Managing the aftercare of patients with a Mitrofanoff pouch

Rachel Leaver

The Mitrofanoff technique uses the appendix to create a continent ‘tunnel’ between the skin’s surface and the bladder, which is then drained using a catheter, which is inserted along the tunnel rather than via the urethra. This is a complex procedure that needs the patient to be motivated and committed to living with such life-changing surgery. Intense preparation and long-term support from a urinary diversion nurse specialist as well as any involved community nurses is vital. Long term follow-up is vital to ensure continued good health and to anticipate any problems such as infection, stone formation or renal damage. Having access to community healthcare professionals who know about the possible dangers and can offer advice and support is also key to ensure any complications are dealt with swiftly and safely.

KEYWORDS: Contincence ■ Urinary diversion ■ Intermittent self-catheterisation

French paediatric surgeon Paul Mitrofanoff first described the procedure that ultimately took his name in 1980 (Mitrofanoff, 1980). He described using the appendix to create a continent ‘tunnel’ between the skin’s surface and the bladder. This allowed urine to be drained using a catheter, which is inserted intermittently along the tunnel rather than via the urethra.

This new technique meant that patients who had a malfunctioning bladder and/or urethra, or who needed bladder replacement (called a pouch), could be offered the option of choosing an alternative to the previously held ‘gold standard’ incontinent diversion, known as the ileal conduit (also called a urostomy), which redirected the urine so that it drained into a bag located on the abdomen (Leaver, 2004; Veeratterapillay et al, 2013).

The ileal conduit and the Mitrofanoff are both diversions, however, the ileal conduit is known as an incontinent urinary diversion while the Mitrofanoff is termed a continent urinary diversion. The Mitrofanoff specifically refers to the way the new channel is ‘plumbed’ into the bladder/reconstructed bladder or pouch to form a non-return valve.

Before the advent of continent urinary diversions, patients had no choice if the bladder was malfunctioning or had to be removed — the only option was the formation of an ileal conduit. Since the 1980s, there has been a move to offer patients the option of a continent diversion as well as a urinary stoma if appropriate.

However, not all patients are eligible for a continent urinary diversion, for example those with a physical or psychological problem which impacts on their ability to properly manage the diversion.

The Mitrofanoff is not the only available diversion that uses a continent abdominal stoma — other options include the Kock or Indiana pouch, for example. Arguably though, the Mitrofanoff is the version most commonly performed in the UK (Leaver, 2004).

CONTINENT DIVERSION

Patients with congenital abnormalities, continence problems, neuropathic bladder (where damaged or poor nerve supply leads to uncoordinated bladder action), or cancer can opt for a continent diversion, which means
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Red Flag Infection

Problems for the community nurse to look out for, include:

- Where the bladder has been partially or totally replaced by bowel — the bowel bacteria already present can mean that the patient may be vulnerable to infection
- Patients have to perform clean intermittent catheterisation (CISC) on a regular basis, increasing the potential for introducing bacteria into the system
- If there is bowel used in the bladder reconstruction/replacement, this will continue to produce mucus, which may lead to stone formation and potential infection if not washed-out regularly.

they are able to avoid wearing an external appliance to collect their urine (Veeratterapillay et al, 2013; Mozafarpour et al, 2015). This provides patients with control over their voiding and although an appliance (a catheter) is still needed to achieve emptying, at least this is intermittent, which helps them to feel ‘more normal’ than if they were wearing a stoma bag (Leaver, 2002; 2004).

The point of any continent diversion is to replace the non-functioning or diseased lower urinary tract. This has the following aims:
- To replace the urine-holding reservoir (bladder) (Figure 1)
- To replace the channel that transports urine away from the bladder (the urethra), if that is also problematic
- Ensuring there is a continence mechanism in place to keep the person ‘dry’ until they are ready to void.

The reservoir can be the native bladder itself, or one partially or totally refashioned from a section of bowel. The small bowel is usually preferred, though large bowel can also be used. The advantage of using small bowel is that no bowel preparation is required other than the patient observing a low residue diet (designed to reduce the frequency and volume of stools while prolonging intestinal transit time) for 1–2 days before surgery. This refashioned reservoir is usually referred to as the pouch.

The channel (Figure 1) is usually made of the appendix, but if this is not viable then a piece of bowel can be used to fashion a narrow tube. One end (about 2–3cm) is tunnelled into the reservoir to form a non-return valve, while the other is brought out onto the abdomen as a continent catheterisable stoma.

The stoma is sited either at the lower right abdomen or, more usually in modern practice, at the navel, which makes it less noticeable. This is especially useful if the patient is obese or has a lot of scar tissue from previous abdominal surgery (Veeratterapillay et al, 2013).

As the pouch fills with urine it expands and puts pressure on the section of the channel where it is ‘buried’ in the pouch wall. This
Five-minute test

Answer the following questions about this topic, either to test the new knowledge you have gained or to form part of your ongoing practice development portfolio.

1 – What are the main types of urinary diversion?
2 – Can you identify the difference between a urostomy and a continent urinary diversion?
3 – What is the role of bowel in the formation of urinary diversions?
4 – Do you understand the role of clean intermittent catheterisation (CISC)?
5 – What is the role of mucus in forming ‘stones’ or obstructions?

Pressure squeezes the channel shut, thereby ensuring continence. To empty the pouch, an intermittent catheter is inserted gently but firmly along the channel, through the valve and into the pouch. Once the pouch is drained, the catheter is removed. The site can be protected with a piece of gauze but most patients leave it uncovered (Leaver, 2002; 2004).

Patient education
Community nurses can play a significant role in preparing any of their patients who need to undergo a Mitrofanoff procedure. Patients need to be well-motivated and have an understanding of why their bladder has malfunctioned and how the surgery is going to change this. They need to be aware that they may need further surgery as complications are common, especially in the year immediately following surgery.

The importance of attending clinics for regular check-ups and a commitment to looking after the new diversion should also be stressed. Above all, any patient should be prepared for the eventuality that the surgeon may think a Mitrofanoff is too dangerous or difficult to perform, in which case the patient may have to undergo an ileal conduit.

Problems that might arise during surgery include the bowel being diseased or having adhesions from previous surgeries — this makes handling the bowel and formation of a pouch difficult and involves additional potential problems such as bowel perforation.

To empty the pouch, an intermittent catheter is inserted gently but firmly along the channel, through the valve and into the pouch.

Similarly, if a tumour is more extensive than expected, the surgeon may opt to form an incontinent diversion instead, a simpler surgery although one which has its complications. This may be the safest for the patient at that time.

Preoperative preparation includes renal function tests to establish a baseline. This is important as the patient’s renal function needs to be monitored following the procedure to ensure the continent diversion is not compromised. In practice, however, research has shown that continent diversions do not compromise renal function and in some cases may improve it, for example following hyperactive bladder replacement (Fontaine et al, 2000).

Surgery
The Mitrofanoff procedure itself usually requires two hospital admissions. The first (approximately 7–10 days) is when the diversion (i.e. pouch and tunnel) are formed; the second (usually only requiring a couple of days) is when the pouch is expanded, the catheters are removed, and the patient is taught how to self-catheterise and care for the pouch. Postoperative care focuses on ensuring that the pouch drains adequately at all times.

Following surgery, most patients will have two catheters exiting the pouch — a suprapubic catheter (inserted through the abdomen and directly into the bladder), and a catheter into the new channel (the Mitrofanoff catheter) (Figure 1) — this provides back-up if one fails and ensures that the pouch can drain urine at all times.

Figure 1.
Diagram shows the pouch and channel involved in urinary diversion.
It is vital that these catheters remain in place for up to 6–8 weeks postoperatively as both the pouch and the tunnel into the pouch need time to heal.

If the patient’s bladder has been removed and a new one — the pouch — has been made to take its place, the ureters from the kidneys would need to be re-implemented into the new pouch so that urine will flow into it from the kidneys. However, handling the delicate ureters and surgically implanting them into the pouch can cause them to swell, thereby obstructing the flow of urine from the kidneys. Plastic tubes called stents are passed along the ureters from the pouch into the kidneys to allow urine to flow until the swelling dies down (approximately 7–10 days later). The stents can then be removed.

If the pouch is allowed to expand with retained urine and mucus before it has properly healed, then there is a danger of rupture. This is an emergency and can lead to sepsis and potentially life-threatening complications (Leaver, 2004; Biers et al, 2012). Leaving both catheters in place (and in some cases the stents also), reduces the chance of blockages and increases the healing potential.

Care should also be taken to ensure the Mitrofanoff catheter is secured to the patient’s abdomen. Should it come loose or fall out, it must be replaced as soon as possible as failure to do this may result in the channel stenosing (where a bodily passage begins to abnormally narrow) or closing over all together, which would mean the patient would require further surgery to reverse the process and/or recreate the channel.

Good catheter care is also important in reducing the chance of infection further impeding healing (Leaver, 2004).

**Pouch washouts**

Before discharge, patients are taught to wash out the pouch. This is something they need to do at least twice a day or more often if required. Performing these pouch washouts is essential because of the mucus produced naturally by the bowel (Greenwell et al, 2001; Leaver, 2002; 2004), which can be very thick and copious following surgery, potentially blocking the catheters that are placed into the channel or the intermittent catheters that the patient will eventually use to drain the pouch. Good fluid intake and regular washouts keep this under control.

Patients should be taught to use a 50ml catheter-tipped syringe filled with saline, which is inserted into the pouch via the catheter. This requires a gentle but firm motion, both when ‘pushing’ the saline in and then when ‘pulling back’ on the syringe to remove the saline and any mucus and debris which has accumulated in the pouch.

*If the pouch is allowed to expand with retained urine and mucus before it has properly healed, then there is a danger of rupture.*

It is important to use a syringe or at the very least a device that provides adequate suction so that the thick mucus is removed from the pouch. Allowing the saline to ‘trickle out’ through gravity is not sufficient and will lead to catheter blockage and incomplete mucus removal.

This can be an anxious period for patients who are not only recovering from major surgery and learning how to care for their pouch, but also having to deal with the delay in finding out whether the surgery has been a success (Leaver, 2004).

**READMISSION**

Six weeks after their first discharge (eight weeks post-surgery) patients are readmitted for one or two days at the most so that they can learn how to catheterise the pouch — some centres may organise a pouchogram (where dye is introduced into the pouch and then X-rayed) to ensure the pouch is completely healed and there is no possibility of a leak.

The Mitrofanoff catheter is removed and the suprapubic catheter is clamped-off using a catheter valve. If the patient has stents in situ, these are also removed. The pouch is then allowed to fill with urine and expand and, rather than releasing the catheter valve on the suprapubic catheter, the pouch is emptied using a Nelaton intermittent catheter inserted via the Mitrofanoff channel. Pouches are made to hold 500mls of urine, however, it is good practice to clamp-off the suprapubic catheter for 1–2 hours at a time to start with before releasing — this avoids over-distention of the bladder and any subsequent discomfort.

A two-hourly clamp-and-release regimen suits most patients at this point, although many prefer to allow the new system to drain freely overnight at this stage before recommencing the clamping in the morning. If comfortable, the gap in between catheterisations can be extended from 1–2 hours to a maximum of 2–4 hours.

The principles of clean intermittent self-catheterisation (CISC) for the Mitrofanoff catheter are the same as for urethral CISC — it is a clean rather than sterile procedure. If not using a self-lubricating catheter, it is good practice to lubricate the catheter to allow for patient comfort and ease of insertion. In the author’s experience, anaesthetic gel is not usually needed as insertion of the catheter is described by patients as a strange sensation but not painful.

The catheter should be introduced gently but firmly into the opening of the channel (Figure 1). When the catheter reaches the valve, there may be some slight resistance. The patient should be encouraged to push the catheter through the valve and into the pouch until urine starts to drain. When the flow of urine slows, the catheter should be inserted a little further to ensure the pouch is completely drained of urine.

Patients should be reassured that the catheter’s flexibility allows it ‘to coil’ in the pouch rather than damage or perforate it. This flexibility also helps to reduce any pain for the patient. Bladder washouts should...
continue to be performed twice-daily or as often as needed to reduce mucus and allow better flow through the channel. The amount of mucus produced varies from patient to patient — it does reduce once the catheters are removed but mucus will always be produced if bowel is used as a component in the pouch, or if the bladder is completely made of bowel. Patients should continue performing bladder washouts even if these do not produce very much mucus, or it is believed that all of the mucus has been ‘flushed-out’ with the urine on drainage via the catheter.

Washing out the pouch (even if not every day) ensures that mucus will not collect at the bottom of the pouch — this can cause infection and promote stone formation.

Once the patient is confident in performing CISC, the suprapubic catheter is also removed. However, sometimes this may take longer than one or two days in hospital and it is perfectly acceptable to send the patient home again but with the clamped-off suprapubic catheter left in place as a safety valve. This allows the patient time for more practice in CISC so that they feel more confident and competent, at which point the suprapubic catheter can be removed (Leaver, 2004).

The Mitrofanoff site does not usually need to be covered, although some patients may wish to do so if mucus leaks and stains their clothes — as mentioned earlier, a simple piece of gauze or a plaster is sufficient. Some patients may also wish to use a waterproof dressing when swimming to protect the site from damage and prevent potential infection (Leaver, 2002; 2004).

**EMPTYING THE POUCH**

The rising volume of urine in the pouch will eventually put pressure on the non-return valve formed by the Mitrofanoff channel where it enters the pouch. If the pouch becomes too full, this pressure may actually impede the catheter from entering through the valve and into the pouch. This is an emergency and will lead to the pouch overfilling, which besides being very uncomfortable and painful for the patient may potentially lead to pouch rupture, which is a life-threatening situation.

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### EXHIBITION 2016

**HELPING NURSES WORKING IN PRIMARY CARE TO UNDERSTAND AND MEET THE NEW REVALIDATION REQUIREMENTS**

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<td>Cedar Court Hotel</td>
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<td>University of the West of England</td>
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NEW FOR 2016: the new online jcn revalidation tool
Therefore, post-discharge, the community nurse should advise the patient that the pouch needs to be emptied at least every 3–4 hours during the day. Eventually the pouch will stretch sufficiently to allow the patient to sleep through the night. Until then, it may be advisable for patients to wake and catheterise once overnight to avoid over-distension of the pouch (patients must be taught never to allow this).

Unfortunately, some patients who produce large quantities of urine will always need to wake at night to drain their pouch (Leaver, 2004).

Patients should drink 2–3 litres of fluid a day to flush the system, dilute any mucus and prevent urinary tract infections (Leaver, 2004). However, it is also important to advise patients to cut back on drinking 2–3 hours before going to bed to reduce their urine production and allow them to sleep through the night without over-distending the pouch.

Allowing the pouch to overfill
When overfull, a pouch may leak urine via the channel; similarly, if the pressure on the valve is too great then pushing a catheter through it may become difficult or impossible.

As mentioned above, a more serious consequence of pouch over-distension is rupture and, although rare, spontaneous pouch rupture may also occur. This is a serious complication, which may prove fatal if not treated immediately with a mortality rate as high as 50% (Fontaine et al, 2003). Community nurses can advise patients to look out for the symptoms, including:

- Abdominal pain
- Distension
- Anuria (failure of the kidneys to produce urine)
- Haematuria (blood in the urine)
- Fever and other signs of sepsis.

If patients experience any of these symptoms they should seek help as soon as possible. They will need to be hospitalised and have a urinary catheter inserted to measure their urine output and keep the pouch drained while the tear/rupture site heals.

Similarly, any urine which has drained from a ruptured pouch into the abdomen may cause a severe infection and sepsis and may have to be drained away. Some patients may develop a subphrenic abscess (an accumulation of infected fluid between the diaphragm, the liver and the spleen), which would require surgery and peritoneal lavage. Large tears in the pouch may also need surgical repair (Greenwell et al, 2001; Leaver, 2004; Rosenburg et al, 2013).

‘Stone formation in the pouch, caused by excess mucus “clumping” together and blocking the catheter and impeding complete urine drainage, occurs in about 3–52% of patients’

AFTERCARE

Patients who have undergone a Mitrofanoff procedure will probably never be completely discharged from a urology unit and will require regular 3–6-monthly follow-up initially, then a yearly check-up appointment. Blood and urine samples are taken to monitor renal function and to check for any urine infection.

Patients also require regular ultrasound scans to check for bladder or kidney stones and any sign of damage or tumours along the urinary tract. The use of bowel to construct the pouch means urine is in constant contact with the bowel which leads to problems with reabsorption of vitamin B12, potentially leading to pernicious anaemia (deficiency in the production of red blood cells through a lack of vitamin B12) (Fontaine et al, 2000).

Urine is full of toxins and waste products so should not be reabsorbed, however, a bladder partially or totally made of bowel will reabsorb substances such as chloride in the urine, potentially leading to acidosis (increased acidity in the blood and tissues).

Patients need to have blood tests to check that they are not affected. Patients may also require periodic vitamin B12 injections to top-up their reserves and any acidosis will need to be countered by taking sodium bicarbonate tablets (Greenwell et al, 2001).

Cancer patients should also be followed-up at regular intervals by an oncologist to ensure that there is no recurrence of any tumour.

However, having a Mitrofanoff channel into the patient’s own bladder does not come with the complications of mucus formation, as discussed above, as the bladder is untouched. The main problem with a simple channel into the patient’s existing bladder is stenosis (narrowing) of the channel, which may mean problematic catheterisation, or the widening of the non-return valve in the channel, which may lead to urine leakage.

Channel stenosis

The most common complication of the Mitrofanoff procedure is stenosis, with rates of 0–100% reported in the literature. This wide range is due to the possibility for stenosis to occur at any time following surgery, with rates increasing with the length of follow-up (Veerasatterapillay et al, 2013).

Clean intermittent self-catheterisation

Most channels are made to take a size 12–14ch catheter, but it is good practice to ensure patients have an emergency supply of smaller size catheters, which they can use to empty their pouch should the channel start to stenose.

If CISC becomes very difficult but the patient does manage to insert a catheter, they should be advised to leave the catheter taped in place to ensure that the pouch can still be emptied while they wait for readmission to have the channel dilated or refashioned. If CISC becomes impossible, this is an emergency and patients should present themselves to their local emergency department (Leaver, 2004).
Stone formation
Stone formation in the pouch, caused by excess mucus ‘clumping’ together and blocking the catheter and impeding complete urine drainage, occurs in about 3–52% of patients and reinforces the importance of regular pouch washouts and adequate fluid intake (Kisku et al, 2015). In the author’s experience, some patients may find drinking cranberry juice reduces mucus.

Urinary infections
Urinary infections usually result in more mucus being produced (Leaver, 2004). Also, most patients will always exhibit bacteriuria because of the use of bowel in the Mitrofanoff procedure, however, this should only be treated if the patient becomes symptomatic, exhibiting, for example:
- Offensive-smelling urine
- Haematuria
- Thickened mucus
- Fever
- Malaise
- Bladder/pouch spasms
- Lower abdominal pain.

If the patient has retained some of their original bladder, they may also have the urge to pass urine more frequently. Most patients will have one or two symptomatic infections a year that will require antibiotic therapy (Biers et al, 2012).

Patients are advised to drink cranberry juice to prevent infection (Shumely et al, 2012). Some surgeons also advocate the use of probiotics (Borchert et al, 2008). Community nurses can encourage patients to experiment and find the combination that works best for them.

CONCLUSION
Despite a major surgical procedure, intense follow up and constant vigilance, patients who opt for a continent urinary diversion often report feeling more ‘normal’ as they are in control of their bladder. Although they may still need an appliance to empty the bladder, this is not as visible as a stoma bag (Horowitz et al, 1995).

Undergoing a Mitrofanoff is a complex procedure that requires the patient to be motivated and committed to coping with such life-changing surgery. Intense preparation and long-term support from a urinary diversion nurse specialist is key to help patients learn how to look after and live with their new pouch.

Long term follow-up is required to ensure continued good health and to anticipate any problems such as infection, stone formation or renal damage. Having access to community healthcare professionals who know about the possible dangers and can offer advice and support is also key to ensure that any complications are dealt with swiftly and safely. **JCN**

REFERENCES

KEY POINTS
- The Mitrofanoff technique uses the appendix to create a continent ‘tunnel’ between the skin’s surface and the bladder.
- Urine is then drained using a catheter, which is inserted along the tunnel rather than via the urethra.
- Intense preparation and long-term support from a urinary diversion nurse specialist as well as any involved community nurses is key.
- Access to community healthcare professionals who know about the possible dangers and can offer advice and support is also key to ensure any complications are dealt with swiftly and safely.
- This is a complex medical procedure that requires the patient to be motivated and committed to coping with such life-changing surgery.
- Long term follow-up of patients is required to ensure their continued good health and to anticipate any problems such as infection, stone formation or renal damage.

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