Examining Pediatric Cases From the Clinical Research Office of the Endourological Society Ureteroscopy Global Study

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OBJECTIVE To evaluate the characteristics and outcomes of ureteroscopy (URS) in children treated in several hospitals participating in the Clinical Research Office of the Endourological Society (CROES) Study, and to present the overall results of pediatric URS compared with adults.

PATIENTS AND METHODS The CROES Study collected data on consecutive patients treated with URS for urolithiasis at each participating center over a 1-year period. The collected prospective global database includes data for 11,885 patients who received URS at 114 centers in 32 countries. Of these URS-treated patients, 192 were ≤18 years old.

RESULTS Of the 114 centers participating in the study, 42% had conducted pediatric URS. Among the pediatric cases, 7 were infants, 53 were small children, 59 were school-aged children, and 73 were adolescents. A considerable number (37%) of the pediatric cases had previously undergone URS treatment. No differences in the surgical outcomes of the adults and children were reported. The URS-treated children had a greater number of positive preoperative urine cultures when compared with adult cases treated. A semirigid scope was used in the vast majority of pediatric cases (85%). According to the present data, within the group of URS-treated children, the younger the child, the more readmissions occurred.

CONCLUSION URS is as efficient and safe in children as it is in adults. The data suggest that readmissions among URS-treated children are associated with age, with the likelihood of readmissions greater among younger age groups. UROLOGY ■■: ■■–■■, 2016. © 2016 Elsevier Inc.

Current trends in urolithiasis epidemiology are characterized by increased urolithiasis rates, combined with a shift toward a lower age of the first stone episode.[1,2] And although spontaneous passage is more likely in children than adults, some children benefit from active interventions.[2-7] The developments and experience made in the endoscopic treatment of adult stone disease also favorably affect pediatric cases. In the past, only mid-to-distal ureteral stones were treated. However, as a result of increased experience, recent clinical studies[1-4,8-10] have demonstrated the use of ureteroscopy (URS) in treating both upper ureteral and renal calculi.

Although minimally invasive interventions performed in adults and children may seem similar, there are also substantial differences. For example, in pediatric cases, the intervention is conducted on a still growing kidney and in smaller-sized anatomies,[6,11] for which different (smaller-sized) equipment is needed. Furthermore, anesthesia requirements for children are different from those of adults. In the pediatric population, diagnostic methods may differ, and the population has an increased hypothermia risk and is vulnerable to the long-term effects of ionizing radiation.[4,7] Finally, the pediatric population may have different clinical manifestations and a higher risk of lifelong recurrent interventions than adults.[12] Subsequently, the diagnosis, treatment, and follow-up protocols have to take these differences and challenges in pediatrics cases into account.

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Multicenter studies with large patient series can provide insights in the approaches used in different countries and medical centers, as well as surgeons' preferences. The Clinical Research Office of the Endourological Society (CROES) URS Global Study has established the world's largest URS database with 11,885 cases treated. This enables analyses of pediatric and adult URS cases within a prospective observational nature.[13] As the guidelines and clinical studies differ to some extent in defining patients eligible for URS treatment, the aim of the current study is to describe the "real-life" use of URS in the pediatric population in general clinical practice. The study compares the procedures and outcomes in children with the adult population to define similarities, differences, and limitations along with the safety and efficacy of the URS procedure.

PATIENTS AND METHODS

Study Population

Current study population is selected from the prospective, observational, international multicenter study initiated by the CROES in January 2010. The CROES URS Global Study collected data on consecutive patients treated with URS for urolithiasis at each participating center over a 1-year period. The study includes data from 11,885 patients who received URS at 114 centers in 32 countries. Of the URS-treated patients, 192 were ≤18 years old and treated in 54 centers in over 23 countries, which is described in more detail elsewhere.[13]

Patients' Characteristics

The age classification criterion of the World Health Organization was used to define age groups into infants (0-1 years), young children (2-4 years), school-aged children (5-14 years), and adolescents (15-18 years). The stone size was demarcated as the largest diameter in millimeter. The stone burden was defined as follows: ∑ stone length *∑stone width *0.25*3.14159. Complications were categorized according to the Clavien-Dindo Classification of Surgical Complications system. The stone-free rate was defined as the proportion of success over failure. Treatment failure was defined as a stone still in situ, remaining stone fragments of >1 mm, and failed access. Subsequently, treatment success was defined as a patient free of stones of >1 mm.

Statistical Methods

Descriptive information is presented as the mean, with standard deviations for continuous normally distributed variables and median interquartile ranges for continuous skewed variables. Categorical variables are presented as percentages. In the case of small proportions, the actual number is also presented. Descriptive information and percentages were based on available data.

To compare the adults (>18) with children (0-18 years), an independent sample *t* test, in which unequal variances were assumed, was used for continuous variables. A log transformation was used for continuous skewed variables prior to a *t* test. A chi-square test was used for categorical or dichotomous variables. To compare the outcomes among different age groups (infants, young children, school-aged children, and adolescents), Pearson's chi-square analysis for dichotomous or categorical variables was used, and an analysis of variance was employed for continuous variables.

All statistical analyses were performed using Stata version 13 (StataCorp LP, College Station, TX; www.stata.com).

RESULTS

Of the 11,885 patients, 10,319 had complete information on age. Of these patients from the URS Global Study, only 192 (1.9%) were 18 years or younger. These patients were treated in 54 centers in over 23 countries. Of the 114 centers participating in the study, 42% had conducted pediatric URS. Most of the pediatric cases were treated in Turkey (46%), India (15%), and Iran (9%) (Fig. 1, Supplementary Table S1). Among the pediatric cases, 7 were infants, 53 were young children, 59 were school-aged children, and 73 were adolescents (Fig. 2, Table 1). The mean age of the children was 10.3 (6.3). Out of all the cases, 56.8% were male. Six pediatric cases had an anatomic anomaly. Seventy-one (37%) pediatric cases had undergone previous treatment, and 9 had undergone more than one previous treatment (Supplementary Table S2).

In addition to the expected differences in age and body mass index, the location of the stones differed between adults and children treated with URS. Furthermore, the URS-treated children had more positive preoperative urine cultures than did adults. During the operation, the vast majority of the pediatric group was treated with a semirigid scope (86%), whereas a semirigid scope was used in only 73% of adults. Regardless of age groups, for both semirigid and flexible ureteroscopes, smaller sizes (7-8F) were preferred (Table 1). No significant differences in ureteroscope size between adults and children, nor between the different age groups within the pediatric population, were found. Table 1 also shows that the most preferred method for access was guidewires in both adult and pediatric cases. In adults, however, guidewire is suggested to be often substituted with a balloon or an access sheath.

The overall mean duration of the intervention was 33 minutes (23-60 minutes) and 40 minutes (25-60 minutes) for children and adults, respectively. As can be seen in Supplementary Table S2, for residual stone evaluation, ultrasound (US) was preferred in 52.6% of children, kidney, ureter, and bladder X-ray in 28.1%, and computomography in 6.3%, and these rates were comparable with adult patients. Whereas intraoperative complications were reported in 1 (0.5%) case in the pediatric group and in 145 (1.4%) cases in the adult group, postoperative complications were reported in 1 (0.5%) case in the pediatric and in 247 (2.4%) cases in the adult group. Twenty-one (10.9%) patients required further treatment. Among the children, 9 underwent re-ureteroscopy, 9 underwent external shock wave lithotripsy, and 1 underwent percutaneous nephrolithotomy (PCNL).