic fragments smaller than 2 mm on follow-up imaging at 1 month, and at 3 months for patients who underwent a second laser URSS session. Failure was defined as the non-fragmentation of the stone to less than two-thirds of its initial size pre- or post-operatively at one month on follow-up imaging. Non-contrast urinary tract scanning was the only imaging modality used for pre- and post-operative assessment. For each patient, the variables studied were epidemiological (age, sex, prevalence), clinical (history, circumstances of discovery, physical signs), paraclinical (biological, morphological and spectrophotometric), therapeutic (medical and surgical), and evolutionary (length of hospitalisation, success and failure rates, postoperative outcomes, complications, residual fragments). The data collected was entered into Excel 2012. This data was then analysed using International Business Machines Corporation (IBM) Statistical Package for the Social Sciences (SPSS) 23 and EPI Info 7.2 software.

3. Results

Three hundred and twenty-three (323) cases of patients treated for urinary lithiasis during the study period were recorded. Among these patients, 141 had lower calyx lithiasis and only 89 underwent URSS surgery. The average age was 35 ± 7 years, with extremes of 16 and 62 years. Most subjects were young. There were 48 women (54%) and 41 men (46%). The sex ratio was 0.8. The average size of the stones was $3.1 \text{ cm} \pm$

1. Ninety percent (90%) were treated in a single session and 10% in two sessions one month apart. The latter concerned stones larger than 4 mm that were symptomatic. The average duration of the procedure was 75 minutes, with a maximum duration of 120 minutes and a minimum duration of 48 minutes. The length of hospital stay varied from 1 ± 0.5 to 3 days, with an average of 1.5 days. There were no intraoperative procedural problems. No major complications were observed. However, 20% of patients experienced immediate postoperative pain, which was relieved by standard level I analgesics. Eighty-one patients, or 91% of patients, were stone-free after the first procedure. Nine patients, or 9% of patients, including eight with stones initially larger than 3 cm in diameter, underwent a second procedure one month later, and follow-up CT scans showed no residual stones. Spectrophotometric analysis was performed in 59 patients (66.29%), revealing a predominance of calcium oxalate (mono- and dihydrate) in the order of 37%.

4. Discussion

In our series, the majority of subjects were young (35 ± 7 years). This result is consistent with the literature, particularly Kamadjou et al. in 2021 [6], Ondziel-Opara et al. in 2022 [7] and Mahamat et al. in 2020 [8], who reported ages of 40.9 years, 42 years and $38.8 \text{ years} \pm 12 \text{ years}$, respectively, in their studies. This could be explained by the fact that developing countries, particularly in Africa, have a predominantly young population with a median age often below twenty years [9]. Our study found a female predominance, with 56% women and a sex ratio of 0.8. This result contradicts that found by Diagana et al. in Mauritania, who reported a female-to-male sex ratio of 1: 10 in a series of 164 cases [10]. This discrepancy can be explained by the fact that the distribution of stones according to gender varies from one study to another. International studies such as those by Mahamat et al. in Chad and Ngaroua et al. in Cameroon found a male predominance of 60.7% and 56.4% respectively [8, 11]. In this study, laser USST achieved success rates of 91% and 100% after one and two sessions, respectively. The study conducted by Jian Sheng Huang et al. focused on stones measuring 2 to 3 cm, with an overall success rate of 61.9%, 82.9%, and 89.5% after one, two, and three URSS laser sessions, respectively [12]. The same is true of the studies by Geraghty [13], which found success rates of 68-86%. The average duration of the procedure in our study was 75 minutes, with results varying between studies; the studies by Geraghty et al. and De Coninck et al. found an average duration of 92 minutes and 60-120 minutes, respectively [13, 14]. These variations in the duration of the procedure could be explained by the varying complexity of the cases treated and the experience of the surgical teams. During our study, the outcome was favourable, with simple postoperative recovery and no major complications in any of our patients. Similar results were also found in studies by Geraghty et al. [13], which reported no major complications during the

first URSS session, laser treatment, and only fever in 15% of patients after the second session [10, 14]. These results can be explained by the fact that URSS is a minimally invasive technique with low tissue impact and therefore fewer complications [15, 16]. The scan at one month showed no residual lithiasis in any of our patients. This outcome is observed in the majority of studies and makes URS an easily accepted approach for patients [17-19].

5. Conclusion

Lower calyceal stones measuring 2 cm or more currently represent a major challenge. Flexible laser URS has become the mainstay of treatment for these stones. It benefits from improvements in all aspects of the equipment, both in terms of flexible ureteroscopy and innovations in laser devices. In our context, given the percentage of patients who are stone-free after two sessions, we can say that laser SLUR appears to be the first-line treatment for stones larger than 2 cm located in the lower calyceal group.

Abbreviations

IBM	Analysed Using International Business Machines Corporation
SPSS	Statistical Package for the Social Sciences

Author Contributions

Mougougou Adrien: Conceptualization, Resources
Mbethe Dimitri: Methodology, Project administration

Conflicts of Interest

The authors declare no conflicts of interest.

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