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Management of obstructive calcular anuria with acute renal failure in children less than 4 years in age: A protocol for initial urinary drainage in relation to planned definitive stone management

Mohammed S. ElSheemy*, Ahmed I. Shoukry, Ahmed M. Shouman, Ahmed ElShenoufy, Waseem Aboulela, Kareem Daw, Ahmed A. Hussein, Hany A. Morsi

Division of Pediatric Urology, Aboul-Riche Children's Hospital, Cairo University, Cairo, Egypt

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Abstract *Objectives:* To describe and evaluate our protocol for management of children ≤4years old with obstructive calcular anuria (OCA) and acute renal failure (ARF) to improve selection of initial urinary drainage (ID) method and to facilitate subsequent definitive stone management (DSM) as studies discussing this special group of patients are still few.
Patients and methods: Patients with a contraindication to any method of ID were excluded. Decision (percutaneous nephrostomy (PCN) or double J (JJ) stent) was based on degree of hydronephrosis and planned DSM. We used 4.8—5Fr JJ or 6—8Fr PCN under general anesthesia and fluoroscopic guidance. According to our protocol, JJ is inserted for hydronephrosis ≤ grade 1. When the hydronephrosis is >grade 1, patients with radiolucent stones were treated by JJ whatever the site of the stone. When the stones were radiopaque, PCN was reserved for stones in a solitary functioning kidney and bilateral ureteric stones prepared for subsequent bilateral ureterolithotomy (or stone prepared for ureterolithotomy in a solitary kidney). After normalization of renal functions, DSM was staged attacking only one side before discharge. Both sides were cleared at the same session in cases with bilateral ureterolithotomy. Renal or ureteric stones suitable for SWL in a solitary kidney were treated with percutaneous nephrolithotripsy (PNL) or ureteroscopy. This was followed also in patients with bilateral stones suitable for SWL

Abbreviations: ARF, acute renal failure; DSM, definitive stone management; ID, initial urinary drainage; JJ, double J ureteric stent; OCA, obstructive calcular anuria; PCN, percutaneous nephrostomy tube; PNL, percutaneous nephrolithotripsy; SWL, extracorporeal shockwave lithotripsy; URU, ureterorenal units.

* Corresponding author. Urology Department, Division of Pediatric Urology, Aboul-Riche Children's Hospital, Kasr Al-Ainy hospitals, Cairo University, Cairo, Egypt. Tel.: +201006117755; fax: +237809663.
E-mail addresses: mohammedshemy@hotmail.com, mohammedshemy@yahoo.com (M.S. ElSheemy).

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by clearing one side using ureteroscopy or PNL before discharge. Open surgery (OS) was reserved for cases with failed ureteroscopy or PNL, for ureteric stones >2.5 cm in size or very large volume complex renal stones. Stone free rate (SFR) was evaluated by CT. Our protocol was evaluated as regard recovery of renal functions, complications, and number of interventions to clear stones.

Results: This study included 62 boys and 22 girls presented with anuria for 1—4 days. JJ and PCN were inserted in 105 and 30 ureterorenal units (URU), respectively. Creatinine returns normal within 72 h. JJ insertion formed a part of DSM in 78/159 (49%) URU (stones prepared for extracorporeal shockwave lithotripsy or oral chemolytic dissolution therapy). PCN was the ideal tract for subsequent PNL in 11/159 (6.9%) URU. Accordingly, ID participated by 55.97% in DSM. Both operative and imaging times were slightly longer with PCN than JJ. There was no statistically significant difference in the insertion success or mean period to return to normal chemistry. Complications of both methods were mild and without any significant difference. Endourologic procedures constituted the majority of our interventions. Open surgical and endoscopic interventions for clearance of stones (including ID, treatment conversion and 2ry procedures) were done once for 25 patients, twice for 43 patients while it was needed three times for 16 patients. Total number of interventions was 149 procedures. SFR was 94%.

Conclusion: Our protocol ensures adequate ID with minimal complications when using our selection criteria in children ≤4 years in age with OCA and ARF. It also minimizes number of subsequent procedures to clear stones. Complications and success in insertion and drainage were equivalent in PCN and JJ groups.

Introduction

Pediatric urolithiasis may cause considerable morbidity [1]. It may be complicated by obstructive calcular anuria (OCA) and post-renal acute renal failure (ARF). In this condition, urgent urinary drainage is the standard of care using a percutaneous nephrostomy tube (PCN) or a retrograde ureteric stenting. However, the literature regarding calcular anuria in children is still sparse [1—3], which may be because of the rarity of this pathology in developed countries, but this is of utmost importance in developing countries and areas endemic with urolithiasis where the number of children presenting with stone disease and OCA is relatively higher [1].

In this study, we describe and evaluate our protocol for management of children ≤4years old with OCA and ARF to improve initial urinary drainage (ID), to facilitate the subsequent definitive clearance of stones and to decrease complications.

Patients and methods

A series of 84 children ≤4years old were managed at Pediatric Urology Department, Cairo University from June 2010 to May 2013. All patients had OCA and ARF. Peritoneal dialysis was done when needed (Fig. 1). The size and level of obstructing stones and the degree of obstruction were determined by abdominal ultrasound, plain urinary tract imaging and non-contrast CT scan. Hydronephrosis was graded according to the Society for Fetal Urology grading system for hydronephrosis [4].

Stable patients were treated by either double J stent (JJ) or PCN according to our protocol based on the degree of hydronephrosis and the planned definitive stone management (DSM) (Fig. 1). Patients with a contraindication to any method of ID (uncontrolled coagulopathy, urethral stricture or urinary diversion) were excluded. We used 4.8—5Fr JJ or 6—8Fr PCN. ID was performed under general anesthesia and fluoroscopic guidance. Postoperatively, the urine volume, serum creatinine, and electrolytes were monitored daily until normal. After normalization of renal functions, DSM was staged, attacking only one side before discharge then clearing the contralateral side later on. Both sides were cleared at the same session in cases with bilateral ureterolithotomy for middle and lower ureteric stones. Open surgery was reserved for cases with failed ureteroscopy or percutaneous nephrolithotripsy (PNL), for ureteric stones >2.5 cm in size or very large volume complex renal stones. Stone free rate was evaluated by CT. It was defined as no detection of residual fragments >2 mm in size.

The two lines of ID were compared in the operative and imaging times, period for recovery of renal functions, complications, and the number of interventions to reach the stone free status to assess safety and efficacy of our protocol and its role in facilitating DSM.

All statistical calculations were done using SPSS version 15. Comparison of numerical variables between the study groups was done using Student *t*, Mann Whitney *U*, chi-square (χ^2) and exact tests. A p value <0.05 was considered statistically significant.

Results

This study included 62 boys and 22 girls who presented with anuria for 1—4 days. Hydronephrosis was detected in all ureterorenal units (URU). No congenital urological