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Antegrade Ureteral Stenting is a Good Alternative for the Retrograde Approach

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Key Words

Double J catheter • Ureteral stent • Ureteral obstruction • Percutaneous • Antegrade • Hydronephrosis • Kidney • Drainage

Abstract

Background/Aims: Double J (JJ) stents for treating obstructive ureteral pathology are generally inserted through a retrograde route with cystoscopic guidance. Antegrade percutaneous insertion using fluoroscopy can be performed alternatively but is less known. Indications, success rate and complications of antegrade ureteral stenting were evaluated. **Methods:** Data of consecutive patients in which antegrade ureteral stenting was performed were retrospectively analysed using the radiology information system and patient records. Patient characteristics, details of the antegrade JJ stent insertion procedure and registered complications were collected. Furthermore, it was investigated if prior to the antegrade procedure a retrograde attempt for JJ stent insertion was performed. **Results:** Total 130 attempts for antegrade JJ stent insertion were performed in 100 patients. A percutaneous nephrostomy catheter had already been placed in the majority of kidneys ($n = 109$) for initial treatment of hydronephrosis. Most prevalent indication for a JJ stent was obstructive ureteral pathology due to malignancy ($n = 63$). A JJ stent was successfully inserted in 125 of 130 procedures. In 21 cases, previous retrograde ureteral stenting had failed but, subsequent antegrade ureteral stenting

was successful. There were 8 procedure related complications; 6 infections, 1 false tract and 1 malposition. **Conclusion:** Antegrade percutaneous insertion of a JJ stent is a good alternative for retrograde insertion.

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Introduction

Percutaneous nephrostomy is commonly used as treatment for acute hydronephrosis aiming at preservation of kidney function and evacuation of infected material. Drawbacks of externally draining nephrostomy catheters are the risk of infection [1] and drain dislocation [2]. In addition, patients can experience severe discomfort from a percutaneous nephrostomy catheter. Double J (JJ) stents can be used alternatively, especially for long-term treatment of ureteral obstruction. JJ stents are mostly inserted through a retrograde route with cystoscopic guidance. Retrograde placement however can be difficult or even impossible, especially in patients with obstructive malignancies [3, 4]. In patients with an ileal conduit urinary diversion or a transplant kidney, a retrograde insertion of a JJ stent can be difficult because of the altered anatomy. Finally, especially in men retrograde insertion of JJ stents is mostly performed using spinal or even gen-

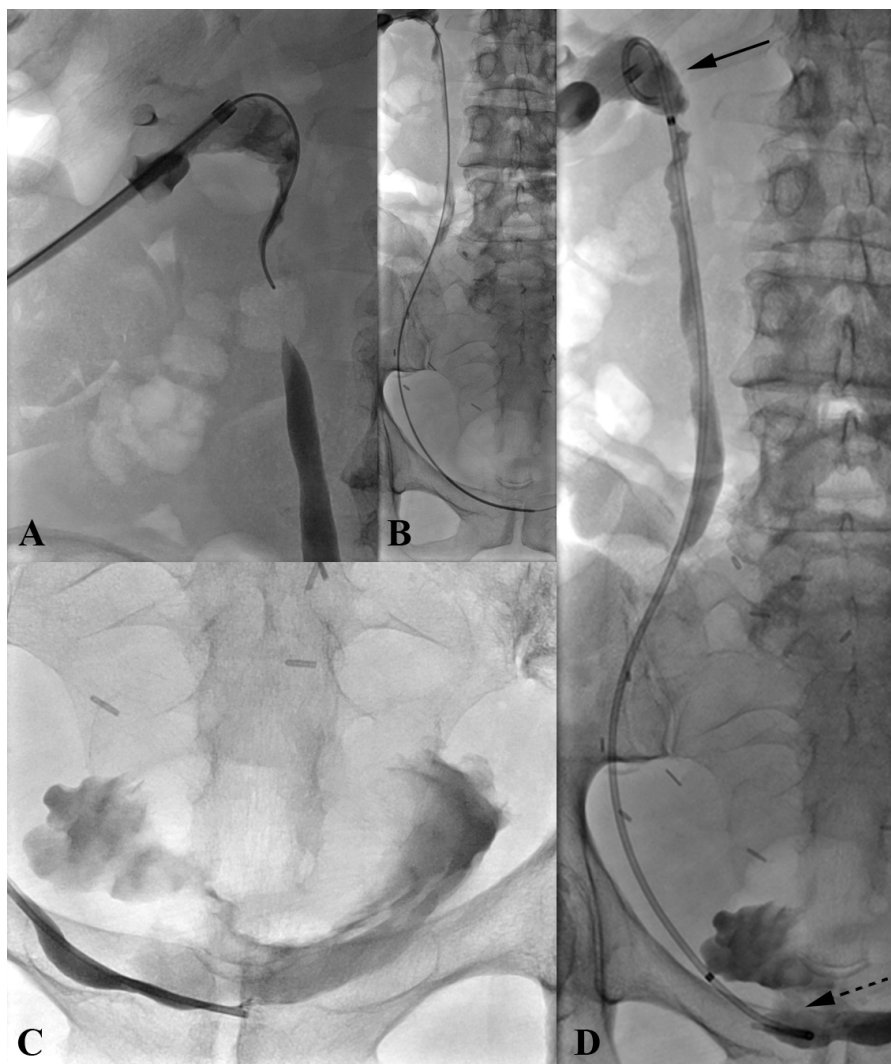


Fig. 1. Antegrade insertion of a JJ ureteral stent. **A:** A 9 French sheath is inserted into the pyelum. **B:** Catheterisation of the ureter into the urinary bladder with a hydrophilic guide-wire and a 4 or 5 French catheter. **C:** Confirmation of catheter position in the urinary bladder using radiopaque contrast material. **D:** Final position of the JJ stent after positioning of the JJ stent using a stiff guide wire. Arrow points at the proximal J within the pyelum of the kidney, the dotted arrow points at the distal J in the urinary bladder.

eral anesthesia. Especially general anesthesia can have serious complications and may be contra-indicated in critically ill patients. In these situations, antegrade percutaneous insertion of a JJ stent through the kidney using fluoroscopic guidance and local anesthesia can be used as an alternative technique. The purpose of the present study was to evaluate the indications, success rate and complications of antegrade ureteral stenting in our institutions.

Methods

Data of consecutive patients in whom antegrade ureteral stenting was performed were retrospectively analysed using patient records and radiology reports. Patients were treated in the Haga hospital, the Hague, the Netherlands, a large teaching hospital, between May 2005 and December 2012 or in Leiden University Medical Center, Leiden, the Netherlands, between April 2008 and February 2013. All procedures were performed by an interventional radiologist using ultrasound and fluoroscopy guidance. Preferentially, local analgesia with or without conscious sedation

was used. General anesthesia was only used exceptionally on demand of the patient. Patients received prophylactic antibiotics preceding the procedure.

Non-heparin coated JJ stents were used (mainly Bard Urosoft®, 7 French; Bard Inlay Optima®, 7 French or Boston Flexima®, 8 French).

In patients without a previously inserted percutaneous nephrostomy catheter, a “Neff percutaneous access set” (Cook Medical) was used to gain access to a renal calyx with the patient preferably positioned in the prone position. Access was preferentially obtained through an interpolar (mid kidney) calyx which offers easiest access to the ureteropelvic junction, or through a posterolateral oriented lower pole calyx which provides a safe, relatively avascular and easy puncture route [5]. After fluoroscopic confirmation of correct position of the Neff catheter, a stiff guide wire was used to change the Neff catheter for an 8 or 9 French introducer sheath (fig. 1).

If a percutaneous nephrostomy catheter had already been placed in an earlier stage, this catheter was changed using a stiff guide wire for an 8 or 9 French introducer sheath.

Thereafter, a hydrophilic 0.035 inch guide wire (Terumo glidewire®) and a steerable angiography catheter were used to catheterize the ureter all the way to the urinary bladder (fig. 1). The hydrophilic guide wire was then changed for a stiff guide wire, and the JJ stent was advanced until a correct position was reached (fig.1). When the angiographic catheter or the JJ stent could not pass the obstruction, an attempt was made to advance a 4–5 mm dilatation balloon across the obstruction which could be inflated to dilate the ureter. Correct placement and patency of the JJ stent was checked by insertion of a small amount of contrast material through the sheath and if necessary the position of the JJ stent was adjusted. Finally, the sheath was removed. Occasionally, when the procedure was troublesome or the aspirated urine was bloody, a closed percutaneous nephrostomy catheter was left in place for a day to secure access to the pyelum. In those cases, a check antegrade pyelogram was performed a day later. The nephrostomy catheter was removed when patency of the JJ stent was confirmed.

The radiology information system and patient records were used to collect patient characteristics, details of the antegrade JJ stent insertion procedure and registered complications. Furthermore, it was investigated if prior to the antegrade procedure a retrograde attempt to insert the JJ stent was performed.

Statistical analysis (χ^2 testing) was performed using SPSS, version 20 (SPSS, Chicago, Ill). A p value < 0.05 was considered statistically significant.

Results

Totally 130 attempts for JJ stent placement were performed. Because some patients needed a JJ stent bilaterally (n = 16) and some patients needed a JJ stent more than once in the period studied, our procedures were divided over 100 patients (56 men and 44 women aged 18–92 years). A percutaneous nephrostomy catheter was already present in 109 renal units before JJ stent placement for initial treatment of hydronephrosis. Most

Table 1. Indications for double J placement

Cause of ureteral obstruction	Number
Tumor	63
Stricture	30
Urolithiasis	12
Surgical complications	10
Retroperitoneal fibrosis	8
Cause unknown	3
Infection	2
Endometriosis	2

prevalent indication for a JJ stent was obstructive ureteral pathology due to malignancy (n = 63), stricture (n = 30), or stones (n = 12) (table 1).

A JJ stent was successfully inserted in 125 of 130 procedures (96%). In 2 patients it was impossible to cross the obstruction. In one patient the ureter could not be catheterised due to gross hydronephrosis. In the fourth patient two separately scheduled attempts were performed. However in both procedures it was impossible to pass an iatrogenic defect in the ureter that was a complication of a prior surgical procedure.

In 13 procedures it was necessary to dilate the ureteral obstruction with a balloon before the JJ stent could pass. Obstructions that needed to be dilated were usually caused by a stricture.

In 19 patients with an ileal conduit urinary conversion and in 12 patients with a kidney transplant, the antegrade approach was the initial approach for JJ stent placement. In these patients with previous ureter reimplantation, scarring of the ureter was the most prevalent indication (n = 20). Other indications were obstruction caused by a malignancy or ureteral damage after surgery (both n = 4), and in the remaining 3 patients the mechanism of obstruction is not known.

In patients without a previous ureteral reinsertion, a retrograde attempt had failed in 18 patients (21 attempts). Twelve of these patients suffered from ureteral obstruction due to malignancy, 3 from a ureteral stricture, 2 from ureteral stones and 1 from retroperitoneal fibrosis. In all these patients antegrade ureteral stenting was subsequently performed successfully.

After 14 JJ stent insertions (11%), complications occurred within 30 days. One of the complications, a urosepsis, occurred in a patient with an extensive oncologic

history and end-stage disease who was already on a palliative regimen. Because of the underlying oncologic disease, it was decided not to treat the infection and this patient died consequently.

Eight of the complications (6%) could be directly related to the antegrade procedure. During these procedures, a JJ stent was inserted unilaterally. Six patients developed urinary tract infection (UTI) (as confirmed by urine sediment analysis or a urine culture) within 30 days after antegrade JJ stent insertion. In 1 patient a false tract was created and in one patient the JJ stent was positioned incorrectly.

The remaining 6 complications within 30 days were related to the JJ stent itself: 5 times the JJ stent dislodged and once the JJ stent became obstructed.

One of the patients who developed a UTI received a percutaneous nephrostomy catheter for the treatment of a pyelonephritis 5 days prior to the JJ stent insertion. None of the other patients with a UTI after JJ stent insertion were diagnosed with an infection prior to the procedure. UTIs were treated with antibiotics; however, in one patient it was also necessary to remove the JJ stent in order to treat the infection effectively.

In 10 cases, complications occurred more than 30 days after antegrade JJ stent insertion. None of these complications seemed directly related to the procedure: The JJ stent became dislodged twice. In 4 patients the JJ stent became obstructed, and 1 patient developed several UTI. In 3 patients it was not possible to remove the JJ stent at the outpatient clinic as usual. Therefore 2 times general anesthesia was necessary to remove these JJ stents. And in one case the JJ stent was left in situ in a patient with a short life expectancy. Most of the patients with dislodged JJ stents at short or long term follow-up had a history of an ileal conduit urinary deviation ($n = 6$).

Fifteen patients complained of mild pain or "lower urinary tract symptoms" shortly after JJ stent insertion. These symptoms were mostly self-limiting. Mild hematuria was reported in 6 patients. None of these patients needed blood transfusion.

Discussion

This retrospective study shows that antegrade, percutaneous insertion of a JJ stent is possible with a high technical success rate (96%) and a low risk of complications. Therefore, antegrade, percutaneous insertion of a JJ stent seems to be a good alternative when retrograde insertion fails.

Retrograde stenting has several advantages over the antegrade approach. Using the retrograde route, it is for example possible to manage obstructive stones, to take a biopsy of intra-ureteral malignancy or to incise strictures. It is known however that retrograde insertion of a JJ stent may be unsuccessful in up to 50% in patients with distal and extra-ureteral obstruction caused by malignancies [4, 6, 7]. In our series of 130 antegrade JJ stent insertions, retrograde placement of a JJ stent had not been successful in 18 patients. In these patients it had usually not been possible to pass the ureteral obstruction with a JJ stent retrogradely. One of the advantages of the antegrade route is the possibility to predilate the ureter with a dilatation balloon which facilitates passage of the JJ stent through the obstruction. Furthermore retrograde insertion of a JJ stent is often performed using spinal or general anesthesia whereas antegrade ureteral stenting is performed using mainly local anesthesia.

Antegrade insertion of a JJ stent should not only be considered when retrograde insertion fails but also when a patient is already having a percutaneous nephrostomy catheter. In those cases, access to the pelvis has already been secured which simplifies the antegrade procedure and lowers the complication rate [8–10].

Several complications of antegrade JJ stent placement have been described [11]. Six percent of our JJ stent insertions were followed by a complication within 30 days that could be directly related to the procedure. UTI was the most commonly registered complication even though antibiotic prophylaxis has been administered prior to the procedure. Absolute numbers of infection after antegrade JJ stent insertion cannot be found in the literature. Usually, UTIs can be treated well with antibiotics. However it might be necessary to remove the JJ stent catheter when the infection does not respond to medical treatment.

Mild hematuria is a common finding shortly after JJ stent insertion that might be caused by damaged urothelium and is mostly self-limiting. Mild hematuria was reported in only 6 cases in our patient group which may be due to underreporting. Another, rarely reported cause of hematuria which is irrespective of antegrade or retrograde insertion is a fistula between the ureter and an artery which were not encountered in our series. In the literature authors report that JJ stent catheters can be predisposing factors [12]. The risk of hematuria caused by a bleeding originating from the kidney is reported to be higher when no percutaneous nephrostomy catheter is placed several days prior to the JJ stent insertion. The risk of a kidney bleeding is most prevalent when the kidney parenchyma is punctured and has been reported to oc-

cur in about 3% of cases after percutaneous nephrostomy catheter placement [13].

JJ stent catheters can be positioned incorrectly. Mostly this will be noticed during the procedure and therefore direct action can be taken to reposition the catheter. However when the catheter is positioned too proximal and the delivery device has already been detached from the catheter, antegrade correction cannot be performed. Using cystoscopy, the catheter can be pulled back into the correct position. When a catheter is placed too distally, the JJ stent can be repositioned antegradely using a snare if the introducer sheath is still left in place. Alternatively a wait and see policy can be executed as long as the proximal holes in the catheter are cranial to the obstruction.

Creation of false tracts is rarely reported. However the possibility of a false tract should be kept in mind with a malfunctioning catheter [14]. When a perforation of the ureter occurs, placement of a percutaneous nephrostomy catheter will relieve the pressure of the perforated ureter, usually allowing the ureter to heal.

The present study is limited by its retrospective nature. Therefore the interventional procedure was not standardised and indications for stenting were heterogeneous.

Furthermore it was not always clear why in some cases retrograde attempts were performed or why a decision was made for primary insertion of a nephrostomy or for primary ureteral stenting using a JJ stent.

To our knowledge randomised controlled clinical trials comparing antegrade and retrograde ureteral stenting have not been performed. A trial in patients with extrinsic ureteral obstruction caused by malignancy is now conducted by the authors to get more insight in the best approach for ureteral stenting

Conclusion

Studies randomizing between antegrade and retrograde JJ stent insertion are not known to the authors but this retrospective study shows that antegrade percutaneous insertion of a JJ stent has a high success rate and a low risk of complications. It seems to be a good alternative for retrograde insertion, especially when a percutaneous nephrostomy catheter has already been placed or when the retrograde approach has failed.

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