Bard Access Systems, Inc.

Power Groshong
Peripherally Inserted Central Catheter

Nursing Guide

BARD
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INTRODUCTION

Product Description
A family of peripherally inserted central catheters made from specially formulated and processed medical grade materials. Each PowerGroshong* catheter has a kink resistant, reverse tapered design. Catheters are packaged in a tray with accessories for reliable long (greater than 30 days) or short (less than 30 days) term vascular access.

PowerGroshong* PICCs have the following features:
Single-lumen
• Soft, medical grade silicone rubber tubing
• Patented, three-position valve
• Radiopaque tip
• Radiopaque catheter body
• Depth markings
• StatLock* stabilization device compatible
• 18 Ga. lumen
The catheter is placed into one of the large antecubital veins and threaded into the superior vena cava above the right atrium.
The Groshong® catheter incorporates a 3-position, pressure-sensitive Groshong® catheter valve. The valve is located near the rounded, closed, radiopaque catheter tip and allows fluid infusion and blood aspiration. When not in use, the valve restricts blood backflow and air embolism by remaining closed.

The Groshong® catheter valve is designed to remain closed between -7 and 80 mm Hg. Since the normal central venous pressure range in the superior vena cava is 0 to 5 mm Hg, the valve remains closed at normal central venous pressure. Pressure in the superior vena cava must exceed 80 mm Hg to open the valve inward. Also, negative pressure (vacuum) will cause the valve to open inward, allowing blood aspiration.

Positive pressure into the catheter (gravity, pump, syringe) will open the valve outward, allowing fluid infusion. The need for the anticoagulant effect of heparin is eliminated because the closed valve prevents blood from entering the catheter and clotting. If the catheter is aspirated, pulling the valve inward, it must be flushed with normal saline to clear blood from the lumen and allow the valve to return to its normal closed position.

**The benefits provided by the Groshong® catheter valve are:**
1. Increased patient safety due to reduced risk of air embolism or bleedback.
2. Elimination of the need for heparin flushing to maintain catheter patency.
3. Reduced need for catheter clamping.
4. Reduced need for flushing when the catheter is not in use.
**INDICATIONS FOR USE**

The PowerGroshong* catheter is indicated for short or long term peripheral access to the central venous system for intravenous therapy and power injection of contrast media. The maximum recommended infusion rate is 4 ml/sec for power injection of contrast media.

**New Important Information:**
- Contrast media should be warmed to body temperature prior to power injection.

**Warning:** Failure to warm contrast media to body temperature prior to power injection may result in catheter failure.
- Vigorously flush the PowerGroshong* catheter using a 10 ml or larger syringe and sterile normal saline prior to and immediately following the completion of power injection studies. This will ensure the patency of the PowerGroshong* catheter and prevent damage to the catheter. Resistance to flushing may indicate partial or complete catheter occlusion. Do not proceed with power injection study until occlusion has been cleared.

**Warning:** Failure to ensure patency of the catheter prior to power injection studies may result in catheter failure.
- Do not exceed the maximum flow rate of 4 ml/sec.

**Warning:** Power injector machine pressure limiting feature may not prevent over-pressurization of an occluded catheter, which may cause catheter failure.

**Warning:** Exceeding the maximum flow rate of 4 ml/sec, or the maximum pressure of 300 psi, may result in catheter failure and/or catheter tip displacement.

**Warning:** PowerGroshong* catheter indication for power injection of contrast media implies the catheter’s ability to withstand the procedure, but does not imply appropriateness of the procedure for a particular patient. A suitably trained clinician is responsible for evaluating the health status of a patient as it pertains to a power injection procedure.
Power Injection Procedure:
1. Remove the injection/needleless cap from the PowerGroshong* catheter.
2. Attach a 10 ml or larger syringe filled with sterile normal saline.
3. Aspirate for adequate blood return and vigorously flush the catheter with the full 10 ml of sterile normal saline.
Warning: Failure to ensure patency of the catheter prior to power injection studies may result in catheter failure.
4. Detach syringe.
5. Attach the power injection device to the PowerGroshong* catheter per manufacturer’s recommendations.
6. Complete power injection study taking care not to exceed the flow rate limits.
Warning: Exceeding the maximum flow rate of 4 ml/sec, or the maximum pressure of 300 psi, may result in catheter failure and/or catheter tip displacement.
7. Disconnect the power injection device.
8. Flush the PowerGroshong* catheter with 10 ml of sterile normal saline, using a 10 ml or larger syringe.
9. Replace the injection/needleless cap on the PowerGroshong* catheter.

Contraindications:
The device is contraindicated whenever:
• The presence of device-related infection, bacteremia, or septicemia is known or suspected.
• The patient’s body size is insufficient to accommodate the size of the implanted device.
• The patient is known or is suspected to be allergic to materials contained in the device.
• Past irradiation of prospective insertion site.
• Previous episodes of venous thrombosis or vascular surgical procedures at the prospective placement site.
• Local tissue factors will prevent proper device stabilization and/or access.

ChloraPrep* One-Step Applicator Contraindications:
• Do not use in children less than 2 months of age because of the potential for excessive skin irritation and increased drug absorption.
• Do not use on patients with known allergies to chlorhexidine gluconate or isopropyl alcohol.
• Do not use for lumbar puncture or in contact with meninges.
• Do not use on open skin wounds or as a general skin cleanser.
**Warnings**

- **This is not a right atrium catheter.** Avoid positioning the catheter tip in the right atrium. Placement or migration of the catheter tip into the right atrium may cause cardiac arrhythmia, myocardial erosion or cardiac tamponade. The risk of these complications may be more likely in neonatal patients.
- **Intended for Single Patient Use. DO NOT REUSE.** Bard Access Systems products are single use devices and should never be reimplanted. Reuse carries with it the attendant concern of cross-infection regardless of the cleaning or sterilization method. Resterilization of incompletely cleaned devices may not be effective. Any device that has been contaminated by blood must not be reused or resterilized.
- **After use, this product may be a potential biohazard.** Handle and discard in accordance with accepted medical practice and applicable local, state and federal laws and regulations.
- **Failure to ensure patency of the catheter prior to power injection studies may result in catheter failure.**
- **Power injector machine pressure limiting feature may not prevent over-pressurization of an occluded catheter, which may cause catheter failure.**
- **Exceeding the maximum flow rate of 4 ml/sec, or the maximum pressure of power injectors of 300 psi, may result in catheter failure and/or catheter tip displacement.**
- **PowerGroshong* catheter indication for power injection of contrast media implies the catheter’s ability to withstand the procedure, but does not imply appropriateness of the procedure for a particular patient.** A suitably trained clinician is responsible for evaluating the health status of a patient as it pertains to a power injection procedure.
- **If the artery is entered, withdraw the needle and apply manual pressure for several minutes.**
- **Place a finger over the orifice of the sheath to minimize blood loss and risk of air aspiration.** The risk of air embolism is reduced by performing this part of the procedure with the patient performing the Valsalva maneuver until the guidewire is inserted into the needle.
- **Do not use the catheter if there is any evidence of mechanical damage or leaking.** Damage to the catheter may lead to rupture, fragmentation, possible embolism, and surgical removal.
- **If signs of extravasation exist, discontinue injections.** Begin appropriate medical intervention immediately.
- **Failure to warm contrast media to body temperature prior to power injection may result in catheter failure.**

**ChloraPrep* One-Step Applicator Warnings**

- **Flammable, keep away from fire or flame.**
- **Do not use with electrocautery procedures.**
- **For external use only.**
- **When using this product keep out of eyes, ears, and mouth.** May cause
serious or permanent injury if permitted to enter and remain. If contact occurs, rinse with cold water right away and contact a physician.

• Stop use and ask a doctor if irritation, sensitization, or allergic reaction occurs. These may be signs of a serious condition.
• Keep out of reach of children. If swallowed, get medical help or contact a poison control center right away.

Precautions

• Carefully read and follow all instructions prior to use.
• Federal (U.S.A.) law restricts this device to sale by or on the order of a physician.
• Only qualified health care practitioners should insert, manipulate and remove these devices.
• The PowerGroshong* catheter features a reverse-taper catheter design. Placement of larger catheters at or below antecubital fossa may result in an increased incidence of phlebitis. Placement of the Power-Groshong* catheter above antecubital fossa is recommended.
• Never use force to remove the stylet. Resistance can damage the catheter. If resistance or bunching of the catheter is observed, stop stylet withdrawal and allow the catheter to return to normal shape. Withdraw both the catheter and stylet together approximately 2 cm and reattempt stylet removal. Repeat this procedure until the stylet is easily removed. Once the stylet is out, advance the catheter into the desired position.
• To minimize the risk of catheter breakage and embolization, the catheter must be secured in place.
• Do not advance the guidewire past the axilla without fluoroscopic guidance.
• The catheter must be secured in place to minimize the risk of catheter breakage and embolization.
• For further information or questions, please call 800-443-3385 or 801-595-0700.
• Only medical practitioners licensed by law, trained and experienced in proper positioning of catheters in the central venous system using percutaneous entry (Seldinger technique) should place this catheter.
• Follow all contraindications, warnings, cautions, precautions, and instructions for all infusates including contrast media as specified by its manufacturer.
• Use aseptic techniques whenever the catheter lumen is opened or connected to other devices.
• Precautions are intended to help avoid catheter damage and/or patient injury.
Catheter Irrigation Procedure

**Purpose:**
To maintain catheter patency.

**Routine Maintenance (every 7 days; after IV administration of TPN, IV fluid or medications)**

**Supplies:**
- Isopropyl alcohol, povidone-iodine wipes, or CHg swab stick
- 10 ml syringe filled with 5 ml of sterile 0.9% sodium chloride (normal saline)

**Procedure:**
1. Swab the top of the injection cap with alcohol pad, povidone-iodine wipes, or CHg swab for at least three seconds or according to facility protocol.
2. Discard the alcohol pad. Be careful not to touch the opening of the injection cap after swabbing.
3. Insert the syringe directly into the injection cap and turn clockwise.
4. Inject saline, infusing last 0.5 ml as the syringe is withdrawn from the injection cap. (This helps prevent a vacuum which can pull a small amount of blood into tip of catheter.)

**After blood aspiration for any reason or when blood is observed in the catheter:**

**Note:** If blood is aspirated prior to infusion of medications (to verify venous placement), catheter should be irrigated with 10 ml of normal saline prior to attaching medication syringe, IV or infusion pump tubing. Failure to do so may result in an occluded catheter, leading to difficulty in aspirating in the future.

**Supplies:**
- Isopropyl alcohol and/or povidone-iodine wipes
- 10 ml syringe filled with 10 ml of sterile 0.9% sodium chloride (normal saline)

**Procedure:**
1. Follow routine maintenance procedure, except use 10 ml normal saline and flush to clear blood from catheter.
2. If unable to flush all blood residue out of the injection cap, replace it after blood sampling per injection cap change procedure (per agency policy).

**Prior to blood sampling when infusing TPN:**
1. Follow routine maintenance procedure, except use 20 ml normal saline and flush to clear TPN from catheter.

**Flushing guidelines for small patients:**
Use the same procedure as used for adults with the following exceptions:
1. Use 2 ml normal saline for routine maintenance (every 7 days; or after IV administration of TPN, IV fluids, or medications).
2. Use 3 ml normal saline after blood aspiration for any reason, or when blood is observed in the catheter.

*Note: This amount is insufficient to clear blood from the injection cap. The injection cap should be changed following blood withdrawal.*
Blood Withdrawal / Aspiration Procedure

Purpose:
To obtain blood samples for laboratory evaluation, eliminating the need for peripheral vein punctures.

To verify venous placement prior to administration of hypertonic or vesicant solutions.

Note: If you encounter difficulties with blood withdrawal, see Troubleshooting Guide-Aspiration Difficulties.

Hub-To-Hub Technique (Syringe):

Supplies:
- 3 – 10 ml syringes
- Sterile 0.9% sodium chloride (normal saline)
- Isopropyl alcohol wipes/povidone-iodine wipes / CHg swabstick
- Blood specimen tubes
- Injection cap

Procedure:
1. Wash hands thoroughly.
2. Draw up 10 ml of normal saline in syringe and set aside.
3. Stop any I.V. fluids infusing through the catheter, including another lumen of the catheter.
4. Remove injection cap/I.V. tubing from catheter hub.
5. Clean catheter hub with alcohol, povidone iodine wipe, or CHg swabstick
6. Attach an empty 10 ml syringe to catheter hub.
7. Pull back syringe plunger 1-2 ml, pausing for 2 seconds to allow blood to come into catheter. Slowly continue to aspirate 5 ml of blood.
8. Disconnect syringe and discard (saline in catheter dilutes specimen and may alter lab values).
9. Attach an empty 10 ml syringe and aspirate per step 7 to withdraw amount of blood needed for testing.
10. Disconnect syringe and attach saline-filled syringe.
11. Flush the catheter with 10 ml normal saline, disconnect.
12. Disconnect syringe and clean catheter hub with alcohol, povidone-iodine wipe, or CHg swabstick.
13. Attach new injection cap per injection cap change procedure or attach sterile I.V. tubing to hub of catheter.
14. Transfer to blood collection tubes per hospital policy.
Needleless adapter through injection cap
(Vacuum Blood Collection System or Syringe):
(May use 10 ml syringe with attached needle or needleless adapter in place of vacuum blood collection system)

Supplies:
- Vacuum blood collection device
- 2 – 10 ml syringes
- Sterile 0.9% sodium chloride (normal saline)
- Isopropyl alcohol wipes/povidone-iodine wipes / CHg swabstick
- Blood specimen tubes

Procedure:
1. Wash hands thoroughly.
2. Draw up 10 ml of normal saline in syringe and set aside.
3. Stop any I.V. fluids infusing through the catheter, including another lumen of the catheter.
4. Clean injection cap with alcohol and/or povidone iodine wipe, or CHg swabstick
5. Attach empty 10 ml syringe to injection cap.
6. Pull back syringe plunger 1-2 ml, pausing for 2 seconds to allow blood to come into catheter. Slowly continue to aspirate 5 ml of blood.

Note: A vacuum collection specimen tube may be used to withdraw the discard sample, but be sure to use one with at least a 5 ml capacity.
7. Remove syringe from injection cap and discard.
8. Clean injection cap with alcohol, povidone iodine wipe, or CHg swabstick.
9. Attach vacuum blood collection system to injection cap. Push blood specimen tube into vacuum collection device sleeve so that rubber stopper is pierced.
10. Blood needed for specimen will flow into specimen tube. Change tubes as needed for required tests.
11. Remove vacuum blood collection system and sleeve from injection cap.
12. Clean injection cap with alcohol, povidone-iodine wipe, or CHg swabstick.
13. Attach saline-filled syringe and flush the catheter with 10 ml of normal saline.
14. If unable to flush all of the blood residue out of the injection cap, attach a new sterile injection cap per injection cap change procedure (per agency policy).
**Injection Cap Change Procedure**

**Purpose:**
To minimize potential for infection from overuse of injection cap.

**Frequency:**
- Every seven days (about 18 uses) or per agency policy.
- When the injection cap has been removed for any reason.
- Anytime the injection cap appears damaged, is leaking, blood is seen in the catheter without explanation or blood residue is observed in the injection cap.
- After blood withdrawal through the injection cap (per agency policy).

**Supplies:**
- New sterile injection cap
- Alcohol wipes / povidone-iodine wipe / CHg swabstick
- 10 ml syringe filled with 5 ml of sterile 0.9% sodium chloride (normal saline)

**Procedure:**
1. Wash hands.
2. Using aseptic technique, open injection cap package and prefill injection cap with normal saline.
3. Hold the hub of the catheter below the level of the patient’s heart (prevents “manometer effect” or fluid drop in the catheter) and remove the old injection cap.
4. Clean the outside of the catheter hub with an alcohol wipe and/or povidone-iodine wipe, or CHg swabstick.
5. Remove the tip protector from the new injection cap and twist clockwise onto the catheter hub.
6. Irrigate the catheter with 5 ml normal saline following the Catheter Irrigation Procedure (per agency policy).
**PICC Dressing Change Procedure**

**Purpose:**
To prevent external infection of the central venous catheter.

**Frequency:**
Every seven days and PRN if dressing is loose or damp.

Chlorhexidine gluconate is the suggested antiseptic to use. Acetone and tincture of iodine should not be used. 2% Chlorhexidine gluconate/70% isopropyl alcohol swabsticks may be used for dressing changes. Povidone-iodine may also be used as an antiseptic.

**Supplies:**
- 1 Each - ChloraPrep* One-Step Applicator
- 2 Each - 2 in. x 2 in. gauze – optional
- 1 Each - 10 cm x 12 cm transparent dressing
- 1 Pair - Sterile gloves

**Procedure:**
1. Wash hands thoroughly.
2. Carefully remove old dressing and discard. Avoid tugging on the catheter, use of scissors or other sharp objects near the catheter.
3. Inspect the catheter exit site for swelling, redness, or exudate. Notify physician if problem observed.
4. Wash hands thoroughly.
5. Put on sterile gloves.
6. Clean the catheter exit site with the ChloraPrep* One-Step Applicator.
   - Pinch the wings on the ChloraPrep* One-Step Applicator to break the ampule and release the antiseptic. Do not touch the sponge.
   - Wet the sponge by repeatedly pressing and releasing the sponge against the treatment area until fluid is visible on the skin.
   - Use repeated back-and-forth strokes of the sponge for approximately 30 seconds. Completely wet the treatment area with antiseptic. Allow the area to dry for approximately 30 seconds. Do not blot or wipe away.
   - Maximum treatment area for one applicator is approximately 130 cm² (approximately 4 in. x 5 in.). Discard the applicator after a single use.
   - Remove and discard gloves.
7. Fold a 2 in. x 2 in. gauze in half and place it under the catheter hub (if desired).
8. Apply the transparent dressing, over the exit site, and catheter tubing.
9. Attach additional securement per institutional policy avoiding the placement of tape directly on the silicone catheter material.

References:


Clearing Occluded Catheters Procedure

Purpose:
To restore patency to a catheter with an occlusion.

Supplies:
- 1 - Sterile injection cap
- Thrombolytic solution
- 1 – 10 ml syringe
- 1 – 10 ml syringe filled with 10 ml normal saline
- Isopropyl alcohol wipes

Procedure:
1. Wash hands.

2. Remove injection cap, attach an empty 10 ml syringe and attempt to aspirate. If aspiration is successful, withdraw clots and flush catheter with 10 ml normal saline. Replace cap. If aspiration is unsuccessful, proceed to step 3.

3. Obtain physician’s order for the use of thrombolytic solution to declot the catheter. Note: Cautions contained in medication package insert should be observed.

4. Draw up enough thrombolytic solution into a 10 ml syringe to equal the internal volume of the catheter (volume may be reduced if catheter length has been cut).

5. Aseptically attach the thrombolytic solution filled syringe to the catheter hub. Slowly and gently inject the thrombolytic solution into the catheter using a push-pull motion to achieve maximum mixing. To avoid catheter rupture, do not force entire amount into catheter if strong resistance is felt.

6. Leave 10 ml syringe attached to catheter. Do not attempt to aspirate for 30-60 minutes.

7. After 30 minutes, attempt to aspirate the drug and residual clot. If unsuccessful, repeat thrombolytic instillation.

8. When patency is restored, aspirate 5 ml of blood to assure removal of all drug and clots.

9. Remove blood-filled syringe and replace it with a 10 ml syringe filled with normal saline. Flush catheter to verify patency.

10. Attach sterile, saline-filled injection cap.

11. Attach additional securement per institutional policy avoiding the placement of tape directly on the silicone catheter material.

Note: For suspected lipid deposition occlusion when thrombolytic solution does not clear the blockage, a sterile ethanol 70% solution may be instilled and left in place for one hour. Follow procedure for thrombolytic instillation.
For suspected calcium and phosphate precipitation when thrombolytic solution does not clear blockage, a sterile 0.1% N hydrochloric acid solution may be instilled in the catheter and left in place for one hour. The solution is then aspirated and the catheter flushed with normal saline.

This may help to clear the catheter of calcium-phosphate or other drug precipitates. Sodium bicarbonate may also be used for precipitates that are soluble in a basic solution.

References:


I. Aspiration Difficulties

A. Possible Causes

1. Failure to flush according to Catheter Irrigation Procedure, resulting in lumen obstruction.
2. Catheter opening may suck up against vein wall with aspiration.
3. Blood clot, fibrin sheath, or particulate matter obstructing catheter.
   - A clot or other obstruction in the catheter lumen can produce a one-way valve effect. During infusion, the catheter wall expands slightly and allows fluid to flow around the obstruction. During aspiration, the catheter wall contracts slightly, tightening down around the obstruction and preventing aspiration.
   - Fibrin sheaths usually begin to form within a few days after the insertion of a central venous catheter. When it has grown enough to extend to the tip of the catheter, it may be pulled into and obstruct the catheter valve when aspiration is attempted, but offer no resistance to infusion.
4. Kinked catheter outside or inside the body.
   - Suture constriction at the catheter skin exit site.
   - Catheter may be curled or kinked within the vessel, or under the dressing.
5. Malposition of catheter tip (i.e. jugular vein, outside of vein).

B. Possible Solutions

1. Visually check catheter for any exterior kinks, or constricting sutures. If sutures are present, their removal may release the constriction and allow aspiration. A removable suture wing is supplied with the insertion tray to prevent suture constriction at the exit site.
2. Move patient’s arm, shoulder and head to see if a change in position will allow aspiration.
3. If no resistance to infusion is felt, attempt to flush with 10 ml normal saline. Then pull back gently on syringe plunger 2-3 ml, pause and proceed with aspiration.
4. If resistance to infusion is felt, check for signs of extravasation. If present, notify physician of possibility of catheter leakage. If not present, see step 5.
5. Attempt to aspirate with a 20 ml syringe (creates greater vacuum).
6. If resistance to aspiration is still present, obtain physician’s order for a chest x-ray or dye study to determine catheter position and status.

7. If studies indicate occlusion is due to a blood clot or drug precipitate, obtain physician’s order regarding the use of thrombolytic or other solution to clear catheter.
   • If the catheter tip is not in the superior vena cava, it should be repositioned.
   • If the catheter tip is out of the vein, it should be replaced.

II. Bleedback in Catheter
   A. Possible Causes
      1. A blood clot or particulate matter may be holding the valve open.
      2. Migration or placement of the catheter tip in the internal jugular vein, or vessel other than the superior vena cava, or coiling of the catheter in a vein may position the catheter tip where the valve is pushed open.
      3. Placement of the catheter in the right atrium or ventricle:
         • Contraction of the heart muscle can force open the catheter valve.
         • Impingement of the catheter tip on the tricuspid valve, heart wall, or apex of the heart can force the catheter valve open.
      4. Catheter tip cut off in error during catheter placement.

   B. Possible Solutions
      1. Attempt to aspirate a clot out of lumen.
      2. If no resistance felt, flush with 10 ml normal saline. If resistance is felt, see step 3.
      3. Obtain physician’s order and instill thrombolytic solution or other solution per Clearing Occluded Catheters Procedure to clear lumen and valve of blood clots, or precipitates.
      4. Obtain physician’s order for chest x-ray or dye study to determine catheter position.
         • Check for radiopaque tip to verify if it is still in place. If not, treat catheter as an open-ended catheter, using heparin and clamping with an atraumatic clamp when opening it to the air until it is repositioned.
         • If malpositioned, coiled or kinked, catheter should be repositioned with the tip in the superior vena cava. If unable to reposition for some reason, treat catheter as an open-ended catheter, using heparin and clamping with an atraumatic clamp when opening it to the air.
III. Catheter Occlusion

A. Possible Causes
2. Drug precipitate or lipid deposition completely obstructing lumen.
3. May be kinked, coiled or damaged.
4. Catheter valve may not be within vein.
5. If sutures were used during the placement of the catheter, they can tighten and restrict flow.

B. Possible Solutions
1. Attempt to aspirate blood clot.
2. Inspect patient for presence of sutures around the catheter. If sutures are present, they should be removed.
3. Move patient’s arm, shoulder and head to see if position change affects ability to infuse.
4. Obtain physician’s order and instill thrombolytic solution or other solution per Clearing Occluded Catheters Procedure.
5. Obtain physician’s order for a chest x-ray or dye study to determine the position of the catheter.

IV. Catheter Damage

A. Possible Causes
1. Repeated clamping.
2. Contact with a sharp object.
3. Rupture from attempt to irrigate an occluded catheter with a small syringe (i.e. 1 or 3 ml syringe)
   - Small syringes can generate very high internal pressures with very little force. The back pressure from an occlusion may not be felt when using a small syringe until damage to the catheter has occurred.
4. Rupture from attempts to power inject through an occluded catheter.

B. Possible Solutions
1. When repairing, always fold the catheter between the patient and the damaged area and tape it together, or clamp the catheter between the patient and the damaged area with a smooth-edged, atraumatic clamp.

V. Air in Line

A. Possible Causes
1. Hole in catheter.
2. Injection cap not prefilled with normal saline.
3. Loose connections (injection cap, IV tubing).
4. “Manometer effect” – holding the catheter connector end above the level of the heart while it is open to the air creates a manometer effect, with fluid dropping to a level 8-10 cm above the Groshong* catheter valve at the tip of the catheter. Air will not enter the blood stream unless the valve has been propped open by a blood clot or drug precipitate, or the catheter tip has been placed where mechanical pressure forces the valve open.
5. Diffusion and evaporation of water through the external catheter segment due to silicone permeability. This may be noticed in the PowerGroshong* catheter because it is flushed less frequently than other silicone catheters.
   • *Silicone has an open matrix which allows water vapor and gases to diffuse through the membrane.*
   • *The amount of diffusion that takes place is dependent on many factors. Therefore, not all patients with silicone catheters will demonstrate this phenomenon.*
   • *The air will stay in the catheter’s external segment. It does not extend below the level of the skin. The air can be aspirated once a week when routine flushing is done. There is no danger of air embolism from silicone permeability.*

B. Possible Solutions
1. Check catheter for leakage by flushing well with normal saline.
2. Prefill injection cap with normal saline before attaching it to the catheter.
3. Check for loose connections (injection cap, IV tubing).
4. Perform procedures requiring the catheter to be opened to the air with the connector end below the level of the patient’s heart.
5. If the catheter is not damaged, aspirate the air and then irrigate the catheter with 10 ml normal saline to flush out any aspirated blood. Air present in the catheter due to silicone permeability will only be present in the external catheter segment and will not migrate into the patient’s bloodstream unless injected.

VI. Fluid Leakage from Catheter Exit Site
A. Possible Causes
   1. Catheter punctured by sharp object (i.e. scalpel, suture needle, scissors) just prior to placement.
   2. Catheter ruptured from attempt to irrigate an occluded catheter with a small syringe (i.e. 1 ml or 3 ml syringe).
Small syringes can generate very high internal pressures with very little manual force. The back pressure from an occlusion may not be felt when using a small syringe until the damage to the catheter has occurred.

3. Catheter may have become encapsulated by a fibrin sheath, which prevents infused fluid from entering the venous system. The fluid will then take the path of least resistance, flowing back along the outside of the catheter to the skin exit site.

4. Rupture from attempts to power inject through an occluded catheter.

5. Central vein thrombosis or tumor growth occluding the vein can cause infused fluid to flow back along the outside of the catheter to the skin exit site.

B. Possible Solutions

1. Slowly infuse 10 ml of normal saline and observe for signs of fluid extravasation under the skin.

2. Obtain physician’s order for a dye study through the catheter to determine path of fluid flow.

3. Remove the catheter if a leak is discovered inside or outside the body. Please report such incidents to Bard Access Systems, Inc. (800-443-5505 - Field Assurance Dept.).

References:
ChloraPrep® One-Step Applicator Active Ingredients

- Chlorhexidine gluconate 2% w/v...antiseptic
- Isopropyl alcohol 70% v/v...antiseptic

Inactive Ingredients

- USP purified water

For further information or questions regarding ChloraPrep® One-Step Applicator call: 1-800-523-0502 (8 a.m.-5 p.m. CST)

An issued or revision date for these instructions is included for user’s information. In the event two years have elapsed between this date and product use, the user should contact Bard Access Systems, Inc. to see if additional product information is available.

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