



Lower Extremity Fasciotomy System

for Laerdal SimMan 3G

Laerdal Product No.

212-55190

212-55200

212-55210

User Manual

Rev.1.1

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1 SYSTEM SUMMARY

This document covers the preparation, use, and care of the Lower Extremity, 2 incisions, 4 compartment Lower Extremity Fasciotomy System for Laerdal. SIMETRI developed a training system compatible with the Laerdal SimMan manikin that helps train in treating compartment syndrome of the lower leg. The Lower Leg Fasciotomy training system's reliability and maintainability is critical to the objective of maintaining warfighters' combat emergency response readiness. Steps on how to assemble and maintain this system are detailed in sections below.

2 INSTALLATION INSTRUCTIONS

2.1 Supplies

No supplies are required to install the Lower Extremity Fasciotomy System for Laerdal onto the Laerdal SimMan 3G manikin.

2.2 System Configuration

2.2.1 Base Unit

The base unit is the main component of the Lower Extremity Fasciotomy System for Laerdal. All components of the System for Laerdal will be sequentially applied to the base unit as outlined in Section 2.2. The base unit, shown in **Figure 1**, is comprised of a support assembly at the top of the trainer and the simulated bones extending downward from the hardware enclosure. The support assembly includes 3 built-in circular attachment points and 1 metal hook attached to the bone structure for attaching the top of the muscle to the unit. In addition, located at the bottom of the bone are 2 transverse holes that situate 4 magnetic pegs for attaching the bottom of the muscle to the unit. Each magnetic peg is numbered to match the corresponding muscle group and is placed in the following hole openings: lateral opening (peg #1), posterior opening (peg #2), medial opening (peg #3), and the anterior opening (peg #4).

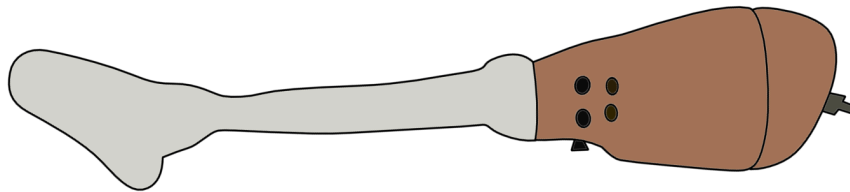


Figure 1. Base Unit for Laerdal

2.2.2 Foot

The distal end of the unit has a bony foot projection with 2 transverse holes that situate 4 magnetic pegs (**Figure 1**) to serve as anchor points for muscular and Great Saphenous Vein attachments. One of the last steps involved in assembling the trainer includes placing the foot skin, seen in **Figure 2**, on the distal end of the base unit.

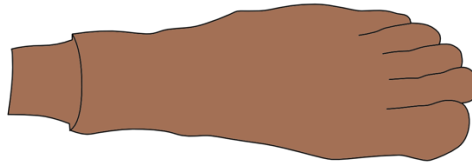


Figure 2. Foot

2.2.3 Fascial Sheaths

There are six fascial sheaths shown in **Figure 3**; each will be placed on individual muscle compartments. Fascia #1 is the fascia for the deep posterior compartment. Fascia #2 is the fascia for the superficial posterior compartment and divided into three components: the fascia marked with L on the top left corner is the left third component of Fascia #2, the fascia marked with M on the top right corner is the middle third component of Fascia #2, and the fascia marked with R on the top right corner is the right third component of Fascia #2. Fascia #3 is the fascia for the lateral compartment. Fascia #4 is the fascia for the anterior compartment. The fascias are marked with the numbers 1, R, M, L, 3, and 4 on the top right corner, which identifies the muscle group and location for assembly. The fascias include a release liner on the underside that is removed prior to muscle application.

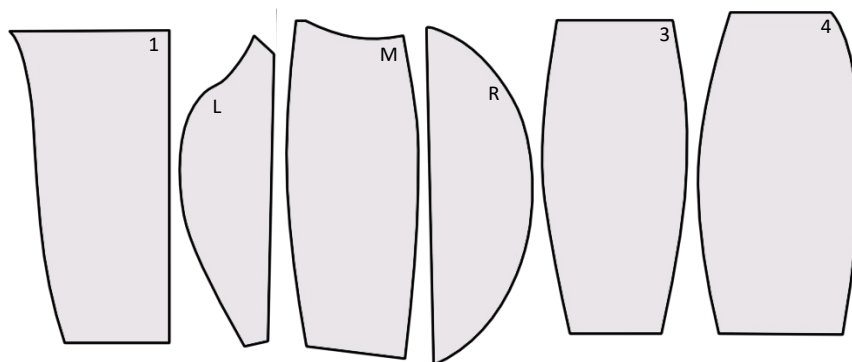


Figure 3. Fascial Sheaths

2.2.4 Muscle Compartments

There are four muscle compartments in the lower extremity. **Figure 4** displays (from left to right) (1) the deep posterior compartment, (2) the superficial posterior compartment, (3) the lateral compartment, and (4) the anterior compartment. The end labeled with a number indicates the top, or superior, part of the muscle assembly. The deep posterior compartment includes the neurovascular bundle and the lateral compartment includes the superficial peroneal nerve.

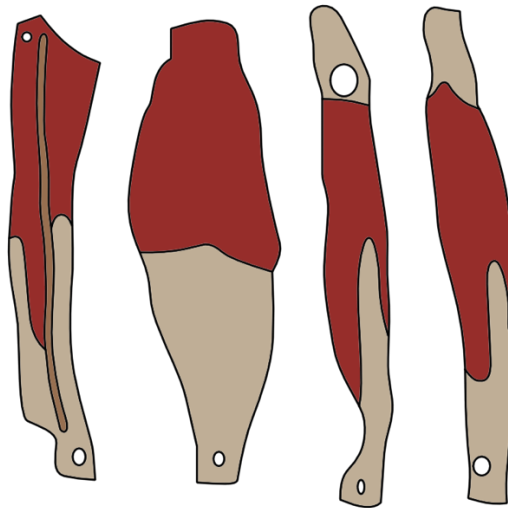


Figure 4. Muscle Compartment

2.2.5 Nerves and Veins

There are two simulated vasculature attachments. The neurovascular bundle is adhered to the deep posterior compartment (muscle #1). **Figure 5** shows the great saphenous vein and its 1 point of attachment. The loop attaches to the metal hook. The 3 branches, from left to right, attach to the corresponding pegs: posterior branch (peg #2), main branch (peg #1), and the anterior branch (peg #4).



Figure 5. Great Saphenous Vein

2.2.6 Skin Layer

The skin layer, shown in **Figure 6**, is applied after the fascia-covered muscles have been

attached to the base unit. It is the outermost layer and has an adipose layer on its underside.

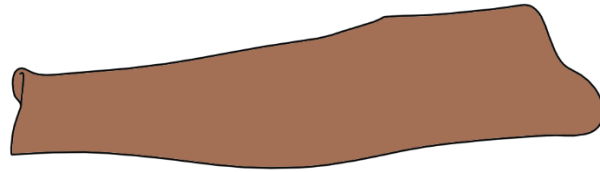


Figure 6. Skin Layer

2.3 Preparation for Use

Once you become familiar with the components that make up the system, follow the steps below to prepare the Lower Extremity Fasciotomy System for Laerdal for use.

1. Identify all components for the System (**Figure 7**).
 - a. Refer to the system configuration section for descriptions and images of all of the components.

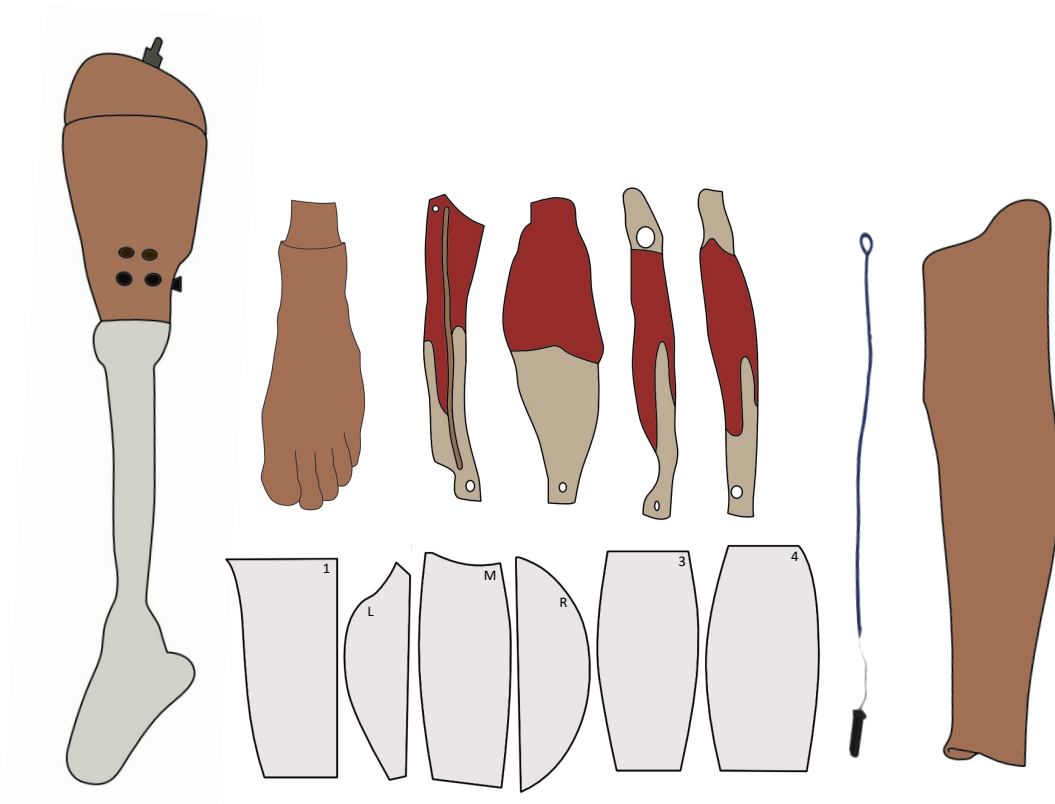


Figure 7. Components of the Fasciotomy System for Laerdal

2. Pair each muscle with its corresponding fascial sheath by matching the numbers on the top right corner of the fascia with numbers on the top of the muscle tubing. The muscle compartment and fascia numbering are as follows:
 - a. Pair deep posterior compartment (#1) with Fascia #1.
 - b. Pair superficial posterior compartment (#2) right third with Fascia R.
 - c. Pair superficial posterior compartment (#2) middle third with Fascia M.
 - d. Pair superficial posterior compartment (#2) left third with Fascia L.
 - e. Pair lateral compartments (#3) with Fascia section #3.
 - f. Pair anterior compartments (#4) with Fascia section #4.

3. Place fascia over corresponding muscle by matching the number on the fascia with the number on the muscle tubing.
 - a. To prepare the fascia for installation, the fascia must be removed from its release liner (**Figure 8**). Lay the fascia up right, so the fascia's number is on the right side. Begin to remove the fascia by pulling up while holding the release liner down.

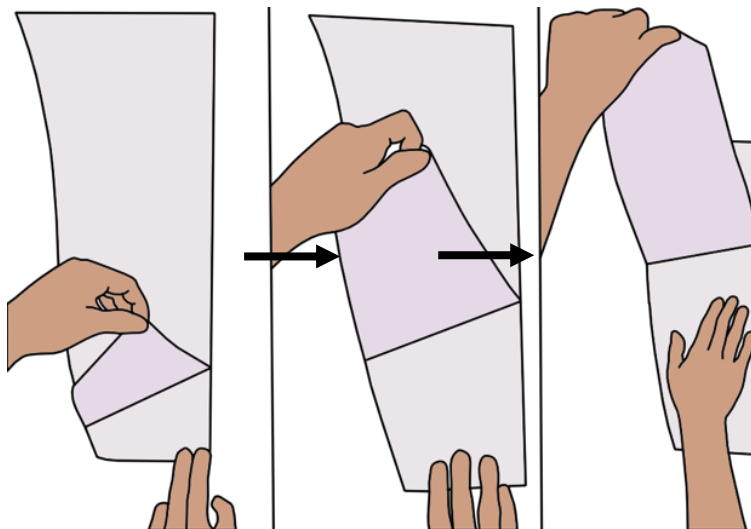


Figure 8. Removing Fascia from Release Liner

- b. To adhere the fascia to the muscle (**Figure 9**), first correctly align the muscle over the fascia. Lay the fascia upside down, so the adhesive side

is up. Then place the muscle, facing up, over the right side of the fascia so that only half of the muscle is superimposing the corner fascia. Bring the fascia over the muscle and press firmly to remove creases. Flip the muscle over to adhere the remaining fascia. Repeat for each muscle.

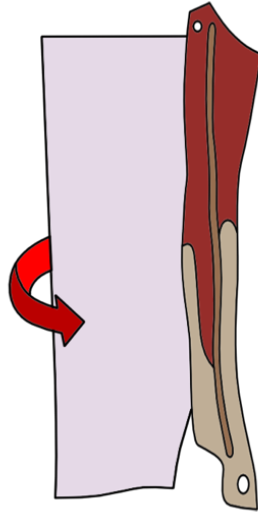


Figure 9. Placing Fascia on Muscle

- c. To adhere muscle #3 and #4 together (**Figure 10**), place a two-sided adhesive sticker below the superficial peroneal nerve on muscle #3. Once adhered to muscle, remove the remaining release liner, place muscle #3 and #4 side by side and adhere muscle #4 to #3.

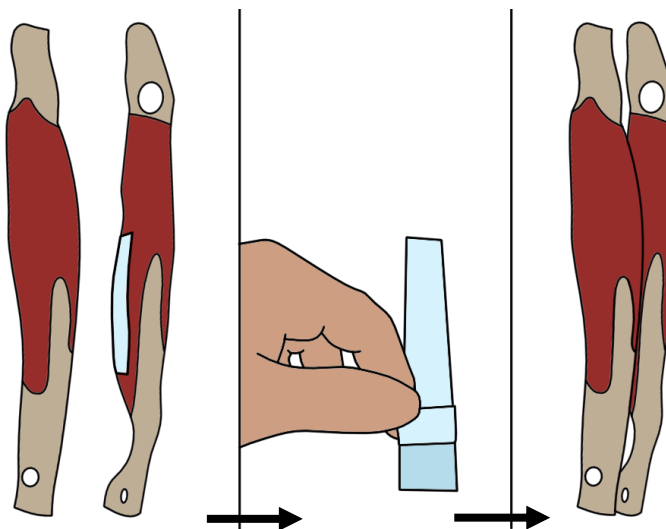


Figure 10. Adhering Muscle 3 and 4

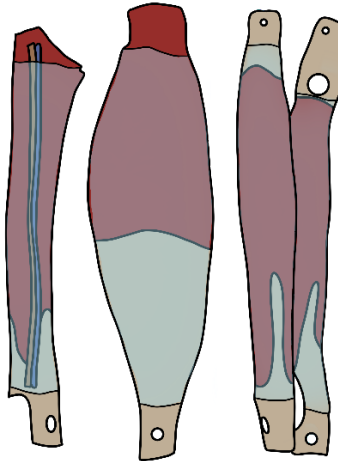


Figure 11. Fascia Adhered to Muscle

4. Place each muscle compartment with adhered fascia (**Figure 11**) on the system base unit.
 - a. Each muscle will have a superior corresponding anchor point on the base unit that is specific to that muscle. The anchor points are numbered for each muscle (see order of application below). Each muscle compartment will have a circular opening at the inferior end, which will slide in its corresponding magnetic peg on the bottom of the tibia. Again, the superior (top) end of the muscle is identified by a number. Repeat this step for each muscular compartment.
 - b. Order of application:
 - i. Deep Posterior Compartment (#1) - will be attached to the metal hook on the top and peg #1 on the bottom (**Figure 12**).

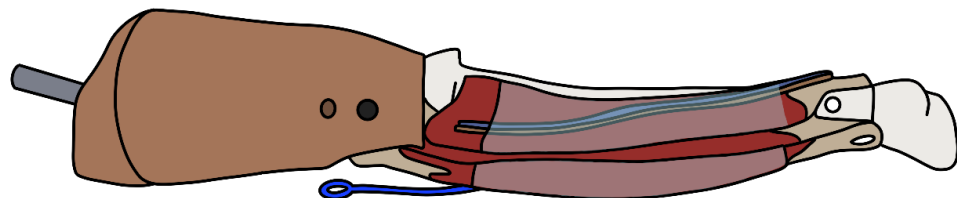


Figure 12. Deep Posterior Compartment Attachment

- ii. Superficial Posterior Compartment (#2) will be attached to anchor point #2 on the top and peg #2 on the bottom (**Figure 13**). The Great Saphenous Vein installation will come already attached to the magnetic peg #4 and will run around as shown below and hook around anchor point #2.

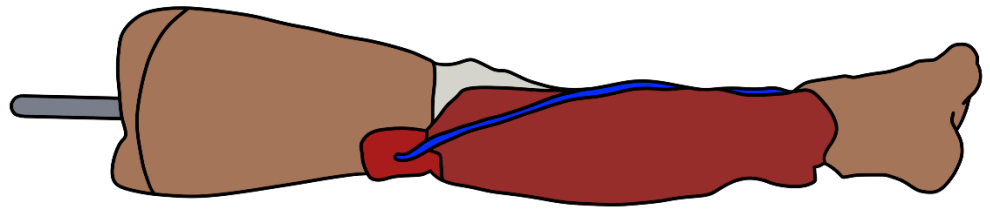


Figure 13. Superficial Posterior Compartment Attachment

- iii. Lateral Compartment (#3) and Anterior Compartment (#4) will be attached to anchor point #3 and #4 on the top and peg #3 and #4, respectively (**Figure 14**). Make to fit the fibular head through the opening in the lateral muscle compartment.

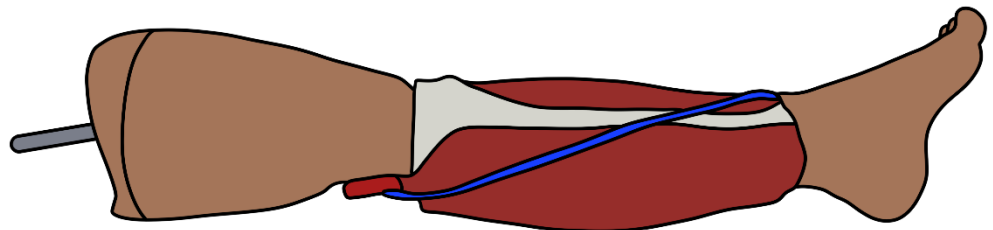


Figure 14. Attaching Lateral and Anterior Muscle Compartments

5. Apply a blood-colored lubricant to the outside of the fascia (Optional).
6. Apply the outer skin layer.
 - a. Place the housing assembly through the top end of the skin. Ensure that the outer skin layer is on all the way by lining up the superior edge of the skin layer with the upper edge of the housing. The zipper should be on the posterior of the calf muscle and zip downwards (**Figure 15**).

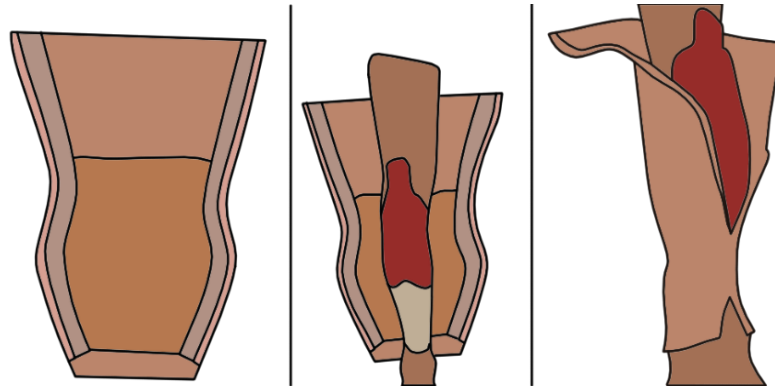


Figure 15. Application of the Skin Layer

7. Apply the foot skin layer.

- a. Fold the ankle portion of the skin down and around the heel of the foot (as seen in **Figure 16**), then place the foot portion of the base unit inside the foot skin. Once the foot portion of the base unit is securely inside the foot skin, place the ankle portion of the skin around the muscle attachment points.

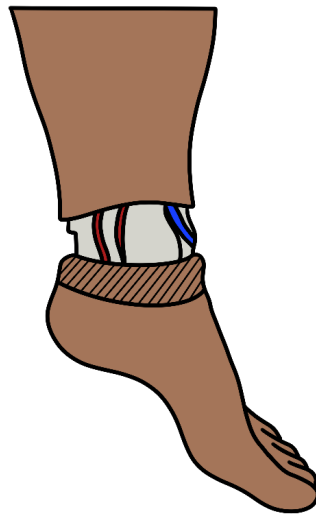


Figure 16. Application of the Foot Skin Layer

3 USER INSTRUCTIONS

After completing the steps outlined in Section 2.3 (Preparation for Use) the System for Laerdal will be ready for use in a training scenario.

3.1 Installation Process

In order to install the Lower Extremity Fasciotomy System for Laerdal, remove the existing limb from the manikin.

If replacing a leg, first unzip the chest skin and lay the skin open to one side so the ribs are exposed, as illustrated in **Figure 17**.

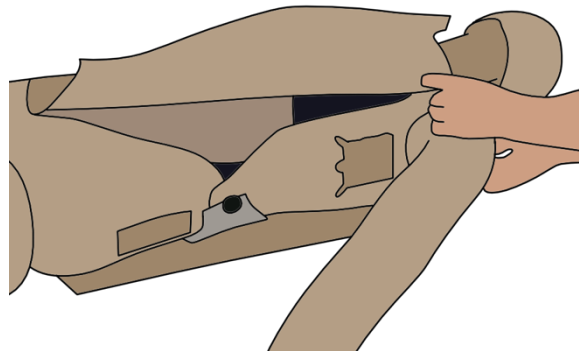


Figure 17. Unzip Chest Skin

Lift the stomach plate out to access the manikin's internal cavity (**Figure 18**).

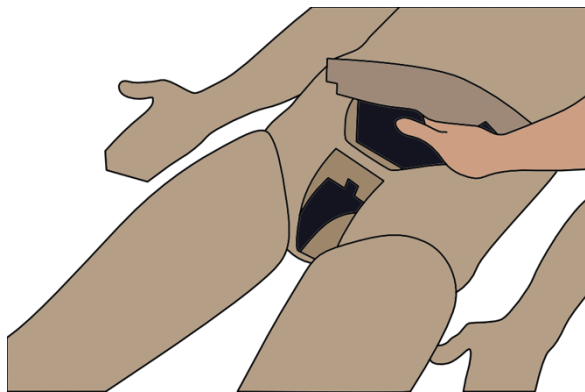


Figure 18. Open Stomach Plate

Locate the top of the leg pipe, which is secured by a small 2” metal pin that is attached to a yellow string. Remove the 2” metal pin from the leg shaft, loosening the limb as depicted in **Figure 19** below. Keep the 2” metal pin nearby; you will need it for Leg Amputation attachment.

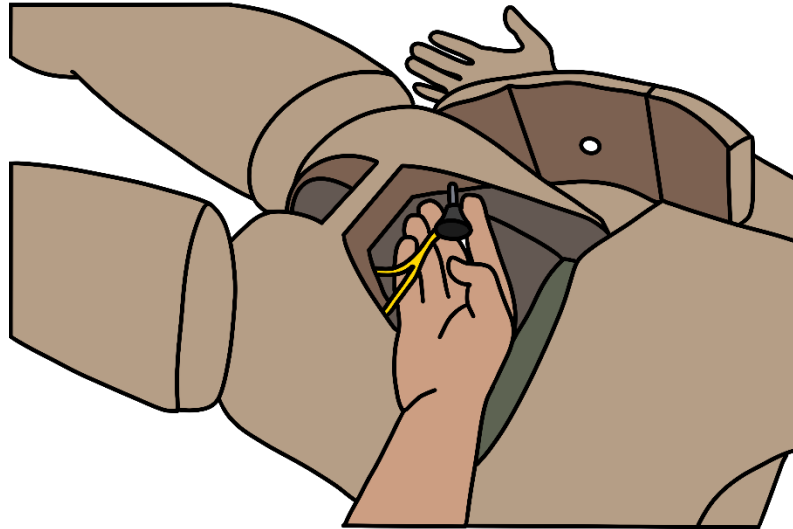


Figure 19. Remove Metal Leg Pin

Insert the Fasciotomy Trainer, orienting it so that the metal leg pipe is located closest to the pelvic region of the manikin. Make sure the hole on the top of the leg pipe can slide into the pelvic opening of the manikin with ease. Once the Leg Amputation is in place, slide the top of the leg pipe directly into the pelvic slot, aligning both holes into place (**Figure 20**).

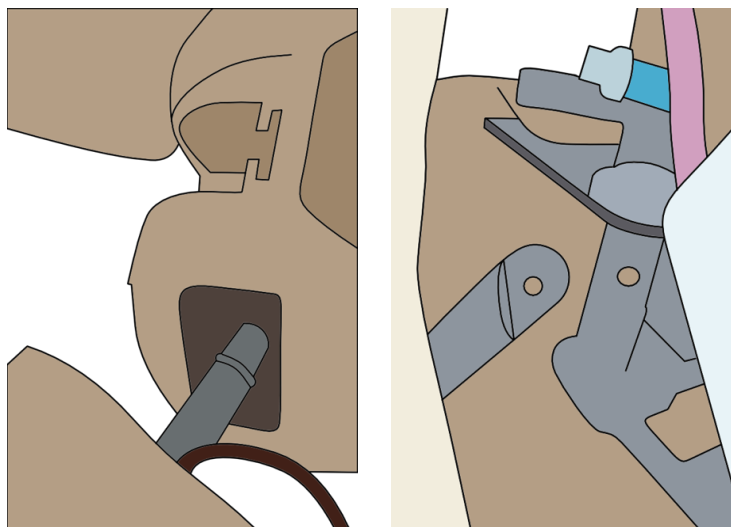


Figure 20. Leg Pipe Orientation into Pelvic Cavity

Insert the 2” metal pin attached by a yellow string into the holes, securing both components into place as illustrated in Figure 21.



Figure 21. Secure Metal Pin in Leg Shaft

3.2 Fasciotomy Procedure

A fasciotomy can be performed on each of the four compartments via 2 incisions (medial and lateral). Each organization should perform the fasciotomy procedure in accordance with its approved training guidelines. A general procedure outline is documented below.

3.2.1 Lateral Incision Fasciotomy Procedure:

- a. Identify the head of the fibula and lateral malleolus in order to determine the location of the fibular shaft.
- b. Make a 15cm incision 2cm anterior to the fibular shaft. This places the incision approximately over the anterior intermuscular septum.
- c. Make a small horizontal cut in the fascia over the septum, providing access to both the anterior and lateral compartments.
- d. Open the fascia of the anterior compartment proximally and distally with blunt scissors.
- e. Open the fascia of the lateral compartment proximally and distally with blunt scissors. Make the cuts in line with the fibular shaft. Directing the scissors towards the lateral malleolus when cutting distally will help in avoiding damage to the superficial peroneal

nerve.

- f. Leave incisions open if the swelling is too great to allow primary skin closure (skin grafting is rarely needed if a full week is allowed for dissipation of edema).

3.2.2 Medial Incision Fasciotomy Procedure:

- a. Identify the posterior medial palpable edge of the tibia.
- b. Make a 15cm incision 2 cm posterior to the posterior medial palpable edge of the tibia.
- c. Separate the fibrous tissue anterior to the posterior tibial margin to avoid the saphenous vein and nerve.
- d. The fascia of the deep posterior compartment is superficial here and readily accessible, it should be opened distally and proximally under the belly of the soleus muscle.
- e. Through the same incision, the fascia of the superficial posterior compartment is opened two centimeters posterior and parallel to the incision of the deep compartment.
- f. Leave incisions open if the swelling is too great to allow primary skin closure (skin grafting is rarely needed if a full week is allowed for dissipation of edema).

Once a fasciotomy has been performed, the outer skin layer and fascias of the muscular compartments will need to be replaced as described in Section 2.3 (Preparation for Use).

4 MAINTENANCE

4.1 Supplies

The following sections contain the maintenance procedures required to ensure continued operation of the Lower Extremity Fasciotomy System for Laerdal. Refurbishment of the Leg Skin requires Sil-Poxy (silicone adhesive), gloves, and paper towels. A new set of Fascias (Fasciotomy – Fascia Set FASC-FSCE-001) must be used to replace the used Fascias and reset the SYSTEM.

4.2 Cleaning and Drying

Silicone material is extremely durable and needs little maintenance. If the skin or muscle layers are dirty and have particles on them, apply 70% isopropyl alcohol to a cloth or paper tissue and wipe away from the surface. Using soap and water will also remove any excess debris from the surface of the silicone components. Let the silicone dry for 1-2 minutes prior to continued use.

4.3 Refurbishment

To refurbish the leg skin, remove from leg and lay it flat and upright. Using gloves, apply small amounts of Sil-Poxy along all cut sections of skin. Then press the cuts closed and allow to cure for 15 minutes.

To refurbish the Fascia, use a new set of Fascias and replace the cut ones following the instructions in section 2.3.