

**PEDIATRIC UROLOGY**

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**Timing of follow-up voiding cystourethrogram in children with primary vesicoureteral reflux: development and application of a clinical algorithm**

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**Background and Objectives:** Of children diagnosed with urinary tract infection, 30% to 40% have primary vesicoureteral reflux (VUR). For the majority of these children, treatment involves long-term prophylactic antibiotics (ABX) and a periodic voiding cystourethrogram (VCUG) until resolution of VUR as detected by VCUG. Radiation exposure and considerable discomfort have been associated with VCUG. To date, no clear guidelines exist regarding the timing of follow-up VCUGs. The objective of this study was to develop a clinically applicable algorithm for the optimal timing of repeat VCUGs and validate this algorithm in a retrospective cohort of children with VUR.

**Methods:** Based on previously published data regarding the probability of resolution of VUR over time, a decision-tree model (DTM) was developed. The DTM compared the differential impact of 3 timing schedules of VCUGs (yearly, every 2 years, and every 3 years) on the average numbers of VCUGs performed, years of ABX exposure, and overall costs. Based on the DTM, an algorithm optimizing the timing of VCUG was developed. The algorithm then was validated in a retrospective cohort of patients at an urban pediatric referral center. Data were extracted from the medical records regarding number of VCUGs, time of ABX prophylaxis, and complications associated with either. VUR in patients in the cohort was grouped into mild VUR (grades I and II and unilateral grade III for those < or =2 years old), and moderate/severe VUR (other grade III and grade IV). Kaplan-Meier survival curves were created from the cohort data. From the survival curves, the median times to resolution of VUR were determined for the cohort, and these times were compared with the median times to VUR resolution of the data used for the DTM. The numbers of VCUGs performed, time of ABX exposure, and costs in the cohort were compared with those that would have occurred if the algorithm had been applied to both mild and moderate/severe VUR groups.

**Results:** Using an algorithm that results in a recommendation of VCUGs every 2 years in mild VUR would reduce the average number of VCUGs by 42% and costs by 33%, with an increase in ABX exposure of 16%, compared with a schedule of yearly VCUGs. For moderate/severe VUR, a VCUG performed every 3 years would reduce the average number of VCUGs by 63% and costs by 51%, with an increase in ABX exposure of 10%. Applying this algorithm to the retrospective cohort consisting of 76 patients (between 1 month and 10 years old) with primary VUR would have reduced overall VCUGs by 19% and costs by 6%, with an increase in ABX exposure of 26%. The patterns of VUR resolution, age distribution, and prevalence of severity of VUR were comparable between previously published results and the retrospective cohort.

**Conclusions:** Delaying the schedule of VCUG from yearly to every 2 years in children with mild VUR and every 3 years in children with moderate/severe VUR yields substantial reductions in the average numbers of VCUGs and costs, with a modest subsequent increase in ABX exposure.

**Editorial Comment**

The authors of this paper recognize that one of the critical issues in the current treatment algorithms for vesicoureteral reflux is the morbidity. These children must stay on antibiotics for long periods of time and they undergo voiding cystourethrograms (VCUGs) annually. These x-rays are not only unpleasant, but result in significant radiation exposure. In an effort to reduce this morbidity, the authors considered, in a mathematical model, the effects of prolonging the interval between VCUGs. The authors based an analysis of their model on

published summary data from a Guidelines Panel on the rate of reflux resolution. The model the authors applied will reduce the number of unpleasant tests, as well as cost and radiation exposure. On the other hand, a negative effect of this approach will be the prolongation of antibiotic usage. In a retrospective analysis of the effect of this policy, VCGUs would have been reduced by 19%, costs by 6% (surprisingly little), but antibiotic use would have increased by 26%.

This is a creative and valuable contribution and should be presented to parents that way. I believe that this will be a viable option for many families. On the other hand, many families would likely prefer not to increase antibiotic usage. They at least would have the option in this respect.

The authors also acknowledge that there may be other changes in treatment policies that may affect this approach. In particular, the use of antibiotics is being questioned for older children and the use of endoscopic injection therapy for the treatment of reflux may obviate long periods of follow-up. So, although this approach is valuable for some families, it may not remain useful algorithm for long.

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### **Ureteroscopy for pediatric urolithiasis: an evolving first-line therapy**

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**Objectives:** To present in a retrospective report a contemporary series of patients aged 14 years and younger who were treated for stones with ureteroscopy at our institution from 1991 to 2002. With the improvement and miniaturization of ureteroscopes and ancillary instruments, the endoscopic treatment of renal and ureteral calculi in children has become more feasible.

**Methods:** A retrospective chart review was performed of 23 patients aged 14 years and younger who had undergone ureteroscopy for the treatment of ureteral or renal calculi at our institution.

**Results:** A total of 27 stones were treated in 23 patients. Of the 27 stones, 18 were in the distal ureter, 5 in the mid ureter, 2 in the proximal ureter, and 2 in the renal pelvis. Ureteral dilation was performed in 4 (17.4%) of the 23 patients. The lithotripsy modalities used were holmium:yttrium-aluminum-garnet laser in 16 (69.6%), electrohydraulic lithotripsy in 3 (13%), a combination of holmium laser and electrohydraulic lithotripsy in 2 (8.7%), and basket extraction alone in 2 (8.7%) of 23 patients. Ureteral stents were placed in 21 (91.3%) of 23 patients. The average operative time was 46.9 minutes (range 15 to 92). In 21 (91.3%) of 23 patients, postoperative imaging was available and revealed that 20 (95.2%) of the 21 patients were rendered stone free. Two patients were lost to follow-up. No intraoperative complications occurred. One patient was treated postoperatively with intravenous antibiotics for transient fever.

**Conclusions:** Ureteroscopy is safe and effective in the management of ureteral and renal calculi in children. In our institution, it has emerged as a valid first-line therapy for the treatment of pediatric urolithiasis.

### **Editorial Comment**

The authors make the point that there has been a shift in their clinical practice from shock wave lithotripsy to ureteroscopy for the treatment of stones in children. This shift occurred because of the efficacy and minimal

morbidity of ureteroscopy with modern instruments. In particular, small ureteroscopes and holmium: YAG laser lithotripsy have both made major contributions to the approach to these stones.

I believe that this is a valuable contribution. Although SWL is “non-invasive,” most children will require an anesthetic or at least heavy sedation requiring anesthesia monitoring for the procedure. Newer machines with smaller focal areas and less power mean that fewer children have been stone free after an initial trial of therapy. This has certainly been our experience. At the same time, holmium laser lithotripsy has been highly effective and most patients are stone free shortly after the procedure. This combination has led to a change in practice pattern in our institution as well. The authors have outlined this change nicely.

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