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Description

GROSHONG® Central Venous Catheters consist of alcohol compatible, soft, medical grade silicone tubing with a closed rounded tip. Unlike open-ended catheters, the closed end has a patented three-position valve (or valves) which allows fluids to flow in or out, but remains closed when not in use.

In addition to the GROSHONG® Valve, GROSHONG® Central Venous Catheters have the following features:

- Alcohol compatible, soft, medical grade silicone tubing
- Radiopaque tip
- Radiopaque stripe
- SURECUFF® Tissue Ingrowth Cuff
- Winged connector(s)
- Depth markings
- Attachable suture wing
- Large lumen(s)
- Single or dual lumens
**Groshong® Single-Lumen Catheter Features**

- Winged connector
- Connector locking sleeve
- Radiopaque rounded atraumatic tip
- Three-way Groshong® Valve
- Attachable suture wing
- Red dot for proper cuff placement within subcutaneous tunnel
- SureCuff® Tissue Ingrowth Cuff
**Groshong® Dual-Lumen Catheter Features**

- Winged connectors
- Connector locking sleeve
- Radiopaque rounded atraumatic tip
- Separate dual lumens with staggered and rotated Groshong® Valves
- Attachable suture wing
- Red dot for proper cuff placement within subcutaneous tunnel
- SURECUFF® Tissue Ingrowth Cuff
The catheter is placed into one of the large central veins so the tip lies in the lower third of the superior vena cava, above the right atrium. The catheter is tunneled subcutaneously for several inches to the desired exit site.

The attached SURECUFF® Tissue Ingrowth Cuff is positioned in the tunnel track. The cuff promotes tissue ingrowth to secure the catheter in place.
The GROSHONG® Central Venous Catheter incorporates the patented, 3-position, pressure-sensitive GROSHONG® 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.

**Aspiration**

Negative pressure in the catheter will cause the valve to open inward, allowing blood aspiration. When the catheter luminal pressure returns to normal, the valve closes.

**Infusion**

Positive pressure into the catheter from gravity, pump or syringe will open the valve outward, allowing fluid infusion. When the catheter luminal pressure returns to normal, the valve closes.

**Closed**

When not in use, the GROSHONG® Valve restricts blood backflow or bleedback and air embolism by remaining closed, maintaining catheter patency and reducing the need for clamping or heparinization. This helps to reduce the cost of ongoing maintenance.

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 GROSHONG® Valve is designed to remain closed between -7 and 80 mmHg. Since the normal central venous pressure range in the superior vena cava is 0 to 5 mmHg, the valve remains closed at normal central venous pressure. Pressure in the superior vena cava must exceed 80 mmHg to open the valve inward.

GROSHONG® Dual-Lumen Catheters have GROSHONG® Valves which are staggered and rotated, allowing the concurrent infusion of compatible or incompatible drugs. Refer to the appropriate drug labeling for indications, contraindications, warnings, precautions, dosage, and administration information. Each lumen of a multi-lumen catheter is treated separately for maintenance and flushing purposes.
**GROSHONG® Catheter Benefits**

- **Reduced risk of air embolism or bleedback** compared to open-ended catheters.
- **Elimination of heparin flushing** to maintain catheter patency.
- **Reduced need for catheter clamping.**
- **Reduced need for flushing** when the catheter is not in use (only flushed every seven days with sterile saline).

**Indications for Use**

GROSHONG® Central Venous Catheters are designed for long-term central venous access for administration of IV fluids, medications, parenteral nutrition, blood products or blood withdrawal.

**Warnings**

Infusion pressures should never exceed 25 psi. Smaller syringes generate more pressure than larger syringes.

**CAUTION: DO NOT USE A SYRINGE SMALLER THAN 10 ML TO FLUSH AND CONFIRM PATENCY.**

Patency should be assessed with a 10 ml or larger syringe with sterile normal saline. Upon confirmation of patency, administration of medication should be given in a syringe appropriately sized for the dose. Do not infuse against resistance.

When catheter damage or connector separation occurs, the catheter should be immediately clamped or kinked closed to prevent any possibility of air embolism or loss of blood.

Universal precautions should be observed by all health care professionals when performing the procedures included in this manual.

**CAUTION: Use aseptic technique whenever the catheter lumen is opened or connected to other devices.**

**CAUTION: The GROSHONG® Central Venous Catheter is designed for use with a needleless connector/injection cap or “direct-to-hub” connection technique. Apply a sterile needleless connector/injection cap on the catheter hub to prevent contamination when not in use.**
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.
**Groshong® CENTRAL VENOUS CATHETER CARE AND MAINTENANCE**

<table>
<thead>
<tr>
<th>Catheter Flushing Protocol/ Medication Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td>▪ To maintain catheter patency.</td>
</tr>
<tr>
<td>▪ To prevent mixing of incompatible medications.</td>
</tr>
</tbody>
</table>

**Routine Maintenance**

Flush catheter at least every 7 days; after IV administration of TPN, IV fluid and medications.

**CAUTION: DO NOT USE A SYRINGE SMALLER THAN 10 ML TO FLUSH AND CONFIRM PATENCY.**

Patency should be assessed with a 10 ml or larger syringe with sterile normal saline. Upon confirmation of patency, administration of medication should be given in a syringe appropriately sized for the dose. Do not infuse against resistance.

**NOTE:** Preservative-free 0.9% Sodium Chloride USP is recommended. Single-use flushing systems, such as pre-filled syringes or single-dose vials, are the preferred choices for flushing and locking. If multiple-dose containers must be used, each container should be dedicated to a single patient.

**Supplies**

- Gloves
- Antiseptic wipes/devices containing alcohol, chlorhexidine, or povidone-iodine
- Pre-filled sterile saline syringe
Procedure (Catheter Flushing)

Scrub the Hub Guidelines: Before accessing hubs, connectors, or injection ports, scrub with alcohol, chlorhexidine or povidone-iodine using friction and a twisting motion for no less than 5 seconds and allow to dry.

1. Gather supplies, perform hand hygiene and don gloves per facility protocol.

2. Using friction, scrub the needleless connector/injection cap for no less than 5 seconds, or per facility protocol, and allow to dry.

3. Insert the sterile tip of the saline syringe directly into the needleless connector/injection cap.

4. Aspirate slowly until a blood return is visualized.

5. Flush the catheter with at least 10 ml of sterile saline. Do not allow the tip of the syringe plunger to bottom out against the base of the syringe. This helps prevent a vacuum which can pull a small amount of blood into tip of catheter.

Procedure (Medication Administration)

Complete Catheter Flushing steps 1-5 prior to medication administration.

1. Disconnect and discard the syringe.

2. Using friction, scrub the needleless connector/injection cap with a new antiseptic wipe/device for no less than 5 seconds, and allow to dry.

3. Administer medication per facility policy.

4. Using friction, scrub the needleless connector/injection cap with a new antiseptic wipe/device for no less than 5 seconds, and allow to dry.

5. Flush the catheter with at least 10 ml of sterile saline.

NOTE: Do not flush against resistance. If resistance to flushing is noted, evaluate catheter for bends or kinks or follow occlusion protocol.
**RECOMMENDED FLUSHING VOLUMES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Routine Flushing</strong></td>
<td>Flush with 10 ml of sterile saline at least every 7 days; after IV administration of TPN, IV fluid and/or medications</td>
</tr>
<tr>
<td><strong>Post Aspiration</strong></td>
<td>Flush with 20 ml of sterile saline</td>
</tr>
<tr>
<td>For any reason or when</td>
<td></td>
</tr>
<tr>
<td>blood is observed in the</td>
<td></td>
</tr>
<tr>
<td>catheter</td>
<td></td>
</tr>
<tr>
<td><strong>After blood sampling</strong></td>
<td>Flush with 20 ml of sterile saline</td>
</tr>
<tr>
<td><strong>Prior to blood sampling</strong></td>
<td><strong>when infusing TPN</strong></td>
</tr>
<tr>
<td></td>
<td>Flush with 20 ml sterile saline and flush to clear TPN from catheter</td>
</tr>
</tbody>
</table>

**SMALL CATHETER FLUSHING GUIDELINES**

*For use with 3.5 to 5.5 Fr catheters only. Larger catheters require more volume.*

Use the same procedure as above with the following amount:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Routine Flushing</strong></td>
<td>2 ml of preservative-free sterile saline least every 7 days; after IV administration of IV fluid and/or medications</td>
</tr>
<tr>
<td></td>
<td>3 ml preservative-free sterile saline after blood aspiration for any reason, TPN or when blood is observed in the catheter</td>
</tr>
</tbody>
</table>

**Heparin Use**

When maintained in accordance with these instructions, the GROSHONG® Central Catheter does not require the use of heparin to flush the catheter lumens. However, use of heparin will not adversely affect the catheter and may be necessary based on patient status or use of alternate flushing and locking techniques.
Blood Draw Through Needleless Connector/Injection Cap or Vacuum Blood Collection System

**Purpose**
To draw blood through needleless connector/injection cap or using a vacuum blood collection system.

**NOTE: Alternative:** May attach syringe directly to catheter hub.

**Supplies**
- Gloves
- Pre-filled sterile saline syringes
- Antiseptic wipes/devices containing alcohol, chlorhexidine, or povidone-iodine
- Appropriate sized vacuum blood collection tubes – at least one 5 ml vacuum tube for discard collection.

**Procedure**

**Scrub the Hub Guidelines:** Before accessing hubs, connectors, or injection ports, scrub with alcohol, chlorhexidine or povidone-iodine using friction and a twisting motion for no less than 5 seconds and allow to dry.

1. Gather supplies, perform hand hygiene and don gloves per facility protocol.
2. Prior to blood sampling, all infusions should be stopped.
3. Using friction, scrub the needleless connector/injection cap for no less than 5 seconds with a new antiseptic wipe/device and allow to dry.
4. Attach a 10 ml pre-filled saline syringe to needleless connector/injection cap. Verify blood return and flush catheter.

**NOTE:** A vacuum collection specimen tube may be used to withdraw the discard sample, but be sure to use one with at least 5 ml capacity.

5. Pull back syringe plunger 1-2 ml, pausing for 2 seconds to allow catheter valve to open and blood to come into catheter. Slowly continue to aspirate 5 ml of blood (3 ml for pediatric.)
6. Remove syringe from needleless connector/injection cap and discard.
7. Using friction, scrub the needleless connector/injection cap for no less than 5 seconds with a new antiseptic wipe/device and allow to dry.

<table>
<thead>
<tr>
<th>IF DRAWING FROM NEEDLELESS CONNECTOR/INJECTION CAP</th>
<th>IF USING VACUUM BLOOD COLLECTION SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attach empty syringe and draw volume needed for tests.</td>
<td></td>
</tr>
<tr>
<td>Alternatively: May remove needleless connector/injection cap and draw hub to hub</td>
<td></td>
</tr>
<tr>
<td>Attach vacuum blood collection system needle into the needleless connector/injection cap. Push blood specimen tube into vacuum collection device sleeve so that needle pierces rubber stopper.</td>
<td></td>
</tr>
<tr>
<td>Blood needed for specimen will flow into specimen tube. Change tubes as needed for required tests.</td>
<td></td>
</tr>
<tr>
<td>Remove vacuum blood collection system and sleeve from needleless connector/injection cap.</td>
<td></td>
</tr>
</tbody>
</table>

8. Using friction, scrub the hub for no less than 5 seconds with a new antiseptic wipe/device and allow to dry.

9. Flush the catheter with 20 ml of sterile saline.

10. If unable to flush all of the blood residue out of the needleless connector/injection cap, attach a new sterile needleless connector/injection cap per facility protocol.

---

### Changing Needleless Connector/Injection Cap

**Purpose**

To minimize potential for infection.

**NOTE:** It is recommended that a positive or neutral needleless connector/injection cap be used with valved catheters to prevent blood reflux.

**Frequency**

- Every seven days, per manufacturer’s directions or per facility policy.
- When the needleless connector/injection cap has been removed for any reason.
• Anytime the needleless connector/injection cap appears damaged, is leaking, blood is seen in the catheter without explanation, or blood residue is observed in the needleless connector/injection cap.

• After blood withdrawal through the needleless connector/injection cap (per facility protocol).

**Supplies**

- Gloves

- New sterile needleless connector/injection cap

- Pre-filled saline syringes (one for each lumen)

- Antiseptic wipes/devices containing alcohol, chlorhexidine, or povidone-iodine

**Procedure**

**Scrub the Hub Guidelines:** Before accessing hubs, connectors, or injection ports, scrub with alcohol, chlorhexidine or povidone-iodine using friction and a twisting motion for no less than 5 seconds and allow to dry.

1. Gather supplies, perform hand hygiene and don gloves per facility protocol.

2. Using aseptic technique, open needleless connector/injection cap package and attach saline syringe to connector, maintaining sterility of syringe tip. Prime the needleless connector/injection cap with 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 needleless connector/injection cap.

4. Using friction, scrub the hub for no less than 5 seconds with a new antiseptic wipe/device and allow to dry.

5. Attach new needleless connector/injection cap per manufacturer’s directions and twist clockwise onto the catheter hub. Avoid overtightening.

6. Flush the catheter with sterile saline following the Catheter Flushing procedure or per facility protocol.
Dressing Change Procedure

Purpose
To prevent external infection of the central venous catheter.

Frequency
Assess the dressing in the first 24 hours after catheter placement and change if there is an accumulation of blood, fluid or moisture beneath the dressing. During all dressing changes assess the insertion site to determine if catheter migration has occurred. If the tissue ingrowth cuff is visualized outside of the tunnel track notify the physician.

Dressing change frequency after the first 24 hours:

- Transparent membrane dressing: change every seven days and as needed if dressing is loose, damp or visibly soiled.
- Gauze and tape dressing: change at least every 48 hours and as needed if dressing is loose, damp or soiled.

NOTE: With a well-healed tunneled central venous access device, consideration may be given to no dressing.

NOTE: When a transparent semipermeable membrane is applied over gauze, it is considered a gauze dressing in accordance with the Infusion Nurses Society Standard 46 and must be changed every 48 hours.

Supplies

Chlorhexidine gluconate 2% is the suggested antiseptic to use. Alternatively, 70% isopropyl alcohol swab-sticks followed by povidone-iodine may also be used as an antiseptic.

Sterile dressing change kit is preferred or sterile supplies:

- 1 pair sterile gloves
- 1 pair clean gloves
- Chlorhexidine gluconate 2% or other antiseptic solution per facility policy
- Transparent dressing large enough to cover the entire insertion site
- Sterile gauze (optional if insertion site is bleeding or oozing after placement)
- Masks (have patient turn head away from insertion site or wear a mask if they can tolerate)
- Securement device, tape or surgical strips
- Sterile needleless connector/injection cap
- Chlorhexidine antimicrobial patch (optional)
- Skin prep pad
- Label

**Procedure**

1. Gather supplies, perform hand hygiene and don clean gloves and mask per facility protocol.
2. Open dressing kit or supplies maintaining asepsis.
3. Carefully remove the old dressing and discard in accordance with blood and body fluids universal precautions. Avoid tugging on the catheter, use of scissors, or other sharp objects near the catheter.
4. Inspect the exit site for swelling, redness, exudate. During all dressing changes assess the external length of the catheter to determine if migration of the catheter has occurred. GROSHONG® Central Venous Catheters have a SURECUFF® Tissue Ingrowth Cuff that should be located inside the tunnel track. Notify physician if the cuff is seen outside the insertion site or if any problems are observed.
5. Remove gloves and perform hand hygiene.
6. Don sterile gloves.
7. Cleanse skin with Chlorhexidine gluconate 2% antiseptic solution using a back and forth motion for 30 seconds. Allow to completely air dry. Alternatively, 70% isopropyl alcohol followed by povidone-iodine or other antiseptic solutions may be used.
8. Apply skin protectant per facility policy and allow to dry to the touch.
9. Place antimicrobial patch (i.e. GuardIVa® dressing) around the catheter at the insertion site per facility protocol (optional).
10. Apply securement device tape or surgical strips per institutional policy avoiding the placement of tape directly on the silicone catheter material.
11. Position sterile transparent dressing over insertion site and gently smooth from center toward edge; do not apply excessive tension to skin; shearing may result. Gauze may be placed around the catheter if needed to absorb exudate from insertion site (gauze dressing will need to be changed at least every 48 hours).
12. Change needleless connector/injection cap per facility policy.
13. Remove and discard gloves and used supplies. Perform hand hygiene.

Clearing Occlusions

Purpose
- To restore patency to a catheter with a partial or total occlusion

Supplies – Thrombotic Occlusions
- Gloves
- Sterile needleless connector/injection cap
- Thrombolytic solution mixed per manufacturer’s directions
- Appropriately sized syringe
- Pre-filled saline syringe
- Antiseptic wipes/devices containing alcohol, chlorhexidine, or povidone-iodine

Procedure – Thrombotic Occlusions

Scrub the Hub Guidelines: Before accessing hubs, connectors, or injection ports, scrub with alcohol, chlorhexidine or povidone-iodine using friction and a twisting motion for no less than 5 seconds and allow to dry.

1. Gather supplies, perform hand hygiene and don gloves per facility protocol.
2. Remove needleless connector/injection cap.
3. Using friction, scrub the hub for no less than 5 seconds with an antiseptic wipe/device and allow to dry.
4. Attach an empty 10 ml syringe to the catheter hub and attempt to aspirate. If aspiration is successful, withdraw clots and flush catheter with 10 ml sterile saline.
5. Using friction, scrub the hub for no less than 5 seconds with a new antiseptic wipe/device and allow to dry.
6. Attach new sterile needleless connector/injection cap. If aspiration is unsuccessful, proceed to step 7.
7. Obtain physician’s order for the use of thrombolytic solution to declot the catheter.
NOTE: Cautions and dosing recommendations contained in medication package insert should be observed. Solution volume is determined by the drug manufacturer’s prescribing instructions and internal volume of the catheter (volume may be reduced if catheter length has been cut).

8. Using friction, scrub the hub for no less than 5 seconds with a new antiseptic wipe/device and allow to dry.

9. Aseptically attach the thrombolytic solution filled syringe to the catheter hub. Slowly and gently inject the thrombolytic solution into the catheter for partially occluded catheters or use stopcock method for totally occluded catheters. To avoid catheter rupture, do not force entire amount into catheter if strong resistance is felt.

10. Allow thrombolytic solution to dwell per drug manufacturer’s directions or per facility protocol.

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

12. Discard blood-filled syringe. Scrub the hub, allow to dry, and gently flush catheter with 10 ml sterile saline to verify patency.

13. Remove and discard syringe.

14. Using friction, scrub the hub for no less than 5 seconds with a new antiseptic wipe/device and allow to dry.

15. Attach sterile, saline-filled needleless connector/injection cap to the catheter.

Procedure – Non-Thrombotic Occlusions

- For suspected lipid deposition occlusion when a thrombolytic solution does not clear the blockage, a sterile ethanol 70% solution may be instilled and left in place for two hours. Aspirate and flush with 10 ml of sterile saline. Repeat if occlusion is unresolved.

- For suspected calcium/phosphate precipitation when thrombolytic solution does not clear blockage, a sterile 0.1% N hydrochloric acid solution (use exact priming volume) may be instilled in the catheter and left in place for one hour. The solution is then aspirated and the catheter flushed with sterile saline solution. Sodium bicarbonate may also be used for precipitates that are soluble in a basic solution.
# Groshong® Central Venous Catheter Repair

## Repair Kit / Specifications Table

<table>
<thead>
<tr>
<th>Catheter Description</th>
<th>Complete External Segment Repair Product Code</th>
<th>Connector Repair Product Code</th>
<th>Total Length (cm)</th>
<th>Tip-Cuff (cm)</th>
<th>Volume (cc)</th>
<th>Gauge</th>
<th>O.D./I.D. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single-Lumen</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groshong® 5.5 Fr.</td>
<td>7741550</td>
<td>7712550</td>
<td>40</td>
<td>18</td>
<td>0.4</td>
<td>16 Ga.</td>
<td>1.8/1.1</td>
</tr>
<tr>
<td>Groshong® 7.0 Fr.</td>
<td>7741700</td>
<td>7712700</td>
<td>50</td>
<td>24</td>
<td>0.7</td>
<td>15 Ga.</td>
<td>2.2/1.3</td>
</tr>
<tr>
<td>Groshong® 8.0 Fr.</td>
<td>7741800</td>
<td>7712800</td>
<td>50</td>
<td>24</td>
<td>0.9</td>
<td>14 Ga.</td>
<td>2.5/1.5</td>
</tr>
<tr>
<td><strong>Dual-Lumen</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groshong® 9.5 Fr.</td>
<td>7742000 - body</td>
<td>7712500 - red</td>
<td>60</td>
<td>18, 24</td>
<td>0.83 - red</td>
<td>15 Ga.-red</td>
<td>3.2/1.33 - red</td>
</tr>
<tr>
<td></td>
<td>7740000 - ext</td>
<td>7712510 - white</td>
<td></td>
<td></td>
<td>0.52 - white</td>
<td>17 Ga. - white</td>
<td>3.2/1.10 - white</td>
</tr>
<tr>
<td><strong>Adhesive</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adhesive Repair Kit</td>
<td>0601720</td>
<td>Silicone Adhesive for Catheter repair (Does not contain catheter components)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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**Note:** The repair kit includes an adhesive for catheter repair, but it does not contain catheter components.
Connector Repair Procedure

Purpose
To repair a damaged or loose connector.

NOTE: Catheter should have been clamped with an atraumatic non-toothed clamp between the catheter exit site and the damaged area when damage or connector separation occurred and must remain clamped during repair.

Supplies
- Sterile repair kit
- Antiseptic wipes/devices containing alcohol, chlorhexidine, or povidone-iodine
- Sterile scissors
- 1 pair clean gloves
- 1 pair sterile gloves
- Sterile drapes
- Sterile 4 in. x 4 in. gauze pads
- Atraumatic clamp
- Mask
- Pre-filled sterile saline syringe

Procedure
1. Obtain a new sterile replacement connector of the correct size (color-coded).
2. Perform hand hygiene, and don mask and clean gloves.
3. Using aseptic technique, open needed supplies and place on sterile field.
4. Scrub catheter segment to be repaired with preferred antiseptic solution and allow to dry. Sterile 4 in. x 4 in. gauze pads may be used to grasp catheter for scrubbing.
5. Place the cleaned catheter onto a sterile drape.
6. Remove gloves, perform hand hygiene, and don new sterile gloves.
7. Using sterile scissors, cut the catheter off at a 90° angle, 1/2 in. distal to the location of the previous connector or damaged site to remove any damaged catheter material.
8. Transfer the clear sleeve (A) onto catheter from connector.

9. Firmly push catheter onto adapter to Position B.

10. Slide the clear oversleeve over the catheter and hub to Position B. If catheter starts to bunch up, swab the catheter with an alcohol wipe before sliding sleeve over it.

11. Attach needleless connector/injection cap and flush catheter with normal saline.
Purpose
To replace or lengthen a damaged GROSHONG® Catheter External Segment.

NOTE: Catheter should have been clamped with an atraumatic non-toothed clamp between the catheter exit site and the damaged area when damage occurred and must remain clamped during repair.

Supplies
- Sterile repair kit
- Antiseptic wipes/devices containing alcohol, chlorhexidine or povidone-iodine
- Atraumatic clamp
- 4 in. x 4 in. gauze pads
- Sterile drape
- Pre-filled sterile saline syringe
- Mask
- Tape
- Tongue blade
- 1 pair clean gloves
- 1 pair sterile gloves

Component Nomenclature
**Procedure**

1. Perform hand hygiene, and don clean gloves and mask. Using aseptic technique, open needed supplies and place on sterile field.

2. Scrub catheter segment to be repaired with preferred antiseptic solution and allow to dry. Sterile 4 in. x 4 in. gauze pads may be used to grasp catheter for scrubbing.

3. Place the cleaned catheter on a sterile drape.

4. Remove gloves. Preform hand hygiene and don sterile gloves.

5. Drape catheter and create a sterile field per facility protocol.

6. Load adhesive into syringe barrel and insert plunger.

---

7. Clamp catheter with an atraumatic clamp near the skin exit site.

8. Cut the external portion of the damaged catheter on a 90° angle. The length of the remaining external segment must be at least 2 inches to permit catheter repair and prevent splice-sleeve retraction under the skin.

9. Align the splicing cannula (pre-attached to replacement segment) to the external portion of the damaged catheter. Push the cannula into the catheter segment until the catheter reaches the stop.
10. Tie the suture onto the catheter/cannula just behind the annular ring. Knot at least four times to secure the suture in place.

11. Apply adhesive to the outside of the joint for a distance of 1/2 inch on either side of the connection. Slide the splice-sleeve and center it over the area of the joint. Inject additional adhesive under the splice-sleeve to fill the space between the catheter surface and the splice sleeve. Roll the splice-sleeve between fingers to spread adhesive. Wipe off excessive adhesive using sterile gauze.

Sterile Field No Longer Required

12. Remove atraumatic clamp. Aspirate the air in the replacement segment. Gently fill the catheter with 10 ml sterile normal saline.

CAUTION: Excessive pressure may rupture the joint.
13. Fasten repaired catheter segment to tongue blade with tape.

14. Avoid allowing the adhesive to come in contact with the patient’s skin for 48 hours. If necessary, the catheter may be used for infusion after 4 hours. The joint will not achieve full mechanical strength for 48 hours, at which time, the tongue blade may be removed.

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### Dual-Lumen Catheter Extension Repair Procedure

**Purpose**

To replace damaged extension tubing of the dual-lumen GROSHONG® Catheter.

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**NOTE:** Catheter should have been clamped with an atraumatic clamp between the catheter exit site and the damaged area when damage occurred and must remain clamped during repair.

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**Supplies**

- Sterile repair kit for 5 Fr and 9.5 Fr catheters
- Antiseptic wipes/devices containing alcohol, chlorhexidine or povidone-iodine
- Atraumatic clamp
- 4 in. x 4 in. gauze pads
- Sterile drape
- Pre-filled sterile saline syringe
- Mask
- Tape
- Tongue blade
- 1 pair clean gloves
- 1 pair sterile gloves
Component Nomenclature

Procedure

**Scrub the Hub Guidelines:** Before accessing hubs, connectors, or injection ports, scrub with alcohol, chlorhexidine or povidone-iodine using friction and a twisting motion for no less than 5 seconds and allow to dry.

1. Perform hand hygiene, and don clean gloves and mask. Using aseptic technique, open needed supplies and place on sterile field.

2. Scrub catheter segment to be repaired with preferred antiseptic solution and allow to dry. Sterile 4 in. x 4 in. gauze pads may be used to grasp catheter for scrubbing.

3. Place the cleaned catheter on a sterile drape.

4. Remove gloves. Perform hand hygiene and don sterile gloves.

5. Drape and create a sterile field per facility protocol.

6. Load adhesive into syringe barrel and insert plunger.

7. Clamp catheter with an atraumatic clamp above the “Y” adapter.

8. Cut the damaged extension on a 90° angle. The length of the remaining extension must be sufficient to permit repair without inserting the splicing cannula (1/2 in. long) into the “Y” joint.
9. Align the splicing cannula (pre-attached to replacement extension) with the remaining extension segment. Push the splicing cannula into the extension segment until the extension segment reaches the stop.

10. Tie the suture onto the extension/cannula just behind the annular ring. Knot at least four times to secure the suture in place.

11. Apply adhesive to the outside of the joint for a distance of 1/2 in. on either side of the connection. Slide the splice-sleeve and center it over the area of the joint. Inject additional adhesive under the splice-sleeve to fill the space between the extension surface and the splice-sleeve. Roll the splice-sleeve between fingers to spread adhesive. Wipe off excess adhesive using sterile gauze.
**Sterile Field No Longer Required**

12. Remove atraumatic clamp. Aspirate the air in the replacement segment. Gently fill the catheter with 10 ml sterile normal saline.

**CAUTION:** Excessive pressure may rupture the joint.

13. Fasten repaired extension to tongue blade with tape.

14. Avoid allowing the adhesive to come in contact with the patient’s skin for 48 hours. If necessary, the catheter may be used for infusion after 4 hours. The joint will not achieve full mechanical strength for 48 hours, at which time the splint may be removed.

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**Dual-Lumen Catheter Body Repair Procedure**

**Purpose**

To replace a dual external catheter segment damaged between the body site and the bifurcation of the extension.

**NOTE:** Catheter should have been clamped with an atraumatic clamp between the catheter exit site and the damaged area when damage occurred and must remain clamped during repair.

**Supplies**

- Sterile repair kit for 9.5 Fr catheter
- Antiseptic wipes/devices containing alcohol, chlorhexidine or povidone-iodine
- Atraumatic clamp
- 4 in. x 4 in. gauze pads
- Sterile drape
- Pre-filled sterile saline syringe
- Mask
- Tape
- Tongue blade
- 1 pair clean gloves
- 1 pair sterile gloves

**Component Nomenclature**

![Component Diagram]

**Procedure**

1. Perform hand hygiene, and don clean gloves and mask. Using aseptic technique, open needed supplies and place on sterile field.

2. Scrub catheter segment to be repaired with preferred antiseptic solution and allow to dry. Sterile 4 in. x 4 in. gauze pads may be used to grasp catheter for scrubbing.

3. Place the cleaned catheter on a sterile drape.

4. Remove gloves. Perform hand hygiene and don sterile gloves.

5. Drape and create a sterile field per facility protocol.

6. Load adhesive into syringe barrel and insert plunger.
7. Catheter should be clamped near the skin exit site.

8. Cut the external portion of the damaged catheter on a 90° angle. The length of the remaining external segment must be sufficient (at least 2 in.) to permit catheter repair and prevent splice-sleeve retraction under the skin.

9. Align the splicing cannula (pre-attached to replacement segment) to the external portion of the damaged catheter. Push the cannula into the catheter segment until the catheter reaches the stop.

10. Tie the suture onto the catheter/cannula just behind the ring. Knot at least four times to secure the suture in place.

11. Apply adhesive to the outside of the joint for a distance of 1/2 in. on either side of the connection. Slide the splice-sleeve and center it over the area of the joint. Inject additional adhesive under the splice-sleeve to fill the space between the catheter surface and the splice-sleeve. Roll the splice-sleeve between fingers to spread adhesive. Wipe off excessive adhesive.
Sterile Field No Longer Required

12. Remove atraumatic clamp. Aspirate the air in the replacement segment. Gently fill the catheter with 10 ml sterile normal saline.

**CAUTION:** Excessive pressure may rupture the joint.

13. Fasten repaired extension to tongue blade with tape.

14. Avoid allowing the adhesive to come in contact with the patient’s skin for 48 hours. If necessary, the catheter may be used for infusion after 4 hours. The joint will not achieve full mechanical strength for 48 hours, at which time the splint may be removed.
TROUBLESHOOTING GUIDE

Aspiration Difficulties

Possible Causes

- Failure to flush according to Catheter Flushing Recommendations, resulting in lumen obstruction.
- Catheter opening may suck up against vein wall with aspiration.
- Blood clot, fibrin sheath, or particulate matter obstructing valve when catheter is aspirated.
  
  » 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 can form quickly after insertion of a central venous catheter. Advancement of the fibrin sheath can lead to valve obstruction. Fibrin may be pulled into and obstruct the catheter valve when aspiration is attempted, but offer no resistance to infusion.

- Kinked catheter outside or inside the body.
  
  » Suture constriction at the catheter skin exit site, cuff, or vessel insertion site.

  » Catheter may be pulled too tight through skin tunnel, causing kink at vessel insertion site, or where it curves into the subcutaneous tunnel.

  » Catheter may be curled or kinked within the vessel, or under the dressing.

- Malposition of catheter tip (i.e., jugular vein, outside of vein).

- Compression or transection of the catheter between the clavicle and the first rib (“pinch off area”). See Pinch Off Troubleshooting.
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. If no resistance to infusion is noted, attempt to flush with 10 ml sterile saline. Then pull back gently on syringe plunger 2-3 ml, pause and proceed with aspiration.

**NOTE:** If resistance to infusion is noted, check for signs of extravasation. If present, notify healthcare provider of possibility of catheter leakage or transection and embolization.

3. Attempt to aspirate with a 20 ml syringe (creates a greater vacuum). If resistance is still present, follow facility protocol for the use of thrombolytic or other solution to clear catheter.

4. If occlusion remains, notify healthcare provider. Obtain an order for a catheter dye study and X-ray to determine catheter position and status.

Catheter Pinch Off

**Pinch off:** Compression or transection of a subclavian placed catheter between the clavicle and first rib.

**Signs and Symptoms:** Pinch off can cause intermittent inability to infuse or aspirate from the catheter. Sometimes lifting the shoulder or arm releases the compressed catheter and the catheter works as intended.

1. Obtain clinician order for a chest X-ray to determine the position of the catheter. X-ray must be taken with the patient’s arms at their sides with normal posture. Raising the arms/shoulders upward can release catheter compression and give inaccurate results.

2. If the catheter has been placed through the pinch-off area, and is being compressed enough to interfere with infusion or aspiration, it is at risk for catheter transection and embolization. The physician should evaluate the patient for catheter replacement. Refer to the GROSHONG® Central venous Catheter Instructions for Use, Pinch Off section for information and warnings.
Bleedback in Catheter

Possible Causes

- A blood clot or particulate matter may be holding the valve open.
- 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.
- Placement of the catheter in the right atrium or ventricle:
  » Contractions of the heart muscle can force the catheter valve open.
  » Impingement of the catheter tip on the tricuspid valve, heart wall, or apex of the heart can force the catheter valve open.
- Catheter valve tip cut off in error during catheter placement.

Possible Solutions

1. Attempt to aspirate clot out of the lumen.
2. If no resistance noted, flush with 10 ml sterile saline. If resistance is noted, follow facility protocol for the use of thrombolytic or other solution to clear catheter.
3. If bleedback remains, notify healthcare provider. Obtain an order for a catheter dye study and X-ray to determine catheter position and function.

Catheter Occlusion

Possible Causes

- Blood clot or fibrin completely obstructing lumen.
- Drug precipitate or lipid deposition completely obstructing lumen.
- Catheter may be kinked, coiled, damaged, or pinched between the clavicle and first rib.
- Catheter valve may not be within vein.
- If sutures were used during the placement of the catheter, they can tighten and restrict flow.
- Catheter may be partially or completely transected. Transection can occur from the repeated pressure of the clavicle and the first rib on the catheter during normal movement if it is placed through the “pinch-off” area.
Possible Solutions
1. Attempt to aspirate blood clot.
2. Move patient’s arm, shoulder, and head to see if position change affects ability to infuse. If so, see Step 5 (could be pinch-off).
3. Inspect patient and operative report for presence of sutures around the catheter. If sutures are present, they should be removed. Removable suture wings are available in the insertion tray for holding long-term catheters in place until the SURECUFF® Tissue Ingrowth Cuff heals in enough to anchor the catheter.
4. Follow facility protocol for the use of thrombolytic or other solution to clear catheter.
5. If occlusion remains, notify healthcare provider. Obtain an order for a catheter dye study and X-ray to determine catheter position and function.

Catheter Damage

Possible Causes
- Repeated clamping.
- Contact with a sharp object.
- Rupture from attempt to irrigate an occluded catheter with a small 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.

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.
2. Determine the site of damage and the size and type of catheter.
3. Refer to the appropriate Catheter Repair Procedure to repair the damage. At least 2 in. of intact catheter beyond the skin exit site is needed to be able to repair the body of the catheter. Use the appropriate size repair kit to assure a good repair.
4. Always use a 10 ml syringe or larger for flushing or checking patency. Do not flush against resistance.
Air in Line

Possible Causes

- Hole in catheter.
- Needleless connector/injection cap not pre-filled with sterile saline.
- Loose connections (Needleless connector/injection cap, IV tubing).
- “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 of 8-10 cm above the GROSHONG® 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.
- Diffusion and evaporation of water through the external catheter segment due to silicone permeability. This may be noticed in the GROSHONG® Catheter because it is flushed less frequently than other silicone catheters, and it is clear, allowing the visualization of air, which is not possible with 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 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.

Possible Solutions

1. Check catheter for leakage by flushing well with sterile saline.
2. Pre-fill needleless connector/injection cap with sterile saline before attaching it to the catheter.
3. Check for loose connections (needleless connector/injection cap, IV tubing). Check for the presence of the oversleeve. If present, check for proper attachment of the catheter, the connector and oversleeve (see Connector Repair Procedure).
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.
Fluid Leakage from Catheter Exit Site

Possible Causes

- Catheter punctured by sharp object (i.e., scalpel, suture needle, trocar) just prior to placement.

- 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.

- Catheter may have become encapsulated by a fibrin sheath which is preventing 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.

- 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.

- Catheter may have been transected by the clavicle and the first rib due to placement through the “pinch-off” area, allowing fluid infused to flow back along the outside of the catheter to the skin exit site.

Possible Solutions

1. Infuse 10 ml of sterile saline and observe for signs of fluid extravasation under the skin.

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

3. Remove the catheter if a leak or transection is discovered inside the body. If a transection has occurred, the embolized fragment may have to be retrieved with a snare.

4. If a leak is discovered in the catheter outside the body, repair it following the Catheter Repair Procedure.
REFERENCES


Infusion Nursing Standards of Practice. Journal of Infusion Nursing. 4th ed. 2011


WARNING: An issued or revision date for these instructions is included for the user’s information. In the event two years have elapsed between this date and product use, the user should contact BARD Peripheral Vascular to see if additional product information is available.

Toll Free Order Department 1-800-321-4254
Clinical Information 1-800-555-7422

Revised Date: October, 2015

Please consult product labels and instructions for use for indications, contraindications, hazards, warnings and precautions.

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