



ORIGINAL ARTICLE / *Interventional imaging*

Rapid percutaneous nephrostomy catheter placement in neonates with the trocar technique

O. Ozbek^a, H.E. Kaya^a, A. Nayman^b, T.B. Saritas^c,
I. Guler^{b,*}, O. Koc^a, H. Karakus^a

^a Department of Radiology, Necmettin Erbakan University Meram Faculty of Medicine, Konya, Turkey

^b Department of Radiology, Selcuk University Faculty of Medicine, Konya, Turkey

^c Department of Anesthesiology, Necmettin Erbakan University Meram Faculty of Medicine, Konya, Turkey

KEYWORDS

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Abstract

Purpose: The purpose of this study was to assess the efficacy of a modified percutaneous nephrostomy procedure for grade III–IV hydronephrosis in neonates.

Material and methods: Eleven neonates (five girls, six boys) with a mean age of 13.7 days \pm 9.9 (SD) (range, 4–28 days) with pronounced hydronephrosis had percutaneous nephrostomy using a modified procedure. In all patients, percutaneous nephrostomy was performed with a trocar catheter under ultrasound guidance and then the catheter was placed into the collecting system without prior dilatation.

Results: Technical success was achieved in all patients. There were no major procedure-related complications. There was no perirenal hematoma on control ultrasound examinations and no hematuria was observed after the procedure. The median drainage time was 75 days (range: 42–120 days). Two children had urinary tract infection, which was controlled by using antibiotics.

Conclusion: The trocar nephrostomy is a practical and feasible method, which can be used for neonates with grade III–IV hydronephrosis.

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* Corresponding author. Selcuk University Faculty of Medicine, 42075 Selcuklu, Konya, Turkey.
E-mail address: dibrahimguler@myinet.com (I. Guler).

Percutaneous nephrostomy (PN) has been widely performed in interventional radiology practice since its first description by Goodwin et al. in 1955 [1]. PN permits urinary diversion and preservation of the renal function until the time of definitive correction of the underlying condition. Ureteropelvic or ureterovesical junction obstruction, posterior urethral valves, vesicoureteral reflux, postoperative stenosis, stone disease, tumoral obstruction of the ureter, complex urinary tract infections are among the most common indications of the procedure [2,3]. Conventional method for the procedure comprises percutaneous puncture of the collecting system under imaging guidance, dilatation of the tract, and then placement of the catheter over a guidewire. Since it is an interventional procedure and requires sedation or anesthesia, several complications can occur, such as hemorrhage, pelvic injury or airway obstruction and blood pressure derangements [4]. The procedure can be challenging especially in neonates because of the factors related to sedation, anesthesia, or monitoring. Some anatomical aspects of the neonate kidney (i.e. smaller size, thinner cortex) can complicate the procedure as well. Therefore, modifications of the method, which allow the procedure to be performed in a short time, are of value. In this case series, a modified PN technique which was applied for 11 neonates with significant hydronephrosis is described.

The purpose of this study was to assess the efficacy of this modified PN procedure for grade III–IV hydronephrosis in neonates.

Material and methods

Patients

A total of 11 neonates underwent the modified PN procedure between 2008 and 2015. There were five girls and six boys, with a mean age of 13.7 days \pm 9.9 (SD) days (range, 4–28 days).

The review board of our institution approved the study and written consents were obtained from the parents of the patients. Unilateral ureteropelvic junction obstruction was the indication of the procedure for all of the patients. Although patients in this age group with ureteropelvic junction obstruction and hydronephrosis are usually treated with early surgical intervention, the patients comprising our study group were referred to our interventional radiology unit for PN due to several reasons causing delay in surgery.

All neonates were evaluated in terms of eligibility for the intervention and anesthesia with physical examination, complete blood count (CBC), prothrombin time (PT), activated partial thromboplastin time (aPTT), international normalized ratio (INR), and electrolyte studies.

Procedure details

Before the procedure, the temperature of the room was set to 26 °C. The patients underwent heart rate, peripheral oxygen saturation, end tidal carbon dioxide, non-invasive blood pressure, and body temperature monitoring. To prevent hypothermia, legs were wrapped and warming blankets were used. Oxygen and 5% sevoflurane were applied via a face mask for anesthesia induction while the patients

were spontaneously breathing. With the loss of spontaneous breathing sevoflurane was reduced to 3%.

All procedures were performed by an interventional radiologist who had three years of experience. Patients were positioned in lateral decubitus position on a fluoroscopy table with C-arm equipment (Advantx®, GE Medical Systems, Milwaukee, USA). To attain a sterile condition, povidone iodine and appropriate draping were used. Lidocaine was administered for local anesthesia, and then the skin was incised with a number 11-scalpel blade. Under ultrasound guidance (Sonoline G40®, Siemens Medical Solutions, Germany), the collecting system was punctured with a trocar catheter (6-Fr trocar type all-purpose catheter, Skater™, Angiotech Pharmaceuticals) (Fig. 1a), which was placed into the collecting system without prior dilatation (Fig. 1b and c). This was achievable only in patients with pronounced (grade III–IV) hydronephrosis due to the low resistance offered by a mildly dilated (grade I–II) collecting system. A mixture of saline and non-ionic contrast material was then injected through the catheter to visualize the collecting system. The placement of the pigtail part of the catheter in the collecting system was confirmed in real time with fluoroscopy (Fig. 1d). After the placement of the catheter, sevoflurane administration was ceased. The catheter was sutured to the skin with 3/0 silk sutures.

Data analysis

Discharge summaries and follow up charts in the electronic medical files of the patients and if these were not available patients' files in the archive of the institution were reviewed to obtain information about drainage time and complications.

Results

The modified PN technique was performed for 11 kidneys (four left, seven right kidneys) in 11 newborns with grade III–IV hydronephrosis. Demographic data of the patients (gestational age, age and weight at the procedure, sex, laterality, hydronephrosis grade) and duration of anesthesia are given in Table 1.

Technical success was achieved in all patients (100%). There were no major procedure-related complications, such as hemorrhage, pelvic injury or abscess formation. There was no perirenal hematoma on control ultrasound examinations and no hematuria was observed after the procedure. The median drainage time was 75 days (range: 42–120 days). Two children had urinary tract infection, which was controlled by using antibiotics.

Discussion

In this study, we described a modified, practical trocar technique for PN and showed that it can be used in neonates with grade III–IV hydronephrosis.

Congenital ureteropelvic obstruction is the most common cause of hydronephrosis in children. Hydronephrosis may lead to deterioration of the renal function due to rapidly developing renal parenchymal damage; therefore, urinary

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