

THE CAUSES AND MANAGEMENT OF CATHETER ENCRUSTATION

Urinary catheterisation is a procedure commonly performed by healthcare workers. It plays an essential role in the management of people with bladder or continence problems. However, urinary catheterisation is not without significant problems, some of which include urinary tract infections, urethral tissue damage and one of the most common complaints, catheter encrustation.



Encrustation on the end of a catheter.

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Urinary catheterisation is a common procedure that the majority of healthcare workers will come across at some time in their working lives. It plays an essential role in the management of people with bladder or continence problems. However, it is not without significant problems, including urinary tract infections, urethral tissue damage and one of the most common complaints, catheter blockage.

In the UK 15–25% of patients in the acute setting are catheterised for a short-term period (up to 14 days). Long-term catheterisation (over 28 days) is necessary for up

to 4% of all community patients (Crow et al, 1986).

It is also estimated that between 4–28% of patients in long-term facilities, such as nursing and residential homes, will have a long-term indwelling urinary catheter in place (Kunin et al, 1992).

'The most significant and common complications of indwelling urinary catheters are urinary tract infections and catheter blockage.'

Therefore, it is vital that all healthcare workers understand the reasons why urinary catheters are used (*Table 1*).

The ideal way to prevent catheter complications (*Table 2*)

is to avoid using an indwelling catheter in the first place. It is imperative that each person is individually assessed for the use of an indwelling catheter and each healthcare worker understands the reason for its use.

The initial reason for insertion should be documented and frequently reviewed to see if the catheter is still appropriate for the clinical treatment of that particular patient.

The most significant and common complications of indwelling urinary catheters are urinary tract infections and catheter blockage. The complication that healthcare workers should be most concerned about is catheter blockage as this can occur frequently and causes great distress to patients. Catheter blockage can result in urinary bypass (leakage of urine around the catheter), painful urinary retention and pain on removing of the catheter, a procedure that can also result in urethral trauma. Catheter blockage is also costly to the NHS in terms of healthcare workers' time and resources.

Table 1

The main reasons for urinary catheterisation

Patients who have difficulty emptying the bladder, e.g. spinal injuries, multiple sclerosis
 Patients who have a bladder outlet obstruction that is not fit for surgery, e.g. enlarged prostate
 Any patient with incontinence (only after a full assessment and all other methods have failed)
 For patient comfort in palliative care

There are two distinct causes of catheter blockage – mechanical and physical. Mechanical causes include kinked tubing, the drainage bag being above the level of the bladder or a full drainage bag. Physical causes include bladder spasm due to the presence of an irritating foreign body, constipation and the most frequent physical problem, encrustation.

ENCRUSTATION

Encrustation occurs when mineral salts are deposited on the surface of the catheter, both internally and externally. These deposits block the flow of urine from the catheter by occluding the lumen (Figure 1).

Getliffe (1992) states that nearly 50% of patients with indwelling catheters will experience problems with blockage due to encrustation. The encrustation itself is mainly composed of struvite (magnesium ammonium phosphate) and calcium phosphate. This is the result of normally sterile acidic urine turning alkaline due to the presence of microorganisms, most often the naturally occurring flora within the patient’s own bowel, e.g. *Proteus mirabilis* and *Escherichia coli*.

Patients are classified into two groups, blockers and non-blockers. Blockers are identified as patients who persistently develop encrustation within days or weeks of the catheter being inserted. This results in a shorter catheter lifespan due either to complete catheter blockage or deficient urinary flow. Non-blockers do not form encrustations even when the catheter is left in situ for weeks or months.

Healthcare workers who deal with indwelling catheters on a regular basis will be very familiar with encrustation and the devastation it can bring to patients and carers. It can result in severe pain and discomfort to the patient due to urinary retention or reduced urinary flow.

Bypassing is also stressful for patients as it leads to wet clothes and bedding. It can also strain the relationship between patient and carer.

MANAGING ENCRUSTATION

Identifying routes for urinary infections

As already stated, encrustation can be caused by the introduction of microorganisms into the bladder. Normally, the body has a range of defences

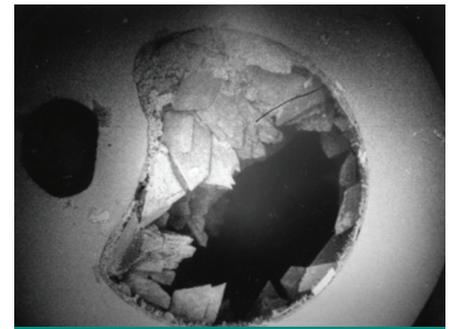


Figure 1: An occluded catheter lumen.

to prevent microorganisms entering the urinary tract, such as tightly closed folds in the urethra, the flushing action of normal voiding and a surface layer of mucus that protects against tissue invasion.

However, as soon as urethral catheterisation takes place, the first two of these defences is compromised (Getliffe and Dolman, 2003).

While healthcare workers may not be able to prevent microorganisms invading the bladder completely, there are numerous steps that can be taken to reduce it (National Institute for Health and Clinical

Table 2

Complications of long-term catheterisation

- Catheter blockage
- Urine Leakage/bypassing
- Urinary tract infections (UTIs)
- Quality of life issues (sexuality, shame, loss of control of bodily functions, reminders of illness/ mortality)
- Encrustation
- Bladder spasms
- Bladder cancer
- Urinary calculi
- Tissue damage/embarrassment
- Meatal erosion
- Catheter expulsion

Excellence [NICE], 2003):

- ▶▶ Healthcare workers must be trained in the insertion of indwelling catheters and be aware of access points of infection
- ▶▶ Urinary indwelling catheters should be inserted using an aseptic technique and sterile equipment
- ▶▶ Indwelling catheters should only be used when necessary
- ▶▶ Catheters should be removed as soon as clinically possible
- ▶▶ A sterile closed drainage system or catheter valve should be used
- ▶▶ Hands must be decontaminated before and after manipulating the catheter
- ▶▶ Urine samples must be taken from the catheter's sample port using an aseptic technique
- ▶▶ The meatus should be washed daily with soap and water
- ▶▶ The catheter should be changed only when clinically indicated or in accordance with the manufacturer's instructions
- ▶▶ The urine drainage bag should be positioned below the bladder and should not come into contact with the floor
- ▶▶ Drainage bags should be emptied frequently to prevent reflux and changed when clinically indicated
- ▶▶ Patients should have an individual care regime.

Antibiotics and/or antiseptics can also be used to combat encrustation. NICE (2003) recommends that prophylactic antibiotics should only be used

for patients with a history of catheter-associated infections following catheter change or patients who have a heart valve lesion, septal defect, patent ductus or prosthetic valve.

The use of antibiotic/antiseptic washouts, although advocated in the past, is no longer considered good practice as there is a potential for the emergence of resistant strains of microorganism (NICE, 2003).

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Planned catheter changes

Recognising whether the patient falls into the blocker or non-blocker category means healthcare workers can intervene pro-actively. To identify which group the patient belongs to, healthcare workers should monitor the life of a minimum of three catheters to see whether they consistently block before the recommended time. If a catheter does block, it should be removed and cut length-wise to access if there is any encrustation. If there is no encrustation, then the likely cause of blockage is bladder spasm or constipation and these should be treated accordingly.

In the presence of encrustation, the earlier documentation of the catheter changes comes into play. For example, if the catheter blocks at eight-weekly intervals, then healthcare workers can change the catheter at week

seven, thus avoiding any encrustation.

However, although planned catheter changes can limit the occurrence of blockages, there are disadvantages to frequent changes, i.e. urethral damage and trauma. For patients who block on a very frequent basis, i.e. less than 7–14 days, proactive catheter maintenance will be required.

Catheter maintenance solutions

Bladder washouts (also known as catheter maintenance) have until recently been the norm in the treatment of catheter blockage. However, they have always been a source of contention.

Healthcare workers have sometimes not understood how or when to use these solutions, and this has affected their effectiveness. Questions commonly asked about maintenance solutions include:

- ▶▶ What solutions should be used?
- ▶▶ How often should they be used?
- ▶▶ How should they be used?

Maintenance solutions are only available on prescription and should be prescribed on an individual patient basis irrespective of the care setting.

There are a number of maintenance solutions available, all of which have different uses. The most common ones used in the UK are:

- ▶▶ Saline 0.9% – this is used to maintain catheters that have a blockage due to pus, blood

Key Points

- ▶▶ Urinary catheterisation is a common nursing procedure, which the majority of healthcare workers will come across in their working lives.
- ▶▶ However urinary catheterisation is not without significant problems, including catheter blockage through encrustation.
- ▶▶ All healthcare workers who deal with indwelling catheters on a regular basis will be very familiar with encrustation and the devastation it can bring to patients.
- ▶▶ Encrustation can cause severe pain and discomfort to the patient due to urinary retention or reduced urinary flow.

- clots or debris. It will not dissolve encrustation
- ▶▶ Solution G (3.23% citric acid) – this works by dissolving encrustation and contains magnesium oxide to aid prevention of bladder irritation
 - ▶▶ Solution R (6% citric acid) is stronger than solution G and is used to dissolve severe encrustation. This solution also contains magnesium oxide to prevent bladder irritation. It can be used for patients who have tried solution G with no success or who experience discomfort on catheter withdrawal due to encrustation around the tip of the catheter.

The frequency of solution used should be guided by clinical judgement and the patient's individual catheter history. However, it should be remembered that every time a maintenance solution is used the catheter's closed system is open to infection. Therefore, it should be performed as infrequently as possible and at the same time as changing the drainage system.

OTHER PREVENTATIVE METHODS

The author normally advises patients with indwelling catheters to drink between 1.5–2 litres of fluid (preferably water) per day. It would seem to be common sense to advise patients to drink more if they experience catheter encrustation, however, there is no clinical evidence to support this theory.

The use of cranberry juice also lacks concrete evidence, although there is a lot of

anecdotal evidence that it is effective for many patients. However, cranberry juice should not be recommended for patients with multiple sclerosis or those on warfarin therapy.

Plain latex and Teflon®-coated catheters demonstrate the greatest susceptibility to encrustation (Getliffe and Dolman, 2003), while silicone or hydrogel catheters demonstrate the least. One of the latest developments are silver-coated catheters, which help prevent urinary infections in patients who use them for short periods. This in turn can help to prevent encrustation.

CONCLUSION

The care of patients with indwelling urinary catheters is a challenge in itself, without the added complication of catheter encrustation. However, approximately 50% of patients will suffer catheter encrustation and become regular blockers. The methods discussed in this article present some of the best clinical guidance available for the management of these patients.

Further research into this area is needed and healthcare workers would benefit from the implementation of best practice clinical guidelines.

Healthcare workers need to use all of the proposed methods for preventing encrustation in conjunction with each other, but the best method of preventing catheter blockage remains avoiding unnecessary catheterisation in the first place. **CE**

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