The Buttonhole Technique: Strategies To Reduce Infections

CNE Continuing Nursing Education

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The buttonhole technique has gained popularity over the last decade in the United States. The fact that it is a relatively new technique, which requires a change to current cannulation practice, has contributed to several unforeseen complications that have led to increased infection rates in AV fistulae. To keep this technique a viable option for patients, it will be necessary to understand the potential infection risks and implement strategies to reduce the incidence of infection.

Goal

To provide an overview of strategies in reducing infection while performing the buttonhole technique.

Objectives

1. Explain a process that patient care staff can institute to prevent buttonhole infections.
2. Discuss the implications of using sharp needles long-term.
3. Describe how improper cannulation technique can cause an infection in a buttonhole cannulation site.

The buttonhole technique has been utilized in the United States for over 10 years, and it has been very effective in reducing pain associated with cannulation, empowering patients to learn to self-cannulate, and decreasing complications related to site rotation cannulation. Unfortunately, there is one aspect of this technique that may impact its use – high infection rates. Over the course of the last 20 years, there has been very limited published literature identifying concerns or complications associated with the buttonhole technique. It has only been within the last four years that research has been published citing infection as a potential problem requiring the renal community's attention (Doss, Schiller, & Moran, 2008; Marticorena et al., 2006, 2009; van Loon, Goovaerts, Kessels, van der Sande, & Tordoir, 2009; Verhallen, Kooistra, & Van Jaarsveld, 2007). This article discusses specific issues associated with the buttonhole technique and identifies strategies to reduce the incidence of infection.

Understanding the Technique

What exactly is the buttonhole technique? It is a technique that fools the fistula into thinking that only one person is cannulating it. The biggest advantage of the buttonhole technique is that it reduces the variability that occurs as the results of staff members' different cannulation skill sets.

It must be understood that buttonhole is not just a variation on site rotation cannulation, but rather, an entirely different way of performing cannulation. How staff members cannulate for site rotation depends on their background (for example, phlebotomist, IV nurse, no experience) and their initial cannulation training. As a result, there is great variability in how needles are inserted.

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Figure 1
Breaking Through the Epithelial Lining of the Buttonhole Tunnel

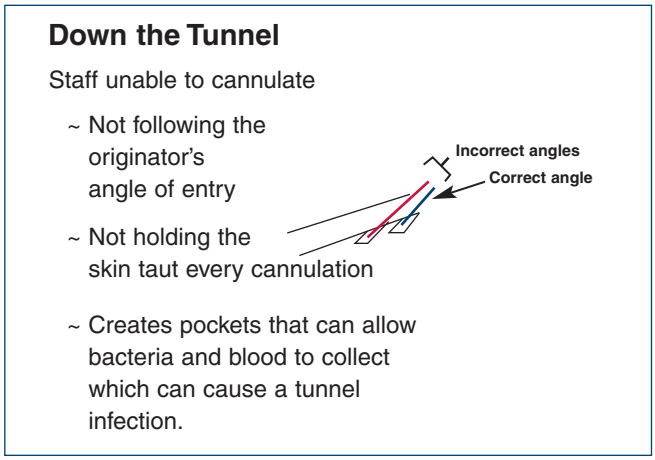
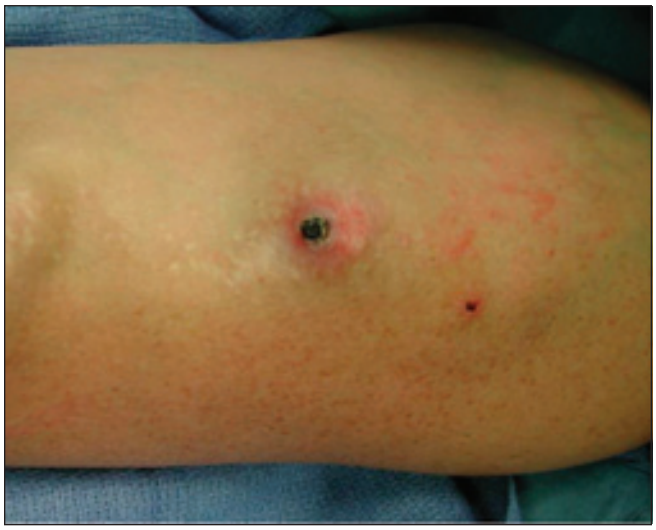


Figure 2
Tunnel Infection

Note: Photo by Tony Samaha, MD.

Figure 3
Alteration in Scab Size Due to Manipulation (Center), Normal Scab Size (Lower Right)



Note: Photo by Tony Samaha, MD.

The buttonhole technique limits this variability to the cannulation skill set of one individual – the creator of the buttonhole sites. It now requires a "follow the leader" approach to cannulation, which has been the hardest concept to grasp with this technique. When you are the follower, site location, directionality, and angle of insertion have been pre-determined; you have no input, nor does it matter how you would have done it differently. Cannulation needs to be done exactly the way it was done by the original cannulator, or damage to the buttonhole site will occur.

Tunnel Creation

Using only one person to create the buttonhole tunnel can keep complications to a minimum (Ball, 2006). It is important to keep the tunnel as close to the diameter of the needle as possible to reduce the amount of manipulation down the tunnel. Manipulation can cause a break in the epithelium lining, which could allow a niche for bacteria or creation of multiple tunnels. Either of these situations could set the patient up for the development of a tunnel infection (see Figures 1 and 2). Having scabs that are larger than the diameter of the needle is one indication the tunnel has been entered at multiple angles of insertion, was created using a too-steep angle of insertion, or someone was "searching" for the tunnel (see Figure 3).

In addition to a single creator, if the advantages of arteriovenous (AV) graft cannulation to the buttonhole technique can be applied, it should aid in creating well-developed buttonhole sites. The first advantage of AV grafts is they are firm and large. How do we get AV fistulae to resemble grafts? By always using a tourniquet to plump up the vessel to enable a complete assessment, determine how deep the vessel is to identify the correct angle of insertion, and know exactly where the center of the blood vessel is located. The second advantage of AV grafts is they do not roll.

One reason grafts are not cannulated immediately after placement is so they can "set" in place by tissue growth around the graft. By pulling the skin taut (Ball, 2005), it enables the skin to come down over the top of the vessel, preventing it from rolling. In the buttonhole technique, we do not want to retract the skin as we do in site rotation because when the skin returns to its original location, it could move the needle tip out of position. Instead, if the skin is stretched taut from side-to-side, it will allow the vein to be stable but not cause needle movement. Everyone who buttonholes needs to realize both of these two actions must be used from the first cannulation until the buttonhole site is used for the last time. Everyone must do the entire process exactly the same to be able to access the sites every time.

Preparing the Buttonhole Sites For Cannulation

It has been well documented for over 20 years that patients on dialysis have more *Staphylococcus aureus* on their skin and in their nares than the general population (Kaplowitz, Comstock, Landwehr, Dalton, & Mayhall, 1988). As a result, staff members must be rigorous in their technique when it comes to skin cleaning prior to inserting needles into the patient's sterile bloodstream. In the current literature, response to buttonhole infections has been to establish a protocol of meticulous cleaning prior to cannulation. It starts with the patient washing the access just before sitting down in the dialysis chair. Patient resistance to this must be met by providing rationale. Showering at home is not sufficient cleaning for the insertion of needles (Ball, 2007a). Patients must know their skin needs to be as clean as possible just prior to inserting needles, and it needs to be cleaned in conjunction with the staff members' cleaning routine. Each manufacturer has a recommended contact time that their agent must have to effectively kill bacteria (Ball, 2007b). It is imperative that staff adhere to this contact time to ensure the maximum amount of *Staphylococcus aureus* is removed prior to cannulation. The recommendations from the research for cleaning buttonhole sites is as follows (Doss et al., 2008; Verhallen et al., 2007):

- Patients must wash the access just before sitting down in the dialysis chair.
- Staff members must clean buttonhole sites before scab removal using the manufacturers' recommendations.
- The scabs must be removed completely.
- Staff members must re-clean buttonhole sites with an antibacterial agent using the manufacturer's recommendations.
- The buttonhole sites are then cannulated.

In addition to skin cleaning, complete scab removal is essential. Since patients sit in their chairs for four hours, *Staphylococcus aureus* comes back onto their skin; when scab formation occurs post-dialysis, the *Staphylococcus aureus* becomes incorporated into the scabs. Moistening scabs before removal helps reduce pain, but care must be taken so trauma at the exit site is minimized to prevent exit site infections.

Many studies have been done on reducing the incidence of exit site infections for both peritoneal and central venous catheters. Jaber (2005) reviewed several randomized controlled trials of prophylactic topical ointments, and they all reduced infections at exit sites compared to nontreated exit sites. Only a couple small studies looked at eliminating buttonhole exit site infections by incorporating antimicrobial prophylaxis. Marticorena et al. (2006, 2009) used betadine or polysporin on the gauze when withdrawing needles, while Nesrallah, Cuerden, Wong, and Pierratos (2010) utilized mupirocin ointment. Results from both groups showed a reduction or elimination of buttonhole infections.

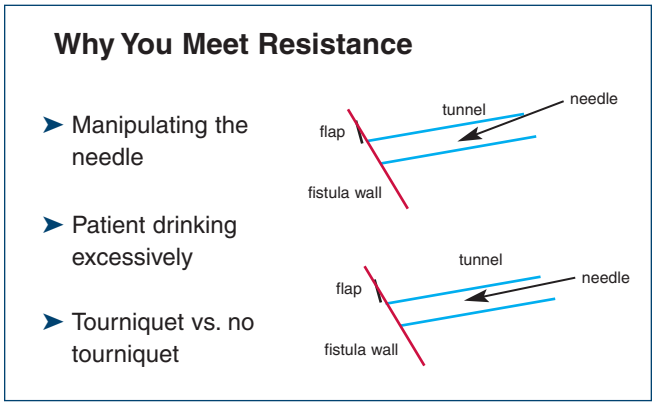
A new phenomenon has recently been identified at the exit site – hubbing (Ball & Mott 2010). In routine cannulation training, staff members are taught to insert the needles with the hub coming into contact with the patient's skin to maximize the amount of needle within the blood vessel, but this is not the best practice for buttonhole cannulation. By repeatedly pushing the needle against the skin of a buttonhole site, the underlying structure of the skin collapses, causing the hub to bury itself inside a cave-like indented buttonhole site. This results in the scab being very difficult to reach and remove, causing staff members to have to dig around the exit site. Incomplete scab removal or tissue trauma at the exit site can lend to bacteria being transferred down the tunnel and into the bloodstream.

Another avenue that may need to be pursued is whether or not to mask when accessing buttonhole cannulation sites. Several studies of peritoneal exit sites have shown a significant association of nasal carriage of *Staphylococcus aureus* with exit site infections. Since the majority of patients on dialysis and their staff are never checked for the presence of *Staphylococcus aureus*, it could be one source of infection that is overlooked. Buttonhole sites are truly exit sites, and thus, should be treated as such. Several dialysis providers have incorporated the use of masks for buttonhole cannulation.

Use of Sharp Needles

The buttonhole technique requires the alignment of the tunnel and the entrance through the blood vessel wall. There are three main reasons why this alignment does not stay true, making it difficult to insert blunt needles (see Figure 4). One reason is cannulators trying to guide the needle down the tunnel, referred to as manipulating or "futzing" with the needle. If the tunnel that has been created is the diameter of the needle, then the needle can find its way down without any difficulty. By pushing on the tunnel, the cannulator can displace the tunnel from the entrance to the blood vessel wall; this is evidenced by meeting resistance and the

Figure 4
Inability to Successfully Insert Blunt Needles in a Buttonhole Site



inability to advance the needle into the bloodstream. A second reason is due to the patient drinking excessive amounts of fluid or having excessive fluid as a result of the extended time since the last dialysis or an inadequate last dialysis. As the fluid increases and remains in the blood vessels, the blood vessels will stretch to accommodate the increased volume, thus shifting the vessel wall entrance out of position with the tunnel. The third reason is cannulators not doing the buttonhole procedure identically – the tourniquet versus the non-tourniquet method.

It is important to remember anything that will alter the amount of fluid in the vein will change the position of the opening into the bloodstream. The way to realign the tunnel and opening is to position the blunt needle up to the point of resistance and lift the tunnel slightly until the opening is found. What the cannulator should *not* do is re-enter the site with a sharp needle. While this will be successful, it will also cannulate in a small area, creating the potential for aneurysm formation, especially if done on a regular basis. If unable to find the opening to the bloodstream after moving the tunnel, then the needle should be removed and a Band-Aid® placed over the buttonhole site; the site should be rotated with a sharp needle elsewhere, avoiding a three-quarter inch in front of the buttonhole site where the tunnel would be located. This will preserve the integrity of the tunnel for future use.

In the last five years, it has been shown that using sharp needles long-term creates a lot of scarring of the tunnel and of the blood vessel wall. The recommendation from the Fistula First Breakthrough Initiative (n.d.) is to no longer use sharp needles long-term. The best demonstrated practice, touch cannulation technique (Mott & Prowant, 2008), decreases the ability of staff members to manipulate needles, resulting in better cannulation success.

Competency Reviews

Failure to consistently conduct cannulation competency reviews has led to deviation from policy and procedures, shortcutting to speed turn around times, and poor cannulation practice. Labriola, Crott, and Jadoul (2009) presented an abstract at the American Society of Nephrology's annual meeting stressing that buttonhole "requires rigorous education and training of the staff" after seeing a rise in infectious events during the second year of buttonhole cannulation, "probably as a result with less attention for careful disinfection." The Fistula First Breakthrough Initiative (n.d.) has created a Buttonhole Skills Cannulation Checklist that is available on the Fistula First Web site for use by the renal community.

Conclusion

Cannulation is an invasive procedure. More focus needs to be placed on cannulation competencies, incorporating practice guidelines, evidence-based research/practice, and manufacturers' recommendations to ensure compliance with accepted cannulation practices. Now is a good time to review infection rates by cannulation type, as well as the policies and procedures for incorporation of new evidence-based practice changes, and look at the skill set of each member of the patient care staff. If the buttonhole technique continues to have higher infection rates than site rotation cannulation, its use will be prohibited. It is paramount to have a safe and effective cannulation technique that will benefit both patients and staff. The buttonhole can be that technique if best practices in cleaning the site, creating and maintaining the buttonholes, and cannulation are followed.

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GOAL To provide an overview of strategies in reducing infection while performing the buttonhole technique.

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b. Discuss the implications of using sharp needles long-term.	1	2	3	4	5
c. Describe how improper cannulation technique can cause an infection in a buttonhole cannulation site.	1	2	3	4	5
3. The content was current and relevant.	1	2	3	4	5
4. This was an effective method to learn this content.	1	2	3	4	5
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