DIVISION OF MEDICINE
DEPARTMENT OF NEPHROLOGY

Self-Directed Learning Package

Buttonhole Cannulation

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HUNTER NEW ENGLAND
NSW HEALTH

HUNTER NEW ENGLAND AREA HEALTH SERVICE
John Hunter Hospital – Division of Medicine
Department of Nephrology

Self Directed Learning Package

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The following package has been written using the references cited in the reference list. Much of the information presented in this module outline is considered generic information and is widely reflected in the nephrology literature, as such it is not feasible to reference all sources of information. Only citations that are directly attributed to a single source/s are referenced in the text presented herein

USING THIS SELF DIRECTED LEARNING PACKAGE

Through out this self directed learning package there are readings and activities that you need to complete. Readings are divided into two categories, those included in the appendices, and those that are identified as online readings. The online readings are not provided due to copyright law restrictions. You will be provided with the source of the article, articles will be available to you from a variety of sources.

- For example to access an article from CIAP you would need to go to the intranet, select the CIAP option from the quick links menu on the home page. Scroll down to databases, select journals@OVID. Log into CIAP using the hospital username and password that is circulated by the library staff.

If you have any difficulty locating the readings please seek assistance from either the Clinical Nurse Educator or the Clinical Nurse Consultant for Nephrology.

This SDLP uses the following icons

	**READING** This icon alerts you to undertake reading related to the topic this may include Safe Work Practices, Journal Articles or Books
	**LEARNING ACTIVITY** **This icon denotes a learning activity or competency assessment that you will need to complete**
	**CARI GUIDELINES** This icon alerts you to the presence of a CARI guideline, related to the subject available at www.cari.org.au

MARKING THE SELF DIRECTED LEARNING PACKAGE

Once you have completed this package you need to submit the completed learning activities to the Clinical Nurse Educator. The Clinical Nurse Educator will then forward the package to the allocated marker.

Please note it may take up to four weeks to have the package marked and returned to you. Staff will be issued with a certificate of completion and can also have this notarised in their record of professional development booklet.

OBJECTIVES

This package aims to increase the nurse's understanding of buttonhole cannulation in the renal dialysis patient.

At the completion of this package, the Registered Nurse will be able to**:**

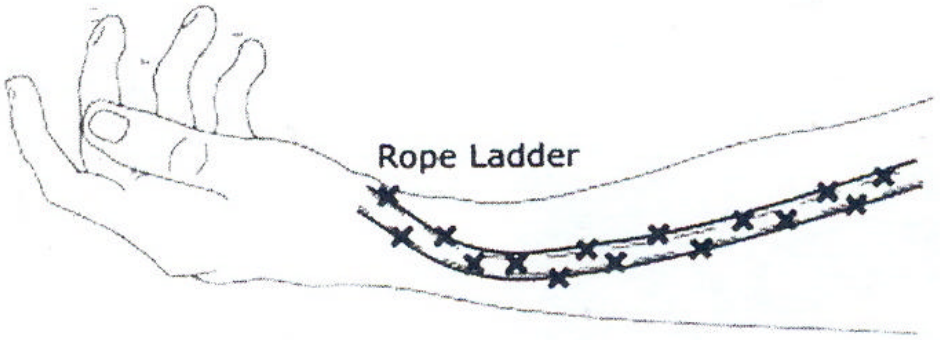
- Explain the advantages and challenges of the buttonhole cannulation technique
- Identify potential complications associated with buttonhole cannulation
- Identify ideal access sites for buttonhole sites
- Discuss the process of developing buttonhole sites according to Department of Nephrology Safe Work Practice

Introduction

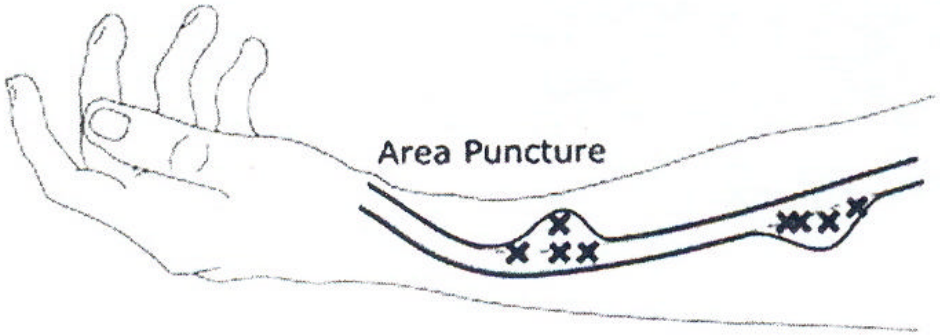
Arteriovenous fistula (AVF) survival is reliant on a number of factors including the quality of the vessels used, the surgical technique in creation, and the cannulation technique used to access the vessel.

The consequences of repetitive cannulation are dependent on the technique utilised. Repeated area cannulation (see B figure 1) can give rise to aneurysmatic dilatations, increased tissue elongation and subsequent development of adjacent stenoses. While, the rope ladder technique (see A figure 1) causes small to moderate dilatations over the vessel length but without aneurysmatic formations. Finally, the repeated puncture of the same site at the same angle and same depth is termed the buttonhole technique (see C figure 1 and figure 2). This technique has been used successfully with nocturnal dialysis programs internationally and is being increasingly used with problematic vessels with limited cannulation areas.

A



B



C

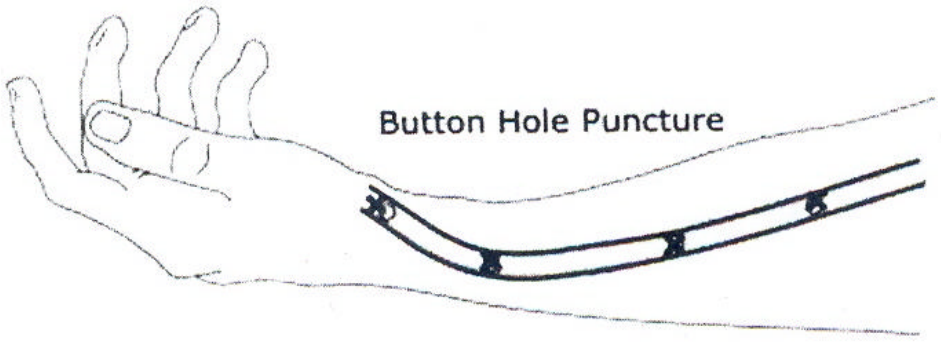


Figure 1: Cannulation Techniques
Source Davies & Gibbons, 2007,page 72)

Familiarise yourself with the following papers, they give a comprehensive consideration to the buttonhole cannulation technique and the many issues that must be taken into account when utilising this technique.

READING

Verhallen, A. M., M. P. Kooistra, et al. (2007). "Cannulating in haemodialysis: rope-ladder or buttonhole technique?. *Nephrology Dialysis Transplantation 22*(9): 2601
Available at http://ndt.oxfordjournals.org/cgi/reprint/gfm043v1

Ball, L. K. (2006). The buttonhole technique for arteriovenous fistula cannulation. *Nephrology Nursing Journal, 33*(3): 299-304.
Available at http://www.nwrenalnetwork.org/fist1st/CEButtonholeAVF.pdf

Twardowski, Z. (1995). "Constant site (buttonhole) method of needle insertion for hemodialysis." Dialysis & Transplantation 24(10): 559–576.
Available at www.esrdnetwork6.org/utils/va/**ConstantSite**Article.pdf

Hunter New England Health, Division of Medicine, Department of Nephrology, Safe Work Practice. Establishing and cannulating constant sites in native arteriovenous fistulas

Assessing the AVF for buttonhole technique suitability

The selection of appropriate candidates for the cannulation for buttonhole technique is paramount to technique success, as is the assessment of appropriate cannulation sites. This is achieved through the performance of both initial and ongoing arteriovenous assessment and documentation. Patient and staffing factors will also need to be considered:

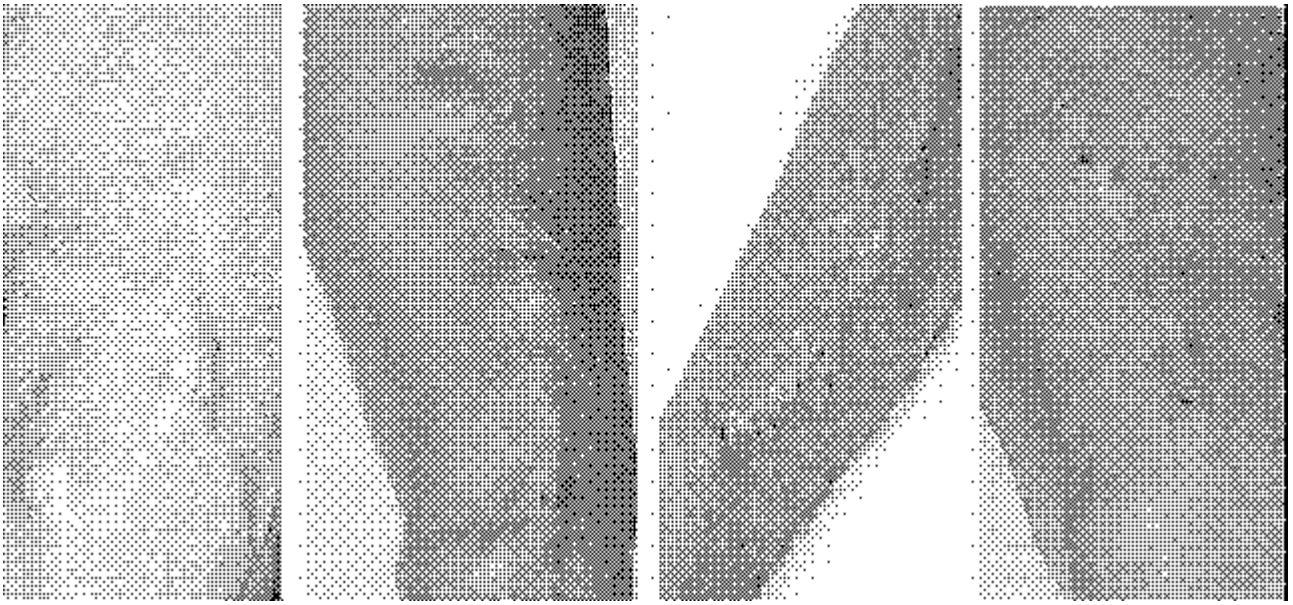


Figure 2: Buttonhole sites, no two sites are the same
Source: **www.esrdnetwork18.org/pdfs/QI_PPWebEx_093007.pdf**

INSPECTION

1. Anatomical placement of vessel: Buttonhole technique has been recommended for AVF's located in the upper arm and short elbow
2. Skin condition over vessel: heavy scarring may prove problematic to the establishment of a viable buttonhole track
3. Visual characterisation of vessel depth: excessive amounts of subcutaneous or adipose tissue may be challenging
4. Existence of either stenoses, pseudoaneurysms or aneurysms
5. Presence of collateral veins: consider need for ligation
6. Type of vessel: Buttonhole technique is not currently recommended for grafts.
7. Access cannulation difficulty: Buttonhole technique is beneficial for vessels with limited cannulation sites. If vessel length is extended and there are no cannulation limitations, the rope ladder technique should be considered.
8. Ideally, relatively unused straight sections of the fistula should be chosen for puncture

PALPATION

1. Temperature
2. Presence of thrill
3. Presence of oedema
4. Vessel characteristics, the use of vessel mapping and photography

AUSCULTATION

1. Characteristics of bruit

ADDITIONAL FACTORS

1. Patient's cognitive ability to understand procedure
2. Patient's ability to self cannulate – is it appropriate for the patient to establish the track? Is patient's eyesight compromised?
3. Staffing levels during development of track phase – will the same staff member be available for each cannulation? Consider possibility of alternate staff member simultaneously establishing second pair of sites.
4. The site chosen must be easily accessible to the patient
5. Buttonhole sites must be at least 6-7cm apart to minimise recirculation
6. Appropriateness of development stage being conducted daily with weekend off or alternate daily
7. When establishing a second pair of buttonhole sites (only after original sites are well defined), ensure they are at least one inch from original sites to avoid any potential damage to already established tracks

Buttonhole Cannulation

The establishment of buttonhole sites involves a two-stage process. The initial phase sees the use of a sharp needle for cannulation while the buttonhole track is developed. It is crucial that the initial cannulation process or the development phase be instigated, maintained and completed by the same experienced nurse to facilitate the formation of an intact scar tunnel as early as possible (as each person has their own unique technique characterised by differing direction and angle of insertion in addition to depth of penetration). However, it may be appropriate for the patient to initiate the process under the strict supervision of the same nurse in order to facilitate congruity. Therefore, forward assessment, planning and appropriate staff rostering will also be necessary for a successful establishment phase.

When choosing suitable sites, consideration must be given to the ability of the patient to successfully cannulate the chosen buttonhole site. It would be counter-productive for the nurse to establish a site that, due to dexterous or physical restrictions, the patient is unable to access and self-cannulate.

During the development phase, it is imperative that the vessel be cannulated using the same angle, same depth and same insertion site fore each cannulation. Failure to do so may imitate the 'area puncture' technique, which can give rise to aneurysmatic dilatations, increased tissue elongation and subsequent development of adjacent stenoses. Correct technique will facilitate the skin, subcutis and vessel wall forming a cylindrical scar tissue tract, which will facilitate the smooth advancement of the needle. This area will be palpable from the buttonhole site in the direction of the tract.

It is at this stage that the dull arteriovenous needles are introduced (see figure 3). Dull bevelled needles facilitate an easier insertion through the established tract and remove the potential for vessel infiltration.

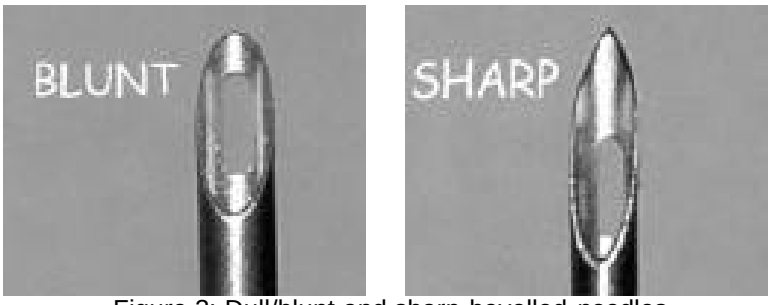


Figure 3: Dull/blunt and sharp bevelled needles
Source: Ball, 2006 p302

Alternatively, sharp needles can traumatise adjacent tissues, enlarge the hole and cause associated bleeding and haematoma formation. Hence, they are only utilised during the development phase of the buttonhole track. If bleeding is noted from the buttonhole site mid treatment, a trial of the dull cannulas is indicated. If slight resistance is encountered during the advancement of the dull bevelled needle (this may occur after a weekend break during the early stages of the established phase), apply gentle pressure while partly rotating advancing needle (see figure 4).

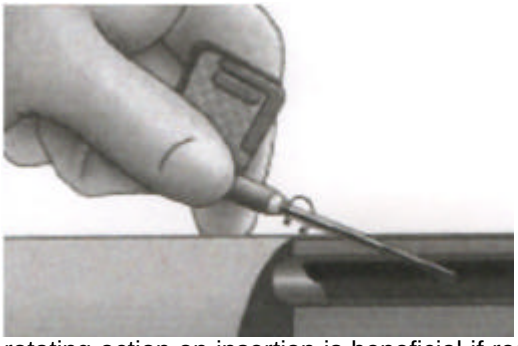


Figure 4. The use of a rotating action on insertion is beneficial if resistance is encountered
Source: unknown

There is some conjecture as to the length of time it takes to establish the buttonhole track with a sharp bevelled needle and before it is time to commence the second stage and convert to a dull bevelled needle. Some schools of thought including Twardowski's, believe that six cannulations may be sufficient to establish the track. However, it may take as many as twelve to fifteen cannulations, even longer if the patient is diabetic. There is

further conjecture as to whether the vessel should be cannulated daily or alternate daily. An alternative may be to simultaneously establish a set of backup sites.

Once backup sites are established they should be cannulated in an alternating manner. No evidence exists as to how long it takes to establish buttonhole sites or if the vessel should be cannulated daily or alternate daily. Indeed, AVF cannulation is individualised in its very nature and no hard and fast rule can be attached to a protocol with regard to the concept of time. There is potential for a multi-centre study to be conducted in the future to establish a best practice policy for the buttonhole technique. In the interim, the HIDS unit will individualise its approach to each patient during both the development and established phase of the buttonhole track.

Buttonhole Surveillance Chart

Site surveillance can and should be multidisciplinary in its practice and purpose. It refers to the monitoring of the progress of the vessel, investigations that have occurred, actions taken, cannulation techniques utilised, needle type and gauge, blood flows and pressures. Additional information regarding complications, difficulties encountered and patient reaction should also be documented each treatment. Photographing buttonhole sites at days 1, 12 and 30 and subsequently at months 6 and 12 to provide pictorial evidence of progress would also be beneficial. A buttonhole surveillance chart should also be used with all patients commencing the buttonhole technique, and be completed in full after each cannulation until the site is established. It should also be used during the establishment of backup sites and for ongoing monitoring.

Cannulation pain

The psychological impact of needle insertion and associated pain should be considered during the assessment process. Pain is multifaceted and subjective in its nature and may influence the patient's ability to self-cannulate. The use of a topical anaesthetic may be suitable, however extended skin contact time may make scab removal difficult. Lignocaine may also be used, however it should no longer be necessary once the buttonhole track is established.

LEARNING ACTIVITIES

These questions have been taken from the readings you were asked to review at the beginning of this package

1. What are the barriers to the success of creating a buttonhole site?

_____

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2. What are the major risks associated with developing buttonhole sites?

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3. List the pros and cons of the buttonhole cannulation technique in terms of patient and staff benefits

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_____

4. Discuss the changes that indicate the readiness to change from sharp to dull bevelled needles

_____

_____

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_____

5. Buttonhole cannulation technique is only suitable for home haemodialysis patients. (please circle correct answer) True/False

6. What are the dos' and don'ts of scab removal?

_____

_____

_____

7. What were the inclusion and exclusion criteria for Verhallen et al's (2007) study?

_____

_____

_____

	8. Complete the following: When choosing potential buttonhole sites I must evaluate… _____ _____

Buttonhole Cannulation Education and Competency

Staff need to be assessed as being competent with buttonhole cannulation prior to undertaking buttonhole cannulation techniques. Staff will have a completed competency assessment form as evidence of their competence.

If a patient with a buttonhole needs to be cannulated and no staff are competent to perform the buttonhole cannulation a standard fistula cannulation needs to be performed at least 2-3cms away from the buttonhole sites.

As part of the competency assessment you are also required to attend an in-service entitled Buttonhole Cannulation, please organise this with the Nephrology Clinical Nurse Educator or the Vascular Access Coordinator

Title of Presentation	Buttonhole Cannulation
Duration	
Location	
Date	
Presenters Signature	
Attendees Signature	

References

Agar, J.W.M., Somerville, C.A., Dwyer, K.M Simmonds, R.E., Boddington, J.M., Waldron, C.M. (2003) Nocturnal Hemodialysis in Australia, *Hemodialysis International, 7*(4), 278-289.

Ball, L. K. (2006). The buttonhole technique for arteriovenous fistula cannulation.*Nephrology Nursing Journal,* 33(3): 299-304.

Besarab, A. & Brouwer, D. (2004) Improving arteriovenous fistula construction: Fistula first initiative *Hemodialysis International*, 8(3)199-206

Bourbonnais, F.F., Perreault, A., & Bouvette, M (2004) Introduction of a pain and symptom assessment tool in the clinical setting – lessons learned. *Journal of Nursing Management*, 12, 194–200

Davies, A.H. & Gibbons, C.P. (eds) (2007). Vascular access simplified (2nd ed). Castle Hills Barns, UK: tfm publishing.

Hunter New England Health, Division of Medicine, Department of Nephrology (2008). Safe Work Practice. Establishing and cannulating constant sites in native arteriovenous fistulas.

Kronung, G. (1984) Plastic Deformation of Cimino Fistula by Repeated Puncture, *Dialysis and Transplantation*, *13*(10), 635-638

Leitch, R., Ouwendyk, M., Ferguson, E., Clement, L., Peters, K., Heidenheim, AP., Lindsay, RM. (2003) Nursing issues related to patient selection, vascular access, and education in quotidian hemodialysis. *American Journal of Kidney Diseases.* 42(1)Suppl 1: :S56-60

Marticorena, R. M., J. Hunter, et al. (2006). "The salvage of aneurysmal fistulae utilizing a modified buttonhole cannulation technique and multiple cannulators." Hemodialysis International 10(2): 193-200.

Peterson, P. (2002). Fistula cannulation: the buttonhole technique. *Nephrology Nursing Journal,* 29(2), 195.

Twardowski, Z. (1995). Constant site (buttonhole) method of needle insertion for hemodialysis. *Dialsyis and Transplantation*, 24(10): 559–576.

Twardowski Z, Kubara H. (1979) Different sites versus constant sites of needle insertion into arteriovenous fistulas for treatment by repeated dialysis. *Dialysis & Transplantation* 8 pp978-980

Verhallen, A. M., M. P. Kooistra, et al. (2007). Cannulating in haemodialysis: rope-ladder or buttonhole technique?. *Nephrology Dialysis Transplantation 22*(9): 2601
Available at http://ndt.oxfordjournals.org/cgi/reprint/gfm043v1