

İyatrojenik Üreter Yaralanmaları Sonrası Dilate Olmayan Böbreklerde Perkütan Nefrostomi

Percutaneous Nephrostomy in Non-Dilated Kidneys for Iatrogenic Ureteral Injuries

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ÖZ

Amaç: Perkütan nefrostomi, iyatrojenik üreter yaralanmalarının tedavisinde çok önemli bir seçenektir. Ancak bu hastalarda pelvikaliseal sistem dilate olmadığı için işlem zordur. Bu çalışmanın amacı dilate olmayan böbreklerde perkütan nefrostomi deneyimimizi paylaşmaktır.

Gereç ve Yöntemler: İyatrojenik üreter yaralanması olan 14 hasta (10 kadın ve 4 erkek) çalışmaya dahil edildi. Bu hastaların 10'u jinekolojik ve 4'ü ürolojik cerrahi sırasında iyatrojenik üreter yaralanması geçirdi. Ultrasonografi ve floroskopi rehberliğinde toplam 17 nefrostomi işlemi (3 bilateral) gerçekleştirildi. İşlem öncesi pelvikaliseal sistemde dilatasyonu sağlamak için intravenöz diüretik infüzyonu uygulandı. İşlemden önce böbreğe giriş için daha ince iğne ve introducer sistem kullanıldı.

Bulgular: Diüretik infüzyon sonrası 10 işlemde renal pelviste 5 mm'den fazla dilatasyon sağlandı ve tüm bu işlemlerde nefrostomi kateteri yerleştirilmesi başarılı oldu. Diğer 7 işlemde 5 mm'den az dilatasyon sağlandı ve bu işlemlerin 4'ünde (%23,5) nefrostomi kateteri yerleştirilmesi başarısız oldu. Teknik başarı oranı %76,5 idi ve majör komplikasyon gözlenmedi. Minör komplikasyon olarak 17 işlemin 5'inde (%29,4) minimal perirenal hematoma meydana geldi.

Sonuç: Perkütan nefrostomi, dilate pelvikaliksiyel sistemler için yüksek başarı ve düşük komplikasyon oranları ile basit bir işlemdir. Öte yandan dilate olmayan böbreklerde işlem genellikle zordur ve komplikasyonların sıklığı ve işlemsel başarısızlık oranı yüksektir.

Anahtar Kelimeler: Perkütan nefrostomi; dilate olmayan pelvikaliksiyel sistem; üreter yaralanması.

ABSTRACT

Aim: Percutaneous nephrostomy is a crucial option in the treatment of iatrogenic ureter injuries. However, in these patients, the procedure is difficult since the pelvicalyceal system is not dilated. The aim of this study is to share our percutaneous nephrostomy experience in non-dilated kidneys.

Materials and Methods: Fourteen patients (10 females and 4 males) with iatrogenic ureter injury were included in the study. As the cause of the injury, ten of these patients had gynecological surgery where four had urological surgery. A total of 17 nephrostomy procedures (3 bilateral) were performed under ultrasonography and fluoroscopy guidance. In order to provide dilatation in pelvicalyceal system before the procedure, intravenous diuretic infusion was applied. In the procedure, a thinner needle and introducer system was used for the kidney access.

Results: After diuretic infusion, dilatation more than 5 mm in renal pelvis was achieved in 10 procedures and nephrostomy catheter placement was successful in all of these procedures. Less than 5 mm dilatation was achieved in other 7 procedures and nephrostomy catheter placement was unsuccessful in 4 of these procedures (23.5%). Technical success rate was 76.5% and no major complications were observed. Minimal perirenal hematoma occurred in 5 of 17 procedures (29.4%) as a minor complication.

Conclusion: Percutaneous nephrostomy is a simple procedure with high success and low complication rates for dilated pelvicalyceal systems. On the other hand, in non-dilated kidneys, the procedure is usually difficult, and the frequency of complications and the rate of procedural failure is high.

Keywords: Percutaneous nephrostomy; non-dilated pelvicalyceal system; ureteral injury.

INTRODUCTION

Percutaneous nephrostomy (PCN) procedure was first introduced in 1955 by Goodwin et al. It is one of the most common interventional procedures and it can be performed by all interventional radiologists. PCN is a frequently used procedure to establish drainage in urinary system obstructions. It is most often used in situations that cause obstructive uropathy (1-3). PCN is an important option in the treatment of iatrogenic ureteral injuries, too. However, PCN is a difficult procedure in these patients since their pelvicalyceal systems are not dilated. The aim of this study is to present our PCN experience in non-dilated pelvicalyceal systems in patients presenting with iatrogenic ureteral injuries.

MATERIALS AND METHODS

Fourteen patients (10 females and 4 males); who were admitted to our interventional radiology unit due to iatrogenic ureteral injuries and who underwent PCN, were included in the study. The mean age of the patients was 51 (38-76) years. Iatrogenic ureteral injuries developed after gynaecological and urologic surgery in 10 and 4 patients, respectively. Before the procedure, signed consent form was obtained from the patients. This study was conducted in accordance with the requirements of the Helsinki protocol committee and was approved by the Institutional Ethics Committee of the Diskapi Yildirim Beyazit Training and Research Hospital (2019; 78/02).

A total of 17 nephrostomy procedures were performed in these 14 patients; including a left nephrostomy in 6 patients, a right nephrostomy in 5 patients, and bilateral nephrostomies in 3 patients. To dilate the pelvicalyceal system in the absence of dilatation in the ultrasonography (US) examination, a diuretic (furosemide) was administered preoperatively at a bolus dose of 20 mg intravenously and this dose was followed by the infusion of 40 mg diuretic in 100 ml saline solution under arterial blood pressure monitorization. Dilatation was monitored with US examinations every 3-5 minutes. After administering antibiotic prophylaxis and local anaesthesia, a finer needle (22 or 23 gauge) instead of the standard 18-gauge needle, and an introducer system (AccuStick II, Boston Scientific) were used to gain access to the kidney during the procedure. The first needle entry was performed under the guidance of a US system (GE Healthcare Logic S6) with a 5.0 MHz sector probe, targeting the dilated calyx. After removing the inner stylet of the fine needle, the urine flow was observed. Then, the position of the needle in the pelvicalyceal system was confirmed by administering contrast agent under fluoroscopy. Following this step, insertion of the biliary introducer system into the pelvicalyceal system was performed over the 0.018-inch wire (V-18 Control Wire, Boston Scientific) and then this wire was exchanged with 0.035-inch stiff wire (Amplatz Super Stiff, Boston Scientific) via introducer sheath with Seldinger technique. After these steps, gradual dilatation was performed over 0.035-inch stiff wire and 8 french drainage catheter (Skater, Argon Medical Devices) was placed into the renal pelvis under fluoroscopy guidance.

Statistical Analyses

The data analyses were done with IBM SPSS Statistics 17.0 package software. Descriptive statistics were expressed in mean value.

RESULTS

The diuretic infusion performed before the total number of 17 interventions in 14 patients resulted in renal pelvis anterior-posterior diameter dilatation of more than 5 mm in 10 interventions of 8 patients' (59%) and less than 5 mm in 7 interventions of 6 patients' (41%) (Figure 1).

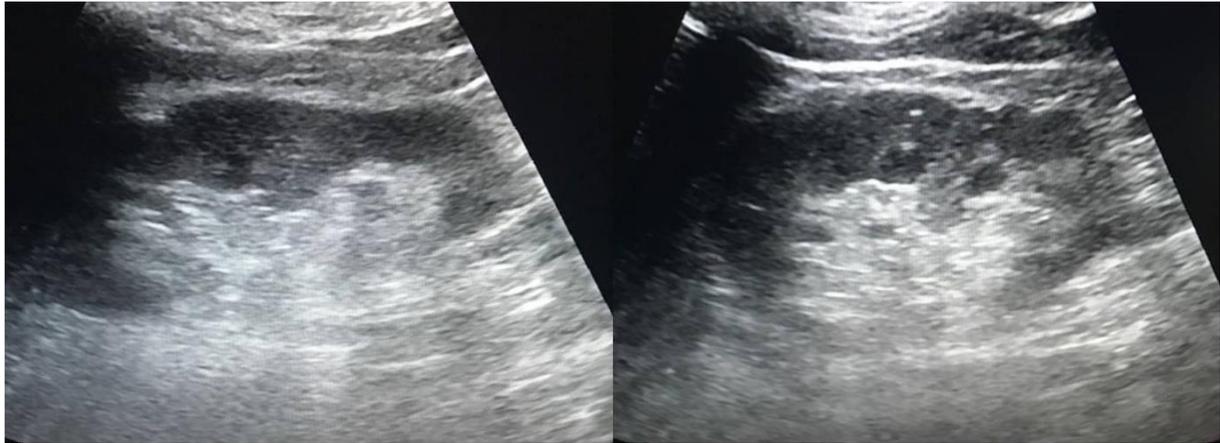


Figure 1. Minimal caliceal dilatation obtained after diuretic administration.

In 10 interventions; in which dilatation was obtained, the procedure was successful at the first needle entry. On the other hand, nephrostomy catheters were placed properly in 3 out of 7 interventions without obtaining dilatation; however, the nephrostomy catheter could not be placed in 4 (23.5%) interventions. For these latter patients, an appointment was scheduled for another session. Perirenal hematoma developed in 5 (29.4%) out of 17 interventions. While a nephrostomy catheter was successfully inserted in 13 interventions (76.5%), appointments for further sessions were scheduled for the respective patients of a total of 4 unsuccessful interventions; comprising 2 interventions resulting in prominent perirenal hematoma and 2 procedures with 5 unsuccessful needle insertion attempts. The mean number of needle entries per intervention was calculated as 2.4 (1-5) in the successful interventions. Nephrostomy catheters were successfully placed in the second session in 2 out of the 4 patients; in whom the insertion of the nephrostomy catheter failed in the first session.

DISCUSSION

Ureteral injuries occur due to iatrogenic causes, blunt trauma, and penetrating injuries in 75%, 18%, and 7% of the patients, respectively. When the category of iatrogenic injuries is examined, it is observed that they develop after gynaecological, intraabdominal (general surgery), and urological interventions in 71%, 15%, and 14% of the patients, respectively (4). Iatrogenic causes were found in all of our study patients and gynaecological interventions were the causes in 71% of the patients.

Urine leak from a ureteral injury is associated with the risk of non-obstructive uropathy and local and systemic infections such as infected urinomas, retroperitoneal abscesses, pyelonephritis, peritonitis, and urosepsis (5). In these patients, PCN for urinary diversion is an effective treatment method. Quality improvement guidelines for percutaneous nephrostomy report PCN success rates between 96-100% in dilated pelvicalyceal systems and 82-96% in non-dilated pelvicalyceal systems (6). The dilated system is usually

aperistaltic. When it is opacified, the contrast material accumulates in calyces; which can be targeted without haste. Furthermore, the wider area in an enlarged system readily enables better wire manipulation and insertion of the nephrostomy catheter in a safe position. However, it may be difficult to insert a nephrostomy catheter into a smaller volume of space in a non-dilated kidney (Figure 2) (7).



Figure 2. Successful nephrostomy catheter placement in a minimally dilated pelvicalyceal system.

In our study, the success rate is 76.5% in non-dilated pelvicalyceal kidneys in the first needle entry in the first session. This rate is lower compared to the rates reported in the literature. When the successful two procedures in the second session were included in this rate, our success rate is calculated as 88%; which is comparable to the rates in the literature.

PCN catheter placement in patients with non-dilated pelvicalyceal systems is a difficult procedure for interventional radiologists. In many centres, PCN is performed under fluoroscopic guidance in patients with non-dilated pelvicalyceal systems. Two techniques are available for use for fluoroscopy-guided PCN. The first one is the one-stick technique utilizing the temporary opacification of the posterior calyces after the administration of intravenous contrast agent. A large volume of contrast media is required to maximize the intended dilatation. Ensuring a fast performance during the application of the technique is of critical importance. The disadvantage of this technique is the requirement to wait for the iodinated contrast material to accumulate in calyces besides the requirement to perform the technique quickly due to the narrow time window for obtaining the opacity and distention. The second technique is the two-stick technique. This technique does not have the disadvantage of poor visibility and distension in the posterior calyces, which are the two factors limiting the one-stick technique described earlier. The first needle is inserted into the renal pelvis under US guidance or by using the anatomical landmarks. Then, an iodinated contrast medium is injected via the second needle to dilate the collecting system just before the entry into the calyces. This technique sometimes requires multiple punctures; which increase the likelihood of complications (7, 8). Also, apart from these two techniques, the retrograde technique which was used by Lawson et al. for the first time is no longer

used due to associated dangerous risks such as intestinal injury (9). We prefer to use US guidance near fluoroscopy for all PCN procedures in our study.

The US-guidance during interventions provide advantages; including shorter duration of the procedure, a low number of needle entries, and the abolishment of the need to administer an intravenous contrast agent (10). However, a non-dilated pelvicalyceal system creates difficulties in performing PCN under US guidance. For this reason, diuretic infusion under US guidance is recommended in patients with non-dilated pelvicalyceal systems before PCN (11). In our study, the diuretic infusion was performed before the procedure; however, not a complete dilatation but a pelvicalyceal system dilatation of less than 5 mm was obtained in 41% of the patients. The outflow of the urine without accumulation can explain this finding in patients with ureteral injuries. However, even a partial dilatation is a facilitating factor to perform the procedure.

According to the quality development guidelines about PCN, minor and major complications in total occur at a rate of approximately 10%. The critical ones among these complications can include septic shock, haemorrhages requiring transfusions, vascular injuries requiring embolization, bowel injuries, and pleural complications (6). The Society of Cardiovascular and Interventional Radiology (SCVIR) reports high complication rates of 1-4% for vascular injury or bleeding and 1-9% for septic shock after PCN (12). In our study, the development of a perirenal hematoma was observed at a rate of 29.4%. However, none of these was a major complication requiring transfusion or embolization and they all regressed during the follow-up period. The main problem that we encountered in our study is the 23.5% high rate of failure in the placement of the nephrostomy catheter percutaneously in the first session.

The small number of patients is the major limitation of our study.

CONCLUSION

The recent increase in laparoscopic surgeries has resulted in increased numbers of iatrogenic ureteral injuries, requiring percutaneous nephrostomy procedure for urinary diversion. A non-dilated collecting system in these patients makes the procedure technically more difficult compared to the standard nephrostomy procedure; however, percutaneous nephrostomy can be performed by experienced interventional radiologists in association with low complication and high success rates.

Conflict of Interest: The authors declare that they have no conflict of interest.

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