

## CHAPTER 5

### ABDOMINAL REPAIR OF URO-GENITAL FISTULAS

Section 5.1: Intra-peritoneal approach
Section 5.2: Interpositional layer
Section 5.3: Extra-peritoneal approach
Section 5.4: Combined abdomino-pelvic approach

#### INDICATIONS FOR ABDOMINAL REPAIR

Although the great majority (over 95%) of uro-genital fistulas can be closed vaginally (resulting in less morbidity), you may have to use an abdominal approach in the following situations:

1) *Decision is made before beginning surgery:*

- None of the fistula (VVF) is visible vaginally i.e. the fistula is high or lateral i.e. out of sight.
- If the proximal end of the fistula cannot be reached vaginally.
- A third group which includes any high fistula which can be approached vaginally or abdominally depending on the experience of the surgeon.

Abdominal repair is more often required with iatrogenic/surgical fistulas (following hysterectomy, Caesarean section, or rupture of uterus and bladder) than with fistulas resulting from prolonged labour. However, vault fistulas following hysterectomy can usually be managed vaginally.

2) *Decision is made during attempted vaginal repair* (see section 5.4) if:

- You fail to either mobilize the fistula i.e. you fail to bring the fistula down or reach the proximal end.
- One of the ureters needs to be re-implanted abdominally and the VVF is high, it may be simpler to repair the VVF abdominally.

3) *Miscellaneous:*


- Bladder augmentation is needed.
- An incorrect diagnosis of a ureteric fistula is made pre-operatively and on abdominal approach, when the bladder is opened, a small VVF is seen.
- There is another indication that requires laparotomy e.g. if the patient has a high fistula and also has an incisional hernia which needs to be repaired (can be performed at the same time).

#### APPROACH

There are two different approaches to trans-abdominal repair: intra-peritoneal and extra-peritoneal. Which one you use mainly depends on the size and accessibility of the fistula and your own preference. Generally, it is worth attempting the extra-peritoneal approach initially, switching to intra-peritoneal approach if necessary.

- *Extra-peritoneal:* The advantages of extra-peritoneal approach are less risk of infection (peritonitis), less risk of bowel injury especially if there are extensive adhesions and less risk of ileus.
  - If the fistula is small and accessible, you can avoid splitting the bladder down to the defect.
  - If the fistula is large, split the bladder down to the fistula to allow better access.
- *Switch to an intra-peritoneal approach* and (in most cases) split the bladder posteriorly if:
  - You have poor access to the fistula or the bladder is very small.
  - The tissues are very fibrotic and you want to bring in an interpositional flap e.g. omentum. However, it is possible to place an interpositional flap with the extra-peritoneal approach using the rectus muscle.
  - The ureter needs to be re-implanted.

The abdominal wall incision made is usually midline for an intra-peritoneal approach and transverse for an extra-peritoneal approach.

 **Tip! (Cherney incision)** If the exposure is inadequate with a transverse incision, you can cut the tendons of the recti muscles bilaterally 1-2 centimeters above the pubic symphysis. Do this after bluntly dissecting with your fingers to separate the tendons from the bladder before cutting. This greatly improves exposure. When re-fixing the muscle at the end of the operation, it helps to pull the muscle (with an Allis forceps or your fingers) towards the periosteum as you tie a mattress suture to re-approximate the muscle back to the periosteum.

#### (5.1) INTRA-PERITONEAL APPROACH

The intra-peritoneal approach is similar to the repair of a ruptured bladder which often occurs with a uterine rupture.

#### Preparation

- The patient is placed in the low lithotomy position with almost no flexion of the hips. The advantages of this position are:

- It allows a second assistant to stand between the patient's legs.
- It also allows access to the urethra and vagina if needed.
- A Foley catheter is passed through the urethra into the bladder observing strict aseptic technique. There are two reasons to do this at the beginning rather than after the operation:
  - The balloon of the Foley helps in identifying the bladder when opening the abdomen/ bladder.
  - Placing the catheter aids identification and protects the internal urethral meatus from occlusion by sutures if the fistula is nearby.
- You may also insert both ureteric catheters through the urethra before opening the abdomen. They can be fixed at the lower end to the drapes with artery forceps to prevent them from being expelled. If there is difficulty inserting the ureteric catheters, push the balloon of the Foley well into the bladder or insert them before you insert the Foley.
- The right-handed surgeon stands on the patient's left as with any pelvic operation.
- Enter the peritoneal cavity through a midline incision.
- If the uterus is still present, it can be pulled up out of the way by placing a stay suture directly on the uterine fundus. Take two bites and tie. Then secure the suture to the bar of the self-retaining retractor and tie it tightly. When this is removed at the end of the operation, cut above the knot to avoid bleeding from the uterus.

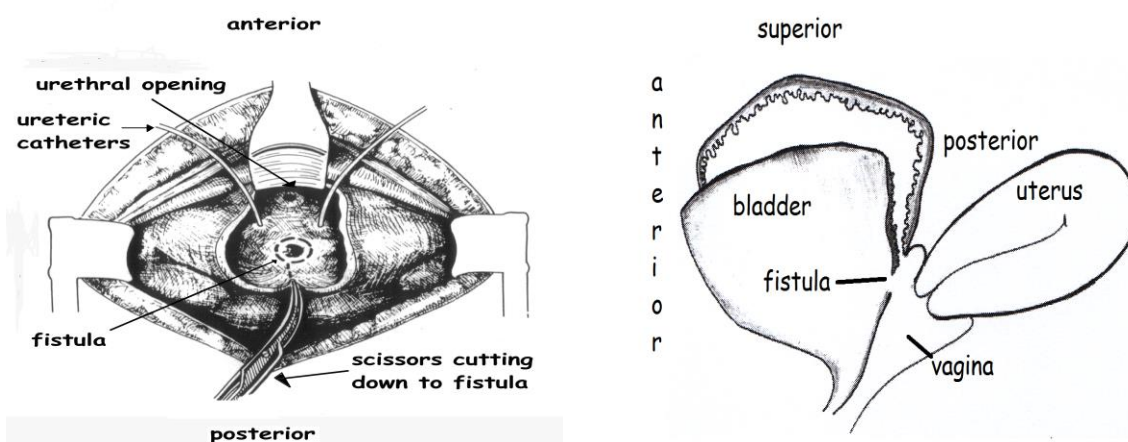


Fig. 5.1a: Overview of operation showing anterior/ posterior(AP) and lateral views of the splitting of the bladder down to the fistula.

- ◆ The bladder is opened in an AP direction and the fistula exposed as shown.
- ◆ The urethral opening is identified by the presence of the Foley catheter (not shown for clarity).
- ◆ The ureteric openings are located about 2-4 cm proximal and lateral to the urethral opening and urine can be seen coming out intermittently. If no urine is seen, give frusemide 10-20 mg IV along with intravenous fluids.
- ◆ The fistula is usually in the area of the trigone or above the trigone in the image on the left. In some cases, especially following rupture of the bladder, the fistula may extend from the fundus of the bladder to the internal urethral meatus.

### STEPS OF THE OPERATION

Note: As shown in Fig. 5.1a, nearly all uro-genital fistulas involve the posterior wall of the bladder so that is where the fistula will be found.

#### (Step 1) Split the bladder down to the fistula:

Grasp the top of the bladder in the midline between two Allis forceps or two stay sutures. Split the bladder vertically in an A-P direction between the two Allis forceps (Fig. 5.1c). You can cut with scissors or cautery (use coagulation mode). If large arterial bleeding occurs, pick the vessels up with artery forceps. The incision in the bladder will partly be intra and partly be extra-peritoneal.

**! Tip!** It is often difficult to outline the extent of the bladder for a properly placed entry incision. It helps to grasp the Foley balloon through the bladder wall with two or three fingers and elevate the balloon to the central midline aspect of the bladder. This will give you an idea how large the bladder is and allows you to enter the bladder at the best location for repair. This is especially helpful if the bladder is very small. (An extra tip is to grasp the Foley before opening the bladder through the bladder wall below the balloon with a Babcock forceps so that it does not slip down.) While grasping the Foley balloon and elevating anteriorly, place Allis forceps by grasping the bladder with good bites on top of the balloon. An incision can be made between the Allis forceps

with easy entry into the bladder. Be careful not to puncture the balloon, or it will need to be replaced. However, balloon puncture virtually ensures that you are in the right spot!

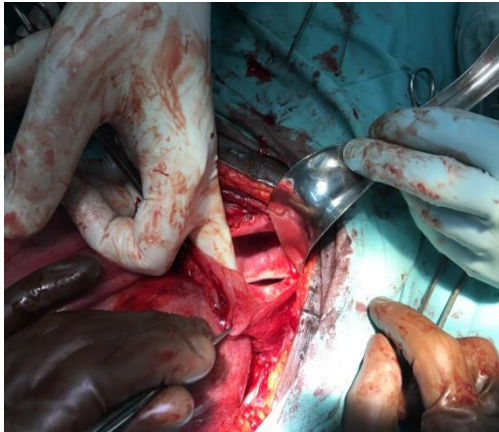


Fig. 5.1b: Shows the bladder split open revealing a large fistula with white edges. Note the Sims speculum being used as a retractor suprapubically.

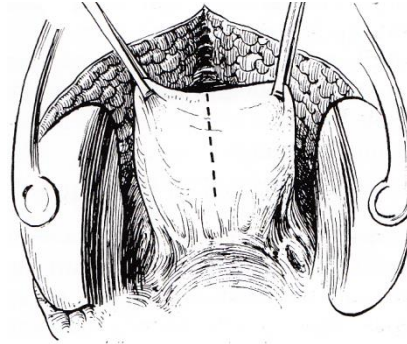


Fig. 5.1c: Shows the line of incision on the bladder which is vertical. The fundus of the bladder is stretched between two Allis forceps. (From *The Vesico-vaginal Fistula: J Chassar Moir. 1967*)

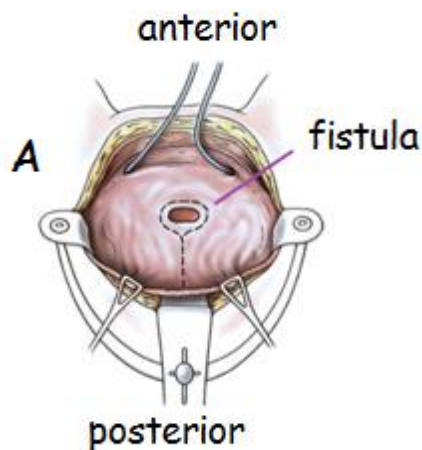


Fig. 5.1d A: Shows the incision on the posterior bladder wall with a midline split made from the dome of the bladder, and extended downward in a racquet-shape around the fistula.

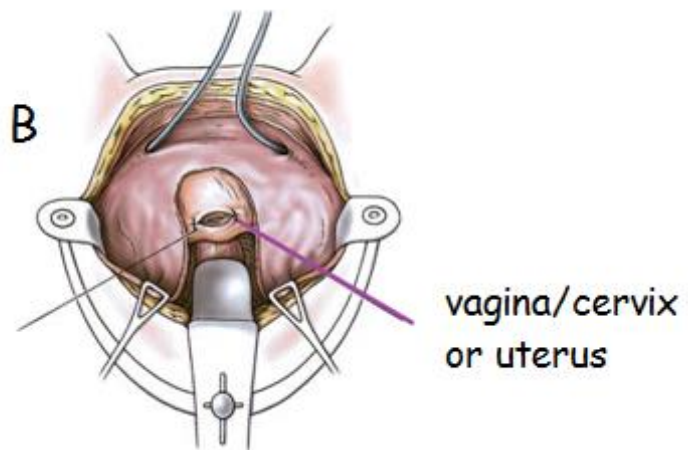


Fig. 5.1d B: The vaginal or cervical defect is being closed in a single layer; the bladder is then closed in either one or two layers. Adapted from *An atlas of gynecologic oncology, investigation and surgery: Chapter 30 Fistula Repair: Paul Hilton.*

#### Retractors:

- A Sims speculum may be used but is not ideal as the curve on the blade takes up quite a lot of space in the bladder. A better option is a small Deaver retractor which can be placed inside the bladder on the anterior wall (Fig.5.1a) to view the ureteric openings.
  - Another retractor to retract the posterior bladder wall may also help.
  - If the bladder is large enough, it may be possible to insert the self-retaining retractor into the bladder lumen as in Fig. 5.1d.
- (a) *The posterior bladder wall:* As you cut, you will first reach the utero-vesical fold. Open this, and free the bladder from the uterus if not already done. The splitting of the bladder is continued down the posterior wall until you reach the fistula. By staying in the midline, you avoid the ureters although you should note their position (see step 2). Cut around the hole of the fistula using a racquet-shaped incision (see Fig. 5.1dA).
- (b) *The anterior wall:* How far you cut down the anterior wall depends on the exposure required. Once the bladder is open sufficiently, it helps to pull the balloon of the Foley catheter up out of the way so that you can see the fistula and the ureteric openings. Only pull up the Foley catheter after you have cut down the


anterior wall sufficiently. To keep the catheter out of the way, clamp it directly with artery or towel forceps to the drape.

**(Step 2) Catheterize the ureters** once the bladder is open sufficiently. Catheterization of the ureters enables you to feel for them as you dissect the bladder off the vagina and this may reduce chances of injuring them.

- If you have difficulty catheterizing the ureters, place a Babcock or Allis forceps below the ureteric opening and pull upwards. This gives you control of the opening and makes it easier to catheterize.
- If you are using the common ureteric catheters or an infant feeding tube to catheterize the ureters, there is a strong tendency for these to fall out. Therefore fix these in place with an absorbable suture by taking a bite of the bladder mucosa near the ureteric orifice (and tie a knot) and then tie around the catheter and tie to the knot on the bladder mucosa. It also helps to fix the catheters (if they are going to be kept in post-operatively) to bring them out through the bladder wall now.


**Tip!** Often the best way to avoid a ureteric catheter coming out from the ureter during the operation is to transfix it with a fine needle and absorbable suture.

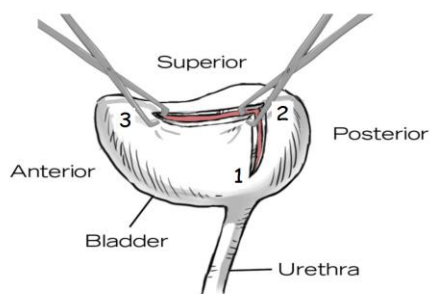
**Tip!** When you have opened the bladder and cut down to the fistula, you should infiltrate vasoconstrictor adrenaline solution where you plan to separate the bladder from the vagina/cervix. Stay within the bladder wall while injecting i.e. you should see the bladder mucosa swelling if you are infiltrating in the correct place. By reducing the bleeding as you dissect here, this will make the operation much easier. If there is bleeding as you dissect, infiltrate more solution.

	If one or both ureters are in the edge of the fistula, consider re-implanting the ureter. This will allow you to get a better closure of the bladder. There is also a risk that the distal ureter may necrose if you include it in the bladder closure.
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**(Step 3) Separate the bladder from the vagina** around the fistula to allow closure of both. The bladder is sharply dissected from the vaginal wall for 1-2 cm distal to the fistula site. This may be difficult at the lower end where spreading with scissors may help to separate the vagina from the bladder.

**Tip!** In trying to distinguish the bladder from the vagina, remember that the bladder wall is thicker than the vaginal wall which is about 3 mm thick.

	Be careful not to injure the ureters when dissecting the bladder off the vagina, as this is often the site of ureteric entry into the bladder. The ureter runs for 1.5 - 2 cm through the bladder wall before entering the trigone. If you are standing on the left side, the left ureter is more at risk as it is not so easily seen. The only way to avoid them is to palpate for the ureteric catheters carefully as you dissect. Anatomical distortion from the primary injury is common, placing the ureters at additional risk.
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*Fig. 5.2: External view of the bladder. The pink area is the open part of the bladder with the inner lining of the bladder exposed.*

- The posterior wall defect lies between points 1 and 2.
- The superior wall defect lies between points 2 and 3.
- The ureters are usually located close to point 1 and are usually close to the balloon of the Foley.


**Tip!** The ureteric catheters should be firm enough so that you can palpate them easily through the bladder wall, which is very important to avoid injuring the ureters.

**(Step 4) Closure of the vagina:** Close the vagina with interrupted sutures (Fig. 5.1d B). These should be placed a little back from the edges, to invert the vagina. Keep two (double) ends long to use later to suture to the omentum (see Fig. 5.3a). When a hysterectomy is being done at the same time, it is best to suture the vault open with a locking purse-string suture to allow any possible haematoma to drain.


An **interpositional layer** should be placed now if it is considered necessary (see section 5.1B below).


**(Step 6) Closure of the bladder wall:** this is usually done in two layers. Start the closure at the lower end of the bladder (Point 1 in Fig. 5.2). Then work up the bladder wall to point 2 to close the posterior wall. The posterior wall is the part most likely to leak so you have to take special care (Fig. 5.1e).




 <b>Top Tip!</b> The key is to do two layers of the bladder together; otherwise it may be difficult to get a 2 <sup>nd</sup> layer in later. Place an outer and inner suture at point 1 in Fig. 5.2. Then focus mainly on the outer layer as this is more difficult to do. Continue the inner layer after you have placed several sutures of the outer layer.	
<b>Outer layer:</b>	Done from the outer aspect of the bladder. Take mainly the muscle layer. Use 2/0 Vicryl suture.
<b>Inner layer:</b>	Done from inside the bladder. It is mainly mucosa that you take. Use a continuous 3/0 Vicryl suture. Place the first suture at distal apex but do not tie it. Then start the outer layer. Only tie the first bite after you have placed several sutures of the outer layer.
<b>For both layers:</b>	There are two options:(a) <i>Continuous suture</i> : is performed in most cases. (b) <i>Interrupted sutures</i> : as it is not so easy to maintain tension with a continuous stitch.

**One layer closure:** If the bladder wall is very thin or access is very difficult, you may have to settle for a one layer closure taking full-thickness bites done from the inside of the bladder. This is often the case when repairing a ruptured bladder in association with a ruptured uterus. Bites are taken 1 cm from the edge, full thickness. The sutures should be pulled tight enough so that it is water-proof but not so tight that you make the repair ischaemic. If necessary if the lower part is difficult, several interrupted sutures can be placed.

 **Tip!** When using a continuous stitch, it is critical to keep the suture tight. The key to keeping the suture tight is to grasp the suture your assistant is holding with the non-toothed dissecting forceps. Then pull it tight with your hand as you release the non-toothed dissecting forceps. Give the suture back to your assistant to keep tight.

 **Tip!** When closing the outer wall of the bladder, some surgeons use a backhand grip of the needle for stitching to give a better angle of access at depth i.e. start on the right side with a backhand grip and then the left also with a backhand grip. The knots end up on the outside.

 **Tip!** A long needle holder is very helpful if the repair is deep in the pelvis.

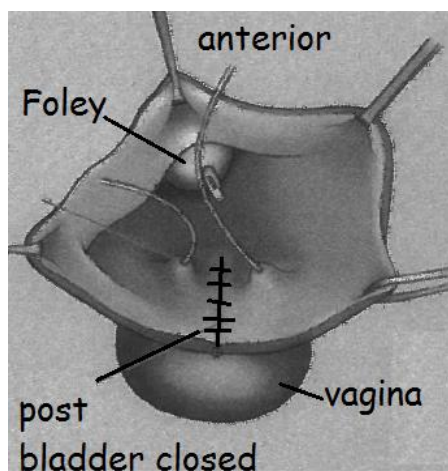


Fig. 5.1e: Shows the bladder from the inside with the posterior wall closed. The superior and anterior walls have yet to be closed (see Fig. 5.2).

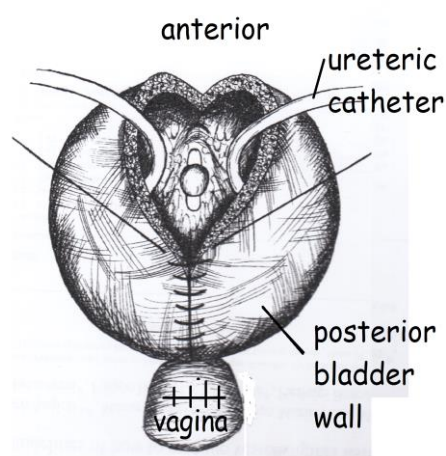


Fig. 5.1f: This shows a view from outside the bladder with the vagina already closed and the posterior bladder wall is now being closed.

**Suprapubic catheters** are not routinely used in abdominal repairs. While it is never wrong to use a suprapubic catheter, it is usually only considered where there is a high risk of breakdown i.e. in post-radiation cases, a difficult repair with possible tension or a thin bladder / poor tissue that you are unhappy with.

- In most repairs, one good size 18-20F urethral catheter is sufficient as this will block less easily.
- There is a greater tendency for haematuria following abdominal repairs which may be due to cutting through the normally vascularised anterior bladder wall.
- Post-operatively, if a suprapubic catheter was used, this can be clamped when the catheter is due for removal on day 14-21 and the urethral catheter removed. If there is any problem with urinating, the suprapubic catheter can be unclamped.
- The only disadvantage to a suprapubic catheter is the occasional leak from the track after removal of the catheter. A small leak of a few mls is common for a few days. If it is a large volume, then a urethral catheter can be re-inserted for 2 weeks to allow the track heal.

**Ureteric catheters:** At this point, the surgeon now has to decide on whether or not to keep the ureteric catheters in. If they are near the edge of the fistula repair they are left in. Otherwise, they are removed before fully closing the bladder. To leave the catheters in, bring the catheter out of the bladder either:

- Through a small stab incision in the anterior wall of the bladder or through one end of the bladder incision at point 3 in Fig. 5.2.
- Through the Foley catheter via the urethra: thread the ureteric catheter into the Foley catheter and then burst or deflate the balloon of the Foley in the bladder. While you hold onto the ureteric catheter, your assistant pulls out the Foley from below and re-inserts a (new) Foley from below.

Before completing the closure of the bladder, remove all blood clots from the bladder. Flush the catheter(s). Close the anterior/ superior wall of the bladder from points 2 to 3 in Fig. 5.2.

**(5.2) REINFORCING THE REPAIR WITH AN INTERPOSITION FLAP**

This step is thought to reduce the risk of failure, although it is not necessary in all cases. It may have its greatest advantage in post-radiation fistulas. It is also recommended during any intra-peritoneal repair. It is best placed after the vagina is closed but before closing the bladder. The choices are: (a) omentum (b) visceral peritoneum from the para-vesical area (c) rectus abdominis flap (d) newer options such as amniotic membrane or buccal mucosa graft.

**(A) OMENTUM:** If the omentum does not come down without tension, it needs to be mobilized (see Fig. 5.3 b + c). Once the omentum is mobilized, it is fixed to the vagina and bladder with three stitches (Fig. 5.3a). To fix the omentum, pass both ends of each of the three stitches through the omentum either with (a) a free needle or (b) an artery forceps which you can push through the omentum. When all three are passed, tie them down. Alternatively, the omentum can be pulled into the vagina and fixed from below.

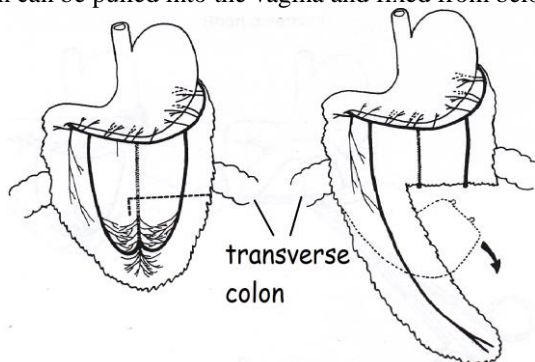
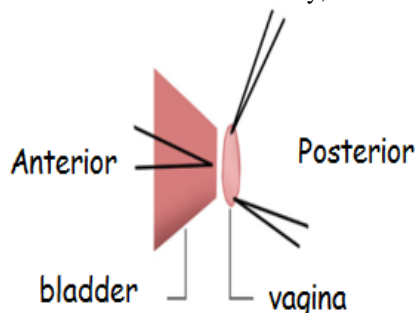


Fig. 5.3a: View from above showing the three stitches that are used for fixing the omentum between the vagina and bladder. The two on the vaginal angle have been placed to close the vagina and are left long.

Fig. 5.3b: If the patient has a long or normal length omentum but more mobility is required (it almost reaches the pelvis but not quite), an incision is made below the transverse colon. Just check that there are sufficient vessels in the part that you bring down to the pelvis.

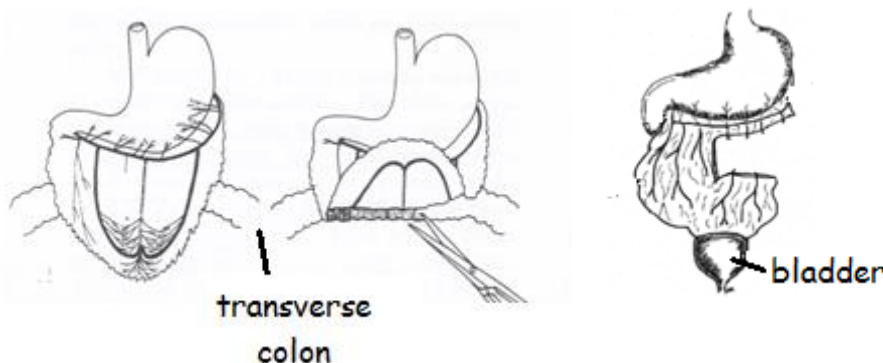
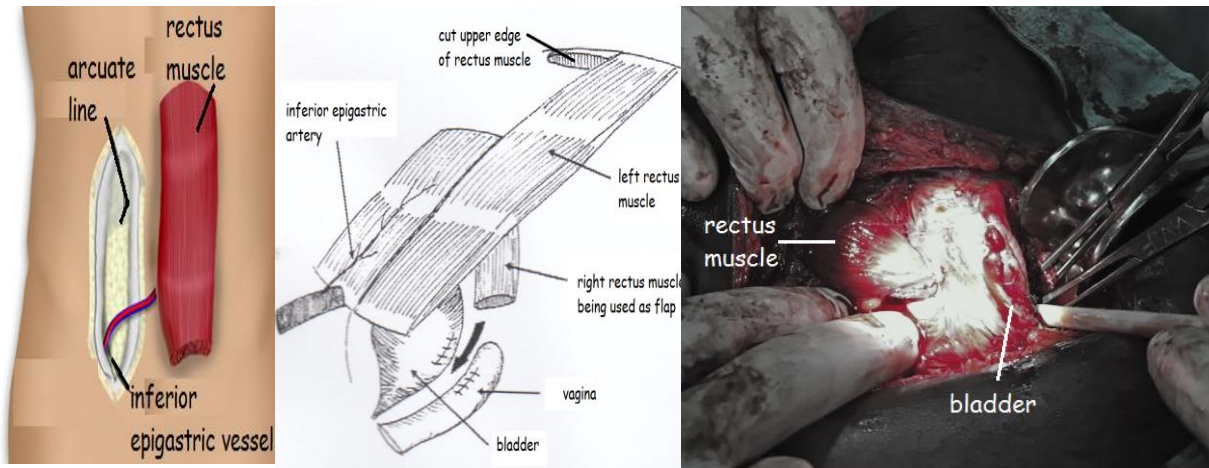


Fig. 5.3c: If the omentum is short (diagram on left), it is necessary to first mobilize it from the transverse colon as shown in the middle diagram. Then an incision is made close to the stomach to gain sufficient omental length to reach the pelvis. The figure on the right shows the omentum which has been partially divided on the left side and brought down to the bladder.

**(B) RECTUS ABDOMINIS MUSCLE FLAP:** Muscle is an excellent layer to interpose because of its vascularity and for this reason, it is preferred for recurrent or radiation-induced fistulas or where the omentum is inadequate or missing. The long arc of rotation of the inferior epigastric pedicle facilitates the positioning of the flap even low in the perineum. The blood supply to this muscle comes from three sources: (1) From above: superior epigastric artery. (2) From below: the inferior epigastric artery which originates from the external iliac artery. (3) Segmental vessels T7-12. Either the right or left side can be used. There are two ways of taking the rectus muscle:



*Fig. 5.3d: Shows the rectus muscle mobilized with its blood supply intact inferiorly.*

*Fig. 5.3e: Shows the rectus flap on the right side about to be placed between the bladder and vagina.*

*Fig. 5.3f: Shows the rectus muscle on the right, freed at the lower end and about to be swung behind the bladder. The white suction tip is in the bladder.*

**Short flap:** The muscle is freed from the pubic bone. It is not usually necessary to divide any pedicle. The lower end is then swung in between the bladder and the uterus/ vagina (Fig. 5.3f). This is usually easy to do provided the muscle is not scarred and gives an adequate amount of muscle in most cases. As long as it reaches the fistula repair site with no tension on the pedicle, it should work well. However, in cases where there is a lot of scarring, it may not be possible to mobilize the muscle to get it to rotate sufficiently. It is therefore more suitable for vesico-uterine fistulas rather than VVFs.

**Long flap:** this gives a much longer flap of muscle.

- Make a vertical incision from above the umbilicus (midway between the umbilicus and xiphoid i.e. level with the lower ribs laterally) down to the symphysis. The longer the incision, the easier it will be to pull the muscle into the pelvis.
- The subcutaneous tissue is elevated off the anterior rectus sheath for 2-3 cm laterally. This will help with closure later.
- Separate the anterior and posterior rectus sheath, and then dissect the anterior rectus sheath laterally off the rectus muscle. Where the sheath is adherent at certain points, it must be dissected off the muscle without damaging the muscle fibers as the muscle is very thin in these areas.
- Once the dissection of the muscle has been completed to the lateral border, the muscle can be divided at a point half-way between the umbilicus and the attachment to the ribs.
- The muscle is then mobilized off the posterior rectus sheath above the arcuate line.
- The intercostal vessels entering the muscle laterally are divided. The inferior epigastric artery enters laterally on the deep surface of the muscle in the middle of the lower third of the muscle and can be seen running along the posterior border of the muscle. There is no point mobilizing the muscle below the insertion of the vessel as it will not gain any additional length.
- This leaves the muscle attached to its lower pedicle, the inferior epigastric vessels. The vessels enter laterally usually surrounded by yellow fat. By lifting the muscle up, the inferior epigastric vessels can be seen attached to the posterior surface of the muscle.
- The muscle is then swung into the pelvis and fixed around the fistula repair site. By attaching a suture to the lower end of the muscle, the suture is pulled into the vagina and the muscle is fixed in the vagina.

- The anterior and posterior rectus sheath is re-approximated in the midline with the fascial edge on the contralateral side. It is often helpful to separate the skin and soft tissues off the anterior sheath for a few centimetres on each side to allow for a precise closure.

*Reference:* VVF repair with Rectus Abdominis Myofascial Interposition Flap: Reynolds WS et al. In Urology 71 (6), 2008.

### (5.3) EXTRA-PERITONEAL APPROACH

This alternative approach often avoids having to split the bladder open extensively and is simpler.

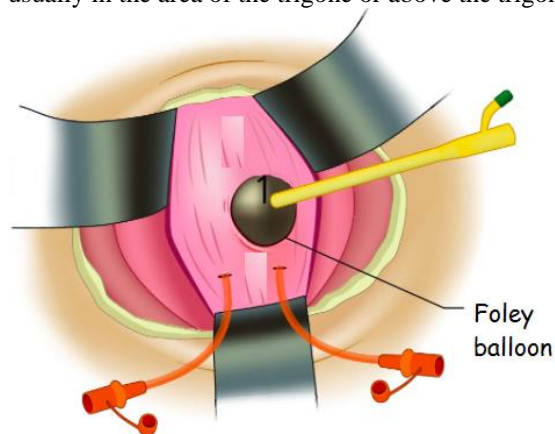
- The patient is placed in the low lithotomy position. It is often helpful to elevate the fistula site by a vaginal pack or place a swab on a sponge forceps which can be manoeuvred during the operation (optional).
- Foley ( $\pm$  ureteric) catheter is passed through the urethra into the bladder.
- The surgeon stands on the patient's left as with any pelvic operation.

#### INCISION

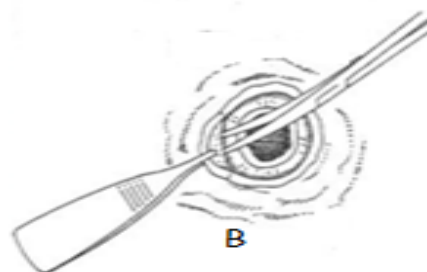
- It is preferable to make a transverse incision on the skin, even in the setting of a prior vertical midline incision (often present in these high fistulas which are usually iatrogenic). This is to avoid the scarring and adhesions from the previous midline vertical incision. The disadvantage of a low, transverse incision arises when ureteric re-implantation is necessary or you want to place omentum between the bladder and vagina. However, if this need arises, you can cut the recti muscles from the pubic bone to gain extra exposure (see Cherney incision page 75).
- Alternatively make a low midline incision and expose the retropubic space by separating the recti muscles.

**!Tip!** To stay extra-peritoneal as you open, push the scissors between the recti muscles close to the pubic bone. Then spread the scissors open. Then with the scissors still open, pull them out and insert a finger from each hand. Dissect with your two fingers of each hand deeply at first and then laterally so that you sweep any tissues off the muscle. The self-retaining retractor can be placed between the recti muscles to keep them apart. Later it may even be possible to place this into the bladder itself as seen in Fig. 5.4A.

The bladder is located by feeling the balloon of the Foley. The bladder dome is opened longitudinally with a midline vertical incision between two Allis clamps or two lateral stay stitches and the fistula exposed which is usually in the area of the trigone or above the trigone.



*Fig. 5.4A: If the fistula is not too small, a Foley catheter can be inserted into the fistula to provide traction.*



*Fig. 5.4B: The bladder is being separated from underlying tissue. Thorek scissors which have a more right-angled tip can be helpful here.*

#### EXPOSURE

- Place a self-retaining retractor between the recti muscle to keep them apart.
- Once the bladder is open, to improve the exposure, place a lateral stay stitch on each side and wrap each of these around the self-retaining retractor on both sides i.e. one end goes under the retractor and the other end goes over the retractor; then re-attach artery forceps to both ends. Clip close to the retractor for tension.
- A curved retractor can be placed in the fundus of the bladder to pull the bladder up. This has the effect of pulling the fistula site upwards.
- The ureteric orifices must be identified and preferably catheterized throughout the procedure. If they are involved near the edge of the fistula repair, the ureteric catheters are retained. Otherwise they are removed



on closure of the bladder. To ensure that they do not fall out during the operation, it is a good idea to transfix them with a fine needle.

- In small defects, only a metal catheter or probe, or a ureteric catheter can be inserted to confirm the site of the fistula.
- Inject diluted adrenaline solution around the fistula.
- To pull the fistula upwards, where possible, use both of the following:
  - Insert a Foley catheter into the defect, inflate the balloon (5-10 ml) and pull up on this (Fig. 5.4A).
  - Place 2-4 stay sutures to access and elevate the fistula. This is very useful in most cases.

### DISSECTION + REPAIR

There are two options in dissecting the bladder off the vagina:

a) **Work within the bladder** to dissect the fistula i.e. without splitting the bladder open.

- Incise around the fistula 2-3 mm from the edge with scalpel number 11.
- The fistula edges are dissected into layers (Fig. 5.4b). In some cases this may be the uterine/ cervical wall with the uterine cavity opening into the bladder. In others, it is the upper vagina. The bladder is separated from the vagina 2 cm all around. Excessive dissection is not necessary. An angled dissecting scissors (e.g. Thorek) is useful.

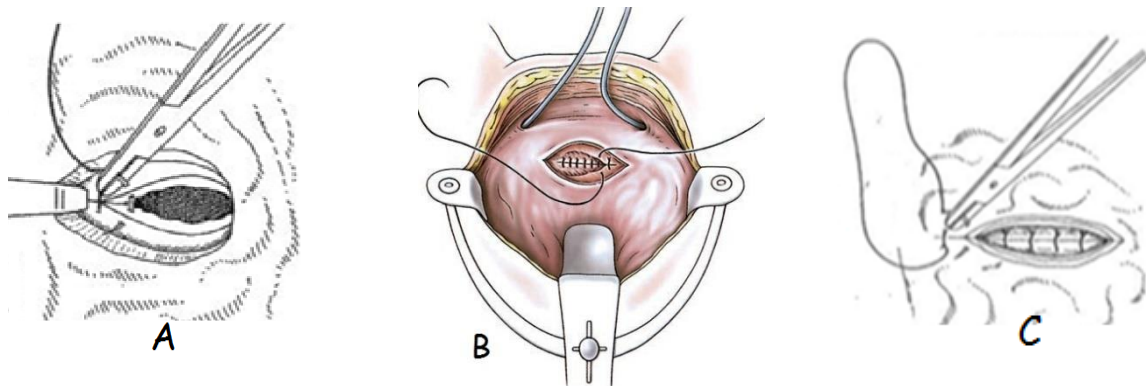


Fig. 5.5: A: Shows the vagina/uterus being closed with a single layer of (inverting) interrupted sutures.

B: Shows the deep layer of the bladder being closed with a layer of interrupted sutures, picking up the vagina and also to close any dead space.

C: A continuous suture is being inserted into the bladder mucosa for haemostatic purposes.

(b) **Split the bladder:** if this gives you better access to the fistula although you may enter the peritoneal cavity in the process. If the bladder is split open, the closure of the bladder is performed as described for intra-peritoneal repair i.e. two layers of continuous sutures.

**! Tip!** If you need to split the posterior wall of the bladder down to the fistula, it is worth bluntly dissecting any tissue (peritoneum) off the back of the bladder first. This will make it less likely that you will enter the peritoneal cavity.

**Repair:** The repair of each layer is done through the fistula and closure is usually performed in three layers starting with the deepest.

- Vagina or uterus:** The deepest layer is repaired with interrupted absorbable sutures (Fig. 5.5A). Leave the short ends of the angles on an artery forceps.
- Interpositional layer:** Rectus muscle (Fig. 5.3f) may be inserted now especially if there is an increased risk of breakdown e.g. tissues friable, urine infected.
- Deep bladder:** The next layer (the bladder wall) is exposed. A layer of interrupted or continuous submucosal sutures of 2/0 or 3/0 Vicryl is inserted (Fig. 5.5B). Secure each angle first and work towards the midline. Then tie both in the midline.

**! Tip!** Leave the short ends of each angle of the deep bladder layer on an artery forceps as it may be difficult to see the angles of the (mucosa) fistula after this layer is tied.

- Superficial bladder:** 3/0 Vicryl: Lastly the mucosal layer is closed with interrupted or more commonly continuous sutures as this gives better haemostasis (Fig. 5.5C).

**Note:** some surgeons do all layers continuously. Sometimes only one layer (interrupted or continuous) is possible for the bladder closure as a second layer can affect the blood supply to the first.

- The dome of the bladder and abdominal incisions are repaired by the routine methods.
- It is important to remove all blood clots from the bladder before closure and ensure adequate drainage through the catheters. A suprapubic catheter is not necessary for uncomplicated repairs – usually one good size 18-20F urethral catheter is sufficient (see notes on suprapubic catheter with intra-peritoneal approach).

#### (5.4) COMBINED VAGINAL AND ABDOMINAL APPROACH

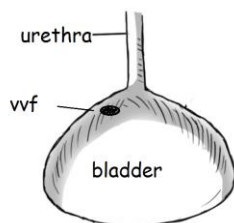
Even the most expert vaginal surgeon will have to admit that this is occasionally necessary. Usually one starts vaginally and then switches to the abdominal approach. Here are some of the situations that it may be necessary:

- 1) A high vesico-uterine or vault fistula can be a challenge especially if it goes up the posterior/ proximal bladder wall and is fixed into scar. With iatrogenic fistulas, the anatomy can be very distorted. If you are unable to finish the mobilization from below, the repair can be completed from above.
- 2) If during repair of a high fistula, you find that one of the ureters needs to re-implanted abdominally, it may be easier to complete the repair of the bladder abdominally as well.

**! Tip!** In both of these situations, it is usually a good idea to close the vagina before proceeding to the abdomen for two reasons: (1) to stop bleeding (2) to avoid having to re-position the patient at the end of the procedure.

**! Tip!** Try to leave a probe or metal catheter through the fistula before abandoning the vaginal approach but this is not always possible.

- 3) If repairing a circumferential VVF, the anterior edge of the bladder is not accessible because it is pulled into the abdomen. At laparotomy, it is easy to mobilize the anterior edge from the anterior abdominal wall. The bladder defect is closed with the lower end of the bladder formed into a tube which is then pulled through into the vagina to anastomose with the urethra. Two strong stay sutures are attached to the lower bladder to help with the pull through.
- 4) If you fail to access a very high and lateral VVF vaginally, which is usually associated with a previous failed vaginal repair. (Note: the suprameatal approach (See section 3.8) is an alternative and easier way to manage these fistulas.) When you open abdominally, you will usually find the fistula at the urethro-vesical junction laterally (Fig. 5.6). If it is difficult to find the fistula, do a dye test.



- *If the bladder has not been opened:* inject dye up the Foley catheter to find the fistula.
- *If the bladder is already open:* do a dye test by injecting dye directly into the opening with a 10 ml syringe. Hold the bladder edges with Allis forceps and use suction to prevent any dye spilling out. Look from the outside of the bladder to see any leakage. The fistula usually appears as a slit-like opening.
- Close the fistula from above i.e. from the outside of bladder/ urethra i.e. extra-vesical approach.

Fig. 5.6: When viewed supra-pubically, the fistula will be found low down near the bladder neck.

After the fistula, (the bladder opening if any) and the abdominal wall are closed, close the vaginal aspect of the fistula from below. As it may have been difficult to get a good closure of the fistula, an additional step would be to sew the bladder to the pelvic side-wall over the leak and then maybe even add a muscle patch over it (see Chapter 1 step 3: If the dye test remains positive).

#### PROBLEMS WITH THE CERVIX DURING ABDOMINAL REPAIR

If the patient presented with menses coming through the bladder/ urine with or without urinary incontinence, once the layers are dissected out, see if you can close some remaining cervix over a small tube coming out of the vagina to ensure the patency of the cervical os. Use one of the following:

- A plain tube (12F) which is transfixed by a suture and then fixed to the vagina or perineum.
- A Foley catheter inflated in the uterine cavity via the cervical canal and vagina. This can also be transfixed with a suture instead of inflating the balloon.

The tube is retained until it falls out or the patient menstruates as the os may stenose again. If it is not treated in this way, the accumulated menstrual blood may force its way through the site of the bladder repair with resultant recurrence of the fistula.