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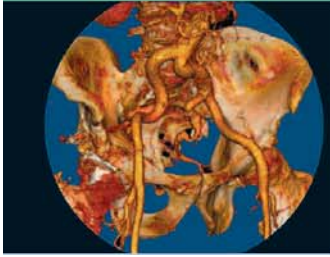
Percutaneous nephrostomy and antegrade ureteric stenting

Tze Wah

Department of Radiology,
St James's University Hospital, Leeds, UK

Address for correspondence:

Dr T M Wah
Department of Radiology
St James's University Hospital
Beckett Street, Leeds LS9 7TF UK
Tel: +44 (0)113 2065525
Fax: +44 (0)113 2064640
Email: Tze.Wah@leedsth.nhs.uk



Tze Wah FRCR is a consultant radiologist based at St James's University Hospital in Leeds, United Kingdom. She undertook her radiology training in Leeds, at the Institute of Urology and Nephrology in London and at Massachusetts General Hospital, Boston, USA.

Her special interests are urological imaging, interventional urology and image-guided tumour ablation therapy for solid organ tumours.

Abstract

The past 30 years have seen a remarkable increase in interventional urological procedures. There is now a wide variety of procedures for patients who require long-term urinary drainage with percutaneous nephrostomy (PCN) or ureteric stenting. This review article aims to give an overview of the current status for the techniques, indications and complications of PCN and antegrade ureteric stent insertion.

Introduction

There is now a wide variety of interventional urological procedures for patients requiring temporary or long-term urinary drainage. The management is dependent upon the underlying pathology, type and length of ureteric stricture and also the patient's preference. Percutaneous nephrostomy (PCN) can provide temporary or permanent drainage of an obstructed urinary system. Patients with benign/malignant ureteric strictures are often treated with ureteric stenting via an antegrade, retrograde or combined approach.

Percutaneous nephrostomy

Indications

PCN was first described in 1955 by Goodwin¹ and is an important technique for providing temporary or permanent drainage of an obstructed urinary system or for establishing diversion of urine flow. Out-of-hours PCN is frequently performed for patients with pyonephrosis and acute renal failure following urinary obstruction. After midnight, any PCN should be performed only if this is deemed to be a life-saving procedure.² Long-term urinary diversion with PCN is used when internal ureteric stenting is impossible or unsuitable.

Techniques

We employ two different ultrasound-guided techniques: the 'Seldinger' technique and the 'one-stab' technique.³

Patients are placed in a prone or prone-oblique position for the procedure. Prophylactic antibiotics are routinely administered to patients with suspected pyonephrosis and renal stone disease, and coagulation profiles should be obtained.

The selection criteria for each technique are dependent upon the collecting system configuration. The 'Seldinger' technique is used for minimally or non-dilated collecting systems and cases with suspected pyonephrosis. This technique, performed with fluoroscopic guidance, is also the usual technique for out-of-hours cases in order to have both ultrasound and X-ray screening available if difficulties are encountered. The 'one stab' (Bonanno) technique is used without fluoroscopic guidance for moderate-to-severe dilated collecting systems.

The 'Seldinger' technique involves ultrasound-guided puncture of the dilated collecting system with a 19 G sheathed needle, insertion of a 0.038" heavy-duty J guidewire and serial track dilation with 6-10 F dilators

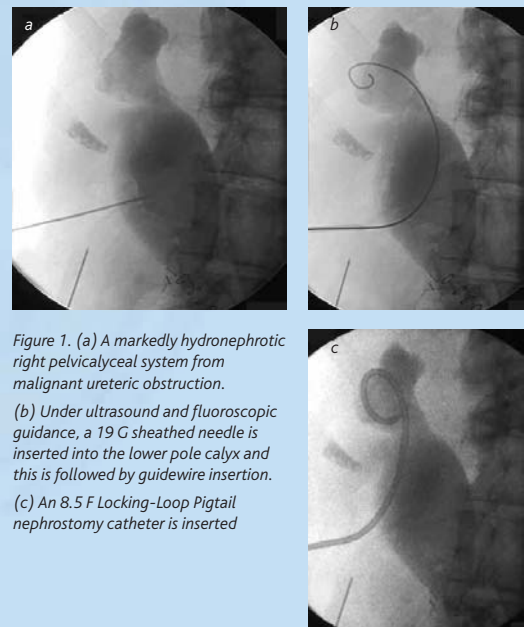
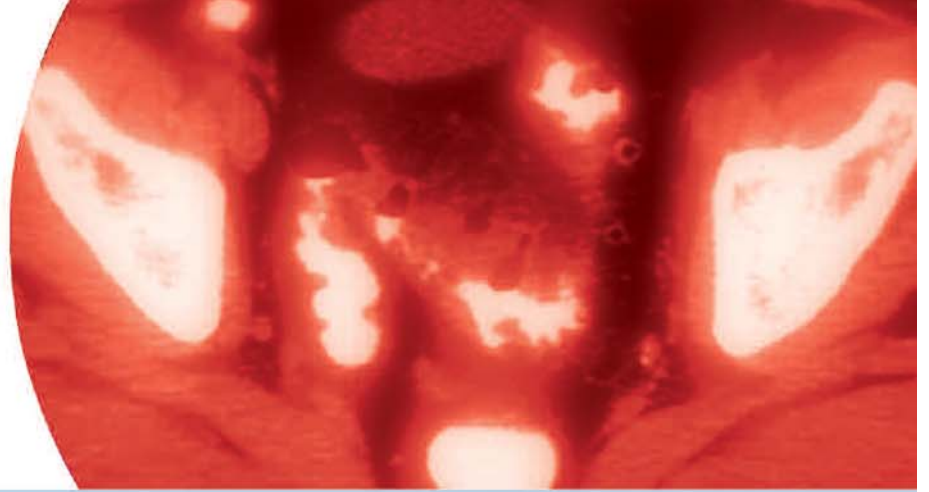


Figure 1. (a) A markedly hydronephrotic right pelvicalyceal system from malignant ureteric obstruction.

(b) Under ultrasound and fluoroscopic guidance, a 19 G sheathed needle is inserted into the lower pole calyx and this is followed by guidewire insertion.

(c) An 8.5 F Locking-Loop Pigtail nephrostomy catheter is inserted



to accommodate 8-12 F nephrostomy catheters with or without fluoroscopic guidance (Figures 1a–c). With fluoroscopic guidance, we routinely administer 5 mls of Urografin contrast to confirm the position of the 19 G sheathed needle prior to guide wire insertion. We use either All Purpose Drainage (APD) catheters (Boston Scientific, USA) or Locking-Loop Pigtail (LLP) catheters (Cook Inc, USA) for nephrostomies.

The second technique used is the ultrasound-guided 'one-stab' technique using a 6 F Bonanno catheter (Beckton Dickinson UK Ltd). This 6 F pigtail Teflon catheter is mounted on a hollow 18 G needle that has a sharp bevelled edge. Under ultrasound guidance, the needle tip is inserted into the dilated pelvicalyceal system, urine backflow is obtained and the catheter slid over the needle into the collecting system.

All catheters are secured to the skin by a catheter fixation disc, covered with adhesive dressings and connected to a closed system urinary drainage bag.

For patients requiring long-term urinary drainage with percutaneous nephrostomy, we exchange all the 8 F APD and 6 F Bonanno catheters with the 8 F LLP catheters. We routinely exchange the nephrostomy catheters every 3 months in our screening suite as an outpatient procedure.

Complications

Generally, PCN is a relatively safe procedure when performed by skilled and well-trained radiologists. The major complications (4-8%) include significant haemorrhage that requires blood transfusion, septicaemia and inadvertent puncturing of the pleura or viscera such as liver, colon and spleen. Minor complications (3-15%) include retroperitoneal urine extravasation and significant macroscopic haematuria causing clot colic and/or catheter blockage necessitating further interventions.^{4,5}

Ureteric stenting

Indications

Long-term urinary drainage in patients with malignant and benign ureteric strictures is often treated with ureteric stenting. This renders the patient 'tubeless' and provides a better quality of life.

Technique - antegrade approach

These strictures may be negotiated using a combination of wires and catheters to traverse the stricture. Usually an angled tip hydrophilic Terumo wire is used to negotiate through the ureteric strictures and pass into the bladder. In most cases, a 6 F torque-controlled manipulation catheter is used to cannulate the stricture and bladder (Figures 2a–d), although in difficult cases, a 4 or 5 F hydrophilic-coated Cobra catheter may be used.

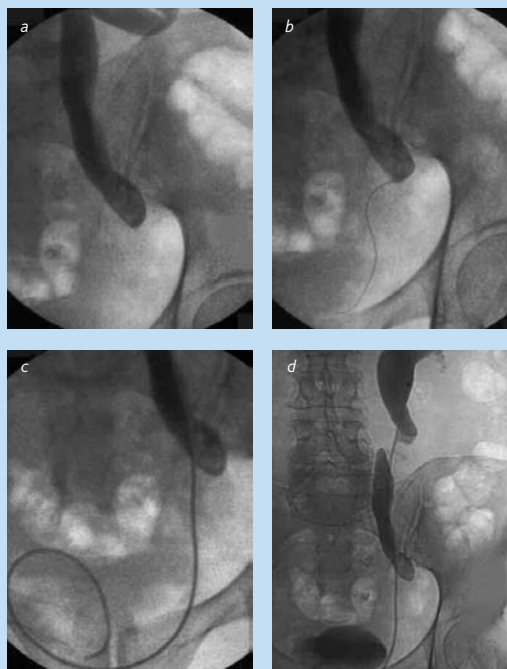
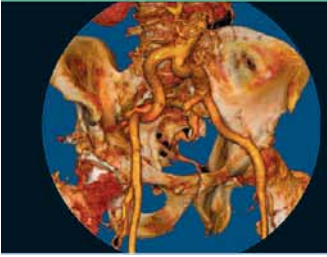


Figure 2. (a) Nephrostogram shows a tight right distal malignant ureteric stricture. (b) This is negotiated with a slippery Terumo guidewire. (c) It is followed by cannulation of the ureteric stricture and bladder with a 5 F Teflon-coated catheter. (d) A 7 F Optimed ureteric stent (Optimed Technologies Inc, Germany) is inserted uneventfully. (Patient in a prone position.)

Percutaneous nephrostomy and antegrade ureteric stenting *continued*

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The Terumo wire is then removed and replaced by a stiffer wire (e.g. Amplatz superstiff wire; Boston Scientific, USA) over which the ureteric stent can be inserted. Occasionally, a benign stricture can be treated by dilation with a balloon catheter or a PTFE-coated Van Andel dilator. We routinely use a 6 to 8 F (Meditech, USA; Boston Scientific, USA) or 7 F (Optimed Technologies Inc, Germany) ureteric stent.

These are changed electively every 3 to 6 months to prevent encrustation.

Complications

The most common early complication is septicaemia in up to 60% of patients.⁶ Other complications include failure to stent and stent blockage/encrustation.

Key Learning

- Depending on the indications, both PCN and ureteric stenting may provide temporary and permanent urinary drainage.
- PCN may be used to provide temporary urinary drainage in acute and elective settings
- Out-of-hours PCNs are frequently performed for pyonephrosis and acute renal failure
- After midnight, PCN should be performed only if it is deemed to be a life-saving procedure.
- PCN is generally a safe procedure with a major complications range from 4–8% and a minor complications range from 3–15%
- For long-term urinary drainage, antegrade ureteric stenting may be used to avoid the need for external drainage and provide a better quality of life
- Awareness of the complications that may arise with both PCN and antegrade ureteric stenting should be at the forefront of the physician's mind and patients should provide fully informed consent

References

1. Goodwin WE, Casey WC, Woolf W. Percutaneous trocar (needle) nephrostomy in hydronephrosis. *JAMA* 1955;**157**:891–4.
2. Wah TM, Weston MJ, Irving HC. Out of hours percutaneous nephrostomy: lessons learnt from a one year prospective audit. Abstract published in BSIR Congress Series 2003 (November).
3. Wah TM, Weston MJ, Irving HC. Percutaneous nephrostomy insertion: outcome data from a prospective multi-operator study at a UK training centre. *Clin Radiol* 2004;**59**:255–61.
4. Farrell TA, Hicks ME. A review of radiologically guided percutaneous nephrostomies in 303 patients. *J Vasc Interv Radiol* 1997;**8**:769–74.
5. Stables DP, Ginsburg NJ, Johnson ML. Percutaneous nephrostomy: a series and review of the literature. *AJR Am J Roentgenol* 1978;**130**:75–82.
6. Paz A, Amiel GE, Pick N, *et al.* Febrile complications following insertion of 100 double-J ureteral stents. *J Endourol* 2005;**19**:147–50.