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# *Retrograde Intrarenal Surgery for Renal Stones in Children: A prospective Analysis of Feasibility and Outcomes*

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**January 2023**

***INTRODUCTION:***

*The incidence of paediatric urolithiasis is on a rising trend globally,[1] and the treatment of stones in children poses a major challenge. Percutaneous nephrolithotomy (PCNL) and shock-wave lithotripsy (SWL) are the established forms of treatment for children with renal stones. despite its non-invasive and safe nature, coupled with high stone-free rates in children, necessity of multiple sessions under anesthesia and increased radiation-exposure risk constitute major concerns for SWL in this specific population [2].*

*On the other hand, published data, to date, have clearly demonstrated that despite excellent stone-free rates obtained in a single session along with ongoing miniaturization process, PNL has the greatest risk of major complications [3], [4], [5]. For this reason, PNL is generally reserved for stones >20 mm and for the ones when other treatment modalities have failed or would probably fail due to certain reasons [3], [4].*

*The acceptability and utilisation of the mini, ultramini and the micro PCNLs is on the rise and the complication rate of these procedures is comparable with the RIRS and is significantly low. Nevertheless, the complications such as the risk of bleeding requiring transfusion, pleural and visceral injury, although low, have not been completely eliminated, even with the miniaturized PCNLs[6,7,8,9].*

*RIRS has become an important treatment option for kidney stones in pediatric patients with the development of new-generation ureteroscopy and holmium laser. It is an effective method in the proximal ureter, collecting duct system, and, especially, lower calyx calculi[10].*

*Flexible ureteroscopy (FURS) has been applied in recent years to the treatment of urinary stones. FURS presents overt advantages over other techniques,*

*including improved resolution and increased optical field, high stone-free rate, reduced risk of bleeding, limited surgical injury, good repeatability, and speedy recovery; in addition, further miniaturization is possible[11–13]. In children and infants, who have a relatively high stone recurrence rate, FURS could be performed repeatedly [14].*

*• Several studies were conducted on RIRS for pediatric renal stones and proved its safety and efficacy. However, RIRS in pediatrics has crossed many milestones, yet many areas need further research, and larger data are required to make RIRS the procedure of choice for renal stone management in children .*

***OBJECTIVE AND HYPOTHESIS:***

*• In this study, we will evaluate the feasibility, stone-free rate, and complication rate of RIRS for renal stones in a pediatric population.*

*• We hypothesize that miniaturized equipment allows experienced urologists to deal with pediatric renal stones safely and effectively .*

***MATERIALS AND METHODS:***

*• **STUDY DESIGN**: A Prospective, single-arm interventional study*

*• **STUDY SETTING**: Urology department/ Al-Hussein and Bab El'Sharia , Al-Azhar University Hospitals*

*• **STUDY PERIOD**: Two years*

*• **STUDY POPULATION:***

*All children (≤18 years), with renal stones ≤ 2 cm indicated for treatment.*

***Exclusion criteria:***

*- Active urinary tract infection( UTI)*

*-Uncorrectable coagulation disorders.*

*- Concomitant pathology that need intervention in the same setting.*

*-Stone in a calyceal diverticulum.*

*-Abnormal renal anatomy*

*-Urinary tract obstruction distal to the stone.*

***Informed written consent will be obtained from the patient parents before inclusion in the study.***

*Parents should be told about the goals of the surgery, likely modifications during surgery, common complications and their treatments, period of hospitalization, postoperative protocol.*

***• STUDY PROCEDURE:***

◊ ***Preoperative evaluation:***

*- Medical history and physical examination*

*- Urinalysis, CBC, and serum creatinine*

*- Plain X-ray KUB and abdominal ultrasonography*

*- Abdominal low-dose NCCT*

*- Contrast imaging (CT or IVU), if detailed calyceal anatomy is needed.*

*- Routine preoperative laboratory investigations and anesthetic workup.*

*- Informed consent (Parental consent)*

◊ ***RIRS procedure:***

*- General anesthesia*

*- Prophylactic antibiotic*

*- Preoperative stenting (DJ), near 2 wks before RIRS.*

*- Without ureteral access sheath*

*- Under direct visualization and/or fluoroscopy guidance.*

*- Disposable flexible ureteroscope 8.6 Fr / 7.5 Fr, and Ho. YAG Laser for stone disintegration.*

*- PO ureteral stenting: external ureteric catheter or DJ stent.*

◊ ***Postoperative evaluation and follow-up:***

➢ ***1st PO day:***

*- Monitoring of general condition, vital signs, and urine colour*

*- CBC, abdominal USG and plain X-ray KUB*

*- Removal of urethral catheter ± Ureteric catheter, if patient is generally stable with clear urine.*

*- Patient will be discharged home on oral antibiotic and on demand analgesic.*

***➢ 2nd PO week and 2nd PO month:***

*- History and Ex., urinalysis, s. creatinine, abdominal USG and plain X-ray KUB or NCCT.*

*• The need for another lab or imaging studies or 2 nd RIRS session and time of DJ removal will be decided according to the PO follow-up findings.*

*• DJ will be removed after 2 weeks if (uncomplicated + Stone free).*

***▪ STUDY PARAMETERS***

*◊ Demographic data and preoperative*

*clinical characteristics*

*◊ Scope-to-stone access*

*◊ Operative time*

*◊ Fluoroscopy time*

*◊ Postoperative ureteral stenting method*

*◊ Intra- and post-operative complications*

*◊ Hospitalization time*

*◊ Postoperative pain (young children)*

*◊ Analgesic dosage*

*◊ Unscheduled hospital visits*

*◊ Reintervention*

*◊ Rehospitalization*

***Results:***

▪ ***Data analysis***

◊ *The 1ry end points are the feasibility of the technique (as evaluated by scope to-stone access rate) and SFR (as evaluated by postoperative imaging studies, 2 months after surgery).*

◊ *Patients will be stratified into 3 groups if sufficient (1) Infants and preschool children (upto 6 yrs); (2) Primary school children (>6 – 12 yrs); and Young children (>12 –18 yrs).*

◊ *The feasibility and outcomes of RIRS, overall and in each group, will be Analyzed using the SPSS program.*

Data Will be analyzed using Statistical Program for Social Science (SPSS) version 24. Qualitative data were expressed as frequency and percentage. Quantitative data were expressed as mean ±SD. **Mean (average):** the central value of a discrete set of numbers, specifically the sum of values divided by the number of values. **Standard deviation (SD):** is the measure of dispersion of a set of values. A low SD indicates that the values tend to be close to the mean of the set, while a high SD indicate that the values are spread out over a wider range.

<u>The following tests will be done:</u>

- **A one-way analysis of variance (ANOVA):** when comparing more than two groups.
- **Chi-square test:** will be used when comparing categorized data.
- **Probability (P-value)**
  - P-value < 0.05 was considered significant.
  - P-value < 0.001 was considered as highly significant.
  - P-value > 0.05 was considered insignificant.

***DISCUSSION:***

***SUMMERY & CONCLUSION:***

***ARABIC SUMMARY:***

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