

CHAPTER 9

URETERIC FISTULAS

Section 9.1: Re-implantation of the ureter abdominally

Section 9.2: Double and ectopic ureters and vaginal re-implantation of ureter

Ureteric fistulas occur following surgery with the exception of congenital ectopic ureters.

(a) *After obstetric procedures:* Caesarean section, repair of ruptured uterus and Caesarean hysterectomy.

(b) *After gynaecological procedures:* hysterectomy, VVF repair.

The left ureter is more commonly affected than the right although the exact reason for this is uncertain. The frequency of ureteric injuries seems to be increasing because more Caesarean sections are being done.

Reference: Diagnosis and management of 365 ureteric injuries following obstetric and gynecologic surgery in resource-limited settings. Raassen T, Ngongo CJ, Mahendeka MM: Int Urogynecol J; October 2017.

DIAGNOSIS (See also chapter 1A)

(a) *History:* Ureteric fistulas are often confused with VVFs as the presenting symptom is urinary leakage. The patient will both leak urine vaginally and pass urine per urethra normally (from the unaffected side) i.e. the patient is wet all the time but also voids. Also, ask about any previous surgery.

(b) *Examination:* A negative dye test with clear urine in the vagina makes this diagnosis likely. Remember to have the patient drink plenty before you examine her. Initially, it may appear like a vaginal discharge.

(c) *Investigation:* The diagnosis is made more likely by ultrasound or intravenous urogram which usually reveal varying degrees of hydronephrosis and hydroureter.

- Ultrasound will be sufficient in most (approximately 95%) cases to localise the affected side i.e. hydronephrosis. Hydronephrosis is more likely to be absent when there is still flow of urine into the bladder from the affected side as well as leaking into the vagina. Getting the patient to drink plenty before the ultrasound examination will often make the hydronephrosis more obvious.



If ultrasound shows no hydronephrosis in a suspected case of ureteric fistula, look again for a bladder fistula. Place a swab in the vagina and re-examine after several hours. Repeat the dye test in the operating room before any surgery and if necessary give frusemide intravenously.

- Intravenous urogram will typically show a dilated ureter and extravasation of dye. Occasionally it will show a silent kidney or persistent column of contrast.
- A double dye test: The patient takes oral phenazopyridine for 24 hours which stains the urine orange. Blue dye is injected via a catheter into the bladder and the patient wears a tampon. Orange staining on the tampon suggests a ureteric fistula.

Timing of surgery: In general surgery can be performed once the diagnosis is made. However, between 2-6 weeks post-injury, the tissues will be more friable so surgery is best delayed (especially if you are not so experienced) to avoid a difficult operation with tearing of the ureter etc. However, if there is hydronephrosis together with fever or renal failure it is better to operate early.

If she has fever: Give antibiotics and operate within 24-48 hours. Another option in this situation would be to do a nephrostomy to gain time before any surgery.

(9.1) RE-IMPLANTATION OF URETER ABDOMINALLY

It is not necessary to find the actual fistula site. The ureter is divided above the site of injury (which is usually in the lower end of the ureter near the level of the uterine vessels) and is re-implanted into the bladder.

Exposure: It is a good idea to have the patient's legs in low-lithotomy position with minimal flexion of the hips so that:

- You can access vaginally and abdominally without re-positioning.
- It allows a second assistant to participate more.

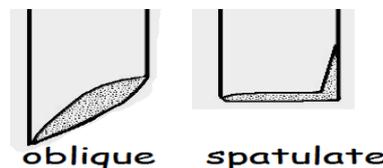
Once the patient is in position, you can prep the abdomen and vagina, and place a Foley catheter aseptically since the catheter will be drawn into the wound during the operation. If you are using the supine position, at least, keep the Foley catheter sterile and place it above the drapes so that you can access it during the operation. *Optional step:* Consider placing a ureteric catheter into the bladder (but not into the ureter) through the urethral meatus at the start of the operation so that it will be ready to be used once the bladder is opened. It can be fixed to the drapes with an artery forceps to prevent it being expelled. If difficulty inserting the ureteric catheter, push the balloon of the Foley well into the bladder or insert it before you insert the Foley.

Confirming the diagnosis: Expose both ureters. The side of the fistula will often have hydroureter and significant scarring. If still in doubt, open the bladder and:

- See if urine is coming from each ureteric orifice. The absence of urine from the injured side is a reliable way of confirming the diagnosis.
- To further confirm the diagnosis (especially if urine is seen coming from both ureteric orifices), catheterise both ureters. Usually, the ureteric catheter is not able to pass at the site of the injury which is most often 2-3 cm from the ureteric orifice. However, it is possible for the ureteric catheter to pass out via the fistula into the vagina. On one occasion, after repairing a VVF abdominally where both ureters were catheterized intra-operatively, the diagnosis of a left-sided ureteric fistula was only made when the upper part of a ureteric catheter was seen in the vagina when cleaning the patient at the end of the surgery. The left ureter was re-implanted immediately.
- Check for double ureters which are not uncommon. Think of this especially when a ureter has been re-implanted and the patient is still wet post-operatively.

! Tip! The urine from the normal side can make it difficult to see the other side. If you press the normal ureter from inside the bladder just above the meatus with a small piece of gauze (peanut) or the end of pickup/ dissecting forceps, this will stop the urine coming from the normal side. You can then observe the other side.

! Tip! The rules for re-implanting the ureter are:
(a) Avoid tension. (b) Minimize the risk of later stenosis i.e. when cutting the ureter, always cut it obliquely and spatulate it. If the ureter is of normal size, spatulate it for 2 cm.



(METHOD 1) INTRA-PERITONEAL (AND INTRA-VESICAL) APPROACH

This is described first as it is the route most familiar to most surgeons.

Incision: Make a midline sub-umbilical incision (may need to extend above umbilicus). It is important to extend the skin and sheath incision down to the pubic symphysis. Sometimes the bladder is high and attached to the abdominal wall, so feel for the Foley balloon if you suspect this. A Pfannenstiel incision is also an option although you may need to divide the recti muscles if access is inadequate.

! Tip! Often the uterus is high and stuck to the abdominal wall. It is easier to dissect down on either side of the uterus initially to get to the bladder. You may have to dissect the uterus off the abdominal wall.

Step 1: Mobilizing the ureter: this is performed in the retroperitoneal space.

- The ureter is located between the ovary (which can be held with a Babcock) and the sigmoid colon. On the right, it is also medial to the caecum.
- In difficult cases, where localisation is challenging, it is worth remembering that it crosses the pelvic brim at the sacro-iliac joint and runs over the bifurcation of the common iliac artery.
- In some cases, it may be very difficult to find the ureter due to inflammation caused by the urine leak. The ureter is covered by a thick false capsule. It is useful to remember that the ureter runs lateral to the common iliac artery before it crosses the bifurcation. Find the ureter higher up where it is healthy and follow it down.
- After cutting the peritoneum over the ureter, hold the two edges of the peritoneum with Allis forceps for exposure.
- When the ureter is covered by a false capsule, you have to cut onto the ureter until you get to the true ureter which is soft. If you make an accidental opening in the ureter, this is easy to repair and heals well if the ureter is kept decompressed. There is no need to excise the false capsule.
- The rule for dissection is to stay close to the ureter. Dissecting forceps stretch the tissues with your left hand while you cut close to the ureter with your right hand. Once you are in the correct plane close to the ureter, blunt dissection with your finger is safe.
- When dissecting the ureter, try to leave adventitia on it as the adventitia contains some of the ureteric blood supply. To preserve the blood supply to the ureter, do not cut too close to the ureter but leave a “mesentery” on it. This is because the blood supply to the ureter is mainly from surrounding structures. i.e. do not strip it bare/ white



The ovarian vein runs parallel to the ureter above the infundibulo-pelvic ligament for some distance and it is easy to mistake it for the ureter until you see it running into the infundibulo-pelvic ligament. It has been re-implanted into the bladder on more than one occasion!

The aim is to ligate the ureter as distally as possible to give a good length and avoid tension. Every millimeter counts. Cut the ureter just before it goes under the uterine artery (uterine artery tunnel). Two methods are used:

- (i) A right-angled forceps/ clamp is useful for dissecting and clamping the lower ureter. Then tie off the lower end.
- (ii) You can pass a tie around the lower ureter and then push it down with pickups. Then tie the suture and then cut the ureter.

Occasionally you may want to free the ureter as far down as possible by dividing the uterine artery.

! Tip! You want to cut the ureter above the area of damage. A rule of thumb is to dissect until it is no longer fun to do so!! Also, the ureter should look viable and not ischaemic.

- Once the distal end is free, the ureter is mobilized upwards about half way up to the kidney. You have to be careful to avoid bleeding as you mobilize. The higher you go, the greater this risk is. Avoid pulling on the ovarian vein high up as this can tear it off the inferior vena cava (right) or renal vein (left) which can result in severe bleeding.

Step 2: Mobilizing the bladder

1. Open the utero-vesical fold before opening the bladder.
2. A lot of bladder mobility can be obtained by bluntly opening the retropubic space.
3. Mobilize the bladder especially the side opposite to where you are going to re-implant so that the bladder can come across the midline and then comes up to the ureter easily. If using sharp dissection, beware of cutting the normal ureter.
4. When opening the bladder, open it transversely (in contrast to VVF repair where it is a longitudinal incision) along its widest point (see Fig. 9.1a). Then if you close it longitudinally (Fig. 9.1b), this will gain a lot of distance by bringing the bladder up towards the ureter.
5. Check if the ureter comes to the bladder without tension. If not, mobilize the ureter and bladder more.

! Tip! If the bladder is difficult to mobilize, sharp dissection close to the pubic bone will free it.



Fig. 9.1a: Bladder opened transversely.



Fig. 9.1b: Shows the bladder about to be closed longitudinally.

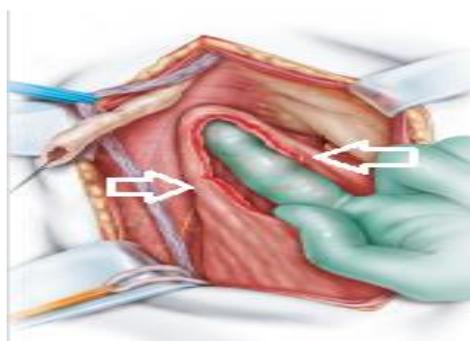


Fig. 9.1c: If there is still difficulty reaching the ureter, the bladder incision can be extended on each side (white arrows) to make the bladder flap a little longer.

Step 3: Re-implanting the ureter

- If the uterus is still present, a new tunnel has to be made in the broad ligament for the ureter to go through. This is important if the patient will become pregnant again to avoid displacement of the ureter by an enlarging uterus. Pick an avascular spot below the round ligament and pull the ureter through with an artery forceps via the stay suture.
- The ureter is re-implanted into the most accessible area of the bladder and pulled through with an artery forceps, which makes a small hole in the bladder. Leave a spout of 1-1.5 cm of the ureter protruding into the bladder lumen. This makes it easier to stitch the ureteric wall to the bladder mucosa rather than trying to stitch the ureteric mucosa to the bladder mucosa. It may also function as a valve because as the bladder fills the rising intravesical pressure will compress the ureter that is protruding.
- If the ureter is of normal size, spatulating the ends reduces the risk of stenosis (as shown in Fig. 9.4 for anastomosing two ends of one ureter). This can be for 2 cm in length. If the ureter is enlarged, then only a smaller spatulation is made i.e. ½-1 cm.
- Initially, three interrupted sutures are placed to form a triangle. The first suture is usually placed at the apex of the spatulation (Fig. 9.1d) and a good tip is to place this as a mattress suture. Then more sutures are inserted to close the gaps in between the initial 3 sutures to ensure a water-tight closure.
- If the ureter is small, a ureteric catheter should be placed early. Note: If the ureter is very dilated, you do not need a ureteric catheter (stent) although it is a good idea to routinely place one for all cases.

- The ureteric catheter must be fixed to the bladder mucosa with an absorbable suture (preferably plain catgut suture); otherwise it may be expelled into the bladder. Catgut makes it easier to remove the catheter later as it dissolves quickly. Vicryl rapide is a good alternative suture. To ensure good fixation:
 - Get your assistant to steady the ureteric catheter as you tie.
 - Take a bite of bladder mucosa near the ureteric orifice and tie a knot so that you leave the two suture ends equal in length.
 - Then wrap the suture around the catheter. First, bring the needle end of the suture around the catheter. Then bring the free end of the suture around the catheter using an artery forceps. Cross and tie the suture in front of the catheter.
 - Alternatively, the catheter can be transfixed with a fine needle to ensure it stays in.
- After the ureter is fixed inside the bladder, you may place 1-2 sutures at the junction of the outer bladder with the ureter i.e. ureteric muscle to bladder muscle. Apart from giving additional support, this also reduces tension on the anastomosis. However, this is not possible in all cases and may lead to holes and increase the risk of stenosis.
- Consider leaving an abdominal drain in case of a urine leak to prevent urine peritonitis.

	When inserting sutures in the ureter, use a fine needle and fine suture (4/0 or 5/0). This is to avoid devascularising the ureter. It will also avoid creating stitch holes which will leak urine.
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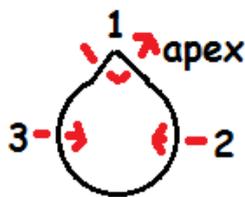


Fig. 9.1d: Shows the placement of the three initial sutures when reimplanting the ureter. The suture at the apex (1) is mattressed.

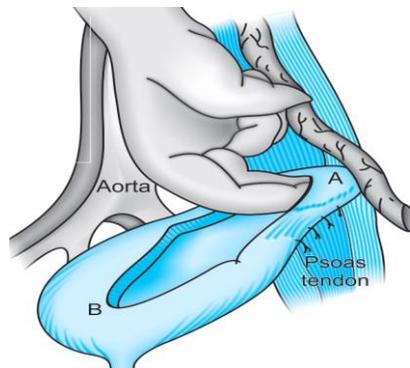


Fig. 9.2a: Shows the Psoas hitch. A strong index finger is used to pull the bladder up.

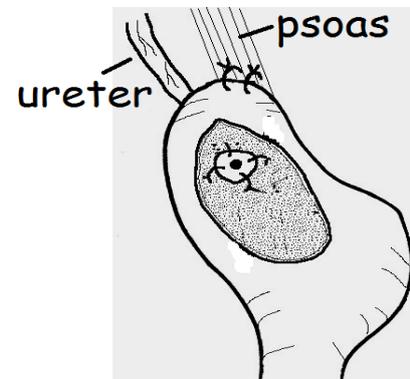


Fig. 9.2b: Shows the Psoas hitch with the ureter now re-implanted.

ADDITIONAL STEPS FOR REDUCING TENSION ON URETERIC RE-IMPLANTATION

(1) **Psoas hitch:** This is the only one of these steps that is required with any frequency. Ideally, the hitch stitch should be above the re-implantation site (Fig. 9.2b) to take the tension off the anastomosis. However, the stitch may then obscure the re-implant site so it is usually easier to place the stitch laterally first (Fig. 9.2a) and then re-implant the ureter. By pulling the bladder to the affected side, this takes the tension off the anastomosis. If the infundibulo-pelvic ligament is in the way, divide it.

- **Bladder stitch:** Place 1-2 stitches from the outside of the lateral bladder wall to the Psoas muscle 2-3 cm above the common iliac artery (Fig. 9.2 a + b). Use No. 0 or 1 Vicryl. You could also use PDS suture but there is a danger that you may have penetrated into the bladder lumen. As the bladder is weaker tissue, you need a good deep bite of at least 1cm in length
 - **Psoas stitch:** Ideally the bites are taken longitudinally through the Psoas fascia which is the upper layer covering the muscle. Try to under-run the fascia for about 1.5cm and while the needle is in this position pull up on the needle to ensure it will not pull out. There is no harm in taking a superficial bite of the muscle but do not go too deep because of the nerve plexus in the psoas muscle. In about 50% of patients, the white shiny tendon of the Psoas minor is seen where you want to place your stitch and this can be used instead.
 - Once the Psoas hitch is performed, re-implant the ureter and then close the bladder longitudinally. After re-implanting the ureter, feel behind the ureter for the amount of tension.
- (2) **End-to-side anastomosis:** If the bladder can be brought up to the ureter but not enough to pull the ureter into the bladder, you can do an end-to-side anastomosis of the ureter to the apex of the bladder incision. This is more likely if the ureter is large. Anastomosis is achieved either by:
- Using two separate sutures (3/0 Vicryl on a 17 mm needle) which both start in the midline posteriorly with the knot tied inside the lumen. One suture works towards the right side and the other to the left. The posterior wall is first approximated. When you reach the corners on each side, you come from in to out on the ureter and tie antero-laterally. The lower part of the bladder incision is now closed and the anterior ureter is then connected to the upper part of the bladder incision using interrupted sutures.
 - Using the technique described in Fig. 9.2c for the posterior wall.

- (3) **Ileal interposition:** use a length of ileum to bridge the distal ureter to the bladder. This is particularly useful in patients with a small bladder which is a common problem after VVF repair. The loop of bowel serves to enlarge the bladder as well. Alternatively, the bladder can be augmented with the loop of ileum and the ureter implanted into the new dome (bowel part) of the bladder as described in section 10.2.
- (4) **Boari flap:** This is not likely to get the bladder any higher than a Psoas hitch. It also requires planning before you open the bladder.
- (5) **Anastomose (end-to-side) to the opposite ureter:** This is easier to do if the recipient ureter is enlarged. The danger of this procedure is that it may compromise both ureters and kidneys so it would only be performed in special situations (see Fig. 9.5).
 - First, spatulate the injured ureter (see Fig. 9.4).
 - Make an incision of 1.5 cm in the recipient ureter between two stay stitches at a suitable level.
 - Use an interrupted technique as shown in Fig. 9.2c + d.
 - Stent the ureter being re-implanted.

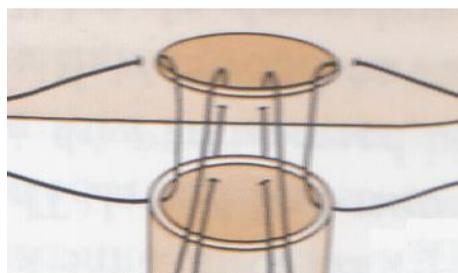


Fig. 9.2c: Shows anastomosis to the opposite ureter. The posterior edges are brought together with interrupted sutures- full thickness sutures.

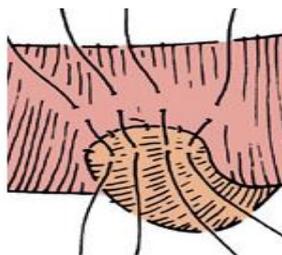


Fig. 9.2d: The anterior row is completed with interrupted sutures. Again it is often better to place all the sutures before you tie them.



Fig. 9.2e: Shows the Gibson incision used for an extra-peritoneal approach.

(METHOD 2) EXTRA-PERITONEAL APPROACH TO RE-IMPLANTING URETER

This has the big advantage of avoiding the bowel and is a less morbid approach. However, it can only be used if you are certain which side the fistula is on. If everything is very stuck, you may have to switch to an intra-peritoneal approach, dividing the recti muscles if necessary or separating them from the pubic bones.

- Make a suprapubic transverse incision which can be curved upwards and laterally towards 2 cm medial to the anterior superior iliac spine on the affected side (see Fig. 9.2e).
- After incising the rectus sheath, oblique muscles and entering the extraperitoneal fat plane, dissect bluntly with your hand starting lateral to the rectus muscle. The ureter is found medial to the psoas muscle and mobilized. Remember that it will be close to the peritoneum. You have to watch out for the ovarian vein which can resemble the ureter.
- Mobilize and divide the ureter. Then open the bladder transversely, pull the ureter inside and then close the bladder longitudinally to get extra length so you can do a Psoas hitch if needed. While some urologists will re-implant extra-vesically (see below) through a small incision on the side or back of the bladder, vision is limited and it is much easier to see the ureter from inside the bladder (intra-vesical).

Close the fascia, muscles and sheath in one layer.

(METHOD 3) EXTRA-VESICAL APPROACH TO RE-IMPLANTING URETER

This involves re-implanting the ureter from outside the bladder rather than from inside. It can be particularly useful if the bladder is small and the ureter is large. It can be used with either the intra or extra-peritoneal approaches. An incision is made in the bladder posteriorly, large enough for the ureter to pass through.

- If the ureter is normal size or not very enlarged, spatulate it first posteriorly (Fig. 9.4).
- For splinting, a ureteric catheter is passed into the bladder through a separate stab incision in the bladder wall and then out through the initial bladder opening and into the ureter.
- It is simplest to place a row of interrupted sutures posteriorly followed by the anterior row (the same end-to-side anastomosis as in Fig. 9.2 c). It is often easier to place all the posterior sutures before you tie. Repeat the same for the anterior row.
- Start with the ureter (go from out to in: see Fig. 9.3), then to the bladder (go from in to out). When this is tied, the knot will be on the outside. However, it is not critical that the knots end up on the outside.

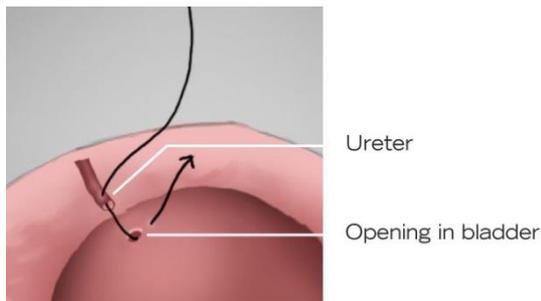


Fig. 9.3: Shows the technique of re-implanting the ureter from outside the bladder.

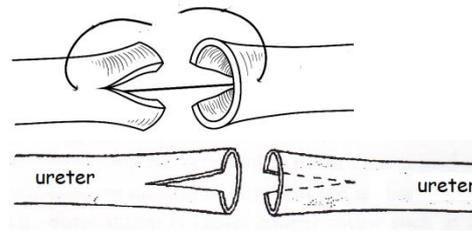


Fig. 9.4a and b: Spatulation: incision is made longitudinally on both sides.

Ureteric injuries above the level of the pelvic brim: In this case, an end-to-end anastomosis can be performed. First, spatulate both ends (Fig. 9.4a) to prevent stenosis. The spatulation should be about 3-5 mm on each side. Make sure both ends are healthy and tension free. The apex of one spatulated end is sutured to the base of the other spatulated end with interrupted sutures (Fig. 9.4b). Place but do not tie these two sutures first which become the stay sutures. Once placed, tie both. Then place sutures between the stay sutures. The repair should be stented for 2-3 weeks.

Stents for all approaches: The ureteric catheters (or infant feeding tube) can be brought out either:

- Suprapubically, via one angle of the bladder incision or through a separate stab incision.
- Through the urethra: thread the ureteric catheter into the Foley catheter and then deflate or burst the balloon of the Foley in the bladder. While you hold on to the ureteric catheter, your assistant pulls out the Foley from below and then puts in the (new) Foley from below.

Ureteric injury in a pelvic kidney: On two occasions, I have encountered a pelvic kidney in association with a ureteric fistula. It can be difficult to find the ureter in these cases. The options are:

- Do a nephrectomy especially if it is a small hydronephrotic kidney (see Appendix 5) but you would need to know the size and preferably the function of the other kidney first.
- If you think the kidney is worth preserving or there is no evidence of a contralateral ureter/ kidney, anastomose the renal pelvis directly onto the bladder.

(9.2) DOUBLE URETERS, ECTOPIC URETERS AND VAGINAL RE-IMPLANATION OF URETER

DOUBLE URETERS

The incidence of double ureters has been quoted as 1:125. The extra ureter(s) may be found opening into the bladder or vagina. When they occur, they can be difficult to diagnose as shown by the following case histories.

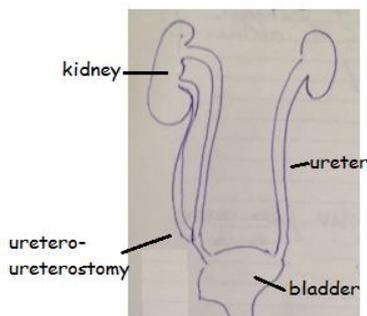


Fig. 9.5: This is a diagram from the operative notes in Case history 2. Courtesy of Andrew Browning.



Fig 9.6a: Shows an ectopic ureter with a probe in it. In this case, it is helpful to pass a catheter, probe or a guide wire up the opening to see which side is affected.

Case history 1: A patient sustained a ureteric fistula following a Caesarean delivery. During abdominal fistula repair, the patient's right and left ureters were catheterized at surgery and found to be normal. A third (double) ureter was found on the right side which was dilated and obstructed 2.5 cm proximal to where it should have opened into the bladder. This ureter was mobilized and re-implanted into the bladder. All three ureteric catheters were draining at the end of the operation.

Case history 2: A patient presented with leaking urine for six years following Caesarean delivery. There was a history of two laparotomies following the Caesarean section for possible ureteric fistula. However, as the operations were performed in another hospital, there were no notes available. The patient continued to be wet following surgery. On admission, a dye test was negative at 240 ml. Clear urine was seen coming from the vagina. An intravenous urogram showed a double ureter on the right side. At laparotomy, both the right and left ureters had previously been re-implanted. There was a duplex system on the right side. The bladder was very

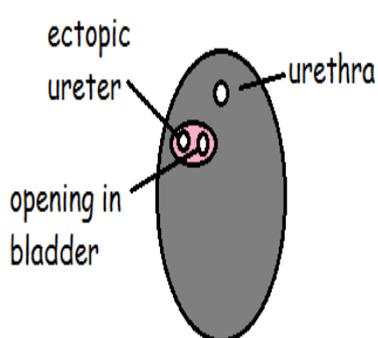
stuck with no mobility. A cystotomy was performed and a ureteric catheter was passed up on the right side to confirm the previous re-implantation. The double ureter on the right side which was not draining into the bladder was transected and spatulated. An end to side uretero-ureterostomy (see Fig. 9.5) was performed over a 5F ureteric catheter. The patient was discharged home dry.

ECTOPIC URETER

(Also see page 3 for diagnosis.) An ectopic ureter terminates in a site that is not in the urinary bladder and is usually part of a duplex ureter. It is often thin and dilated and found in the antero-lateral wall of the vagina proximal to the meatus.

! Top Tip! Under anaesthesia, after giving fluids and frusemide, examine carefully vaginally for the site of leakage and try to catheterize the ureteric opening. Allow up to 30 minutes for this step as otherwise it is easy to miss the diagnosis. The opening may be in the midline (Fig. 9.6a) or to one side. It is worth trying to pass a catheter or guide wire to see which direction it takes. It often only passes into the ureter a short distance but the direction it takes will guide you as to which side it is on. There are two options:

- (a) **Abdominal:** The usual approach is to re-implant it abdominally into the bladder. As the ureter is healthy and of good length, it is usually not difficult to re-implant. An extraperitoneal approach can be used. Via a low transverse incision, on one side, the ureter will be duplex e.g. on the right side. Then open the bladder and catheterize the right ureter draining into the bladder. Feel for the ureteric catheter in both ureters. The ureter without the catheter on the right side will be the ectopic one. In some cases, the ectopic ureter will be enlarged.
- (b) **Vaginal:** Occasionally, if the ureter is clearly visible vaginally and not too distal, it can be re-implanted trans-vaginally. If the ureter opens along the urethra or if the vagina is still small, it would be difficult to use this method.



- Make a circumferential incision (Fig. 9.6b) in the vagina around the ectopic ureter and just beside it where you will make the bladder opening.
- Pass a metal catheter (or a curved clamp) into the urethra/ bladder and then down to beside the ectopic ureter. Incise over the metal catheter. You do not need to mobilize the ureter.
- Insert a ureteric catheter into the ureter and then pass it into the metal catheter and then into the bladder and out the urethra.
- Close the bladder over the ureter/ ureteric catheter.
- The ureteric catheter can be left in for four weeks.

Fig. 9.6b: Vaginal re-implantation of ureter.

VAGINAL RE-IMPLANTATION OF URETERIC FISTULA

These fistulas are usually only seen following a previous VVF repair. The following diagram and photograph illustrate examples and how to manage them.

<p>Case 1: Fig. 9.7: Diagram of operative notes.</p> <p>This patient had a previous VVF repair. She was found to have a pinhole VVF on the right side and the right ureter was seen separately draining on the outside of the bladder wall (Fig. 9.7). The pinhole VVF was enlarged towards the ureter and the ureter was re-implanted into the bladder through the VVF after catheterizing the ureter.</p>	<p>Case 2: Fig. 9.8: Photo of a ureteric fistula.</p> <p>In this case, the ureter has retracted outside of the bladder after a VVF repair. If a ureteric catheter can be inserted into the ureter as shown, then the ureter can be re-implanted vaginally using the method shown in Fig. 9.6b (Photo Kees Waaldijk).</p>
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Case 3: A patient was having a repeat VVF repair of a right lateral pinhole vault fistula. During mobilization of the vagina, the left ureter was injured away from the VVF. It was re-implanted into the bladder using the technique shown in Fig 9.6b with a metal catheter to pull the ureteric catheter back into the bladder.