



# Patient Education

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TRANSTIBIAL ELEVATED VACUUM

NORTH BAY PROSTHETICS & ORTHOTICS

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# WHAT MAKES UP A PROSTHESIS?



## Suspension

The first component of a prosthesis is the ‘suspension’ which is how the prosthesis is suspended or held onto the limb when the prosthetic foot is not on the ground. Often, the suspension is a roll-on silicon or gel liner that is anywhere from 3mm to 9mm thick. The liner is soft and can stretch so it serves as a cushion to the limb and reduces shear forces on the skin (which can cause skin breakdown). The liner attaches to the prosthesis by a lock and pin, suction, or elevated vacuum. For some mature limbs (12-18 months post-surgery), the suspension may be ‘straight suction’ between the skin and the socket (in which a liner would not be used).

## Socket

With the liner rolled on, the residual limb slides into the socket which is made out a variety of materials such as felt, nyglass, and carbon fiber. These materials are laminated together by an acrylic resin that “glues” the material together making it very durable. Often times a flexible inner socket, made of plastic, is used for added comfort.

## Knee

The knee is designed to bend during walking, allowing your prosthetic foot to clear the floor. Each knee has various features to help mimic normal knee movement and help you walk smoothly.

## Foot

The prosthetic foot is designed to maximize energy efficiency and stability when walking.

## Adapters and Other Components

Various other components help connect the prosthesis together. An aluminum or carbon fiber tube called a ‘pylon’ stands between the socket and the foot allowing for height adjustments. Other connecting parts are critical for the alignment of the prosthesis.

# MY SUSPENSION TYPE: BK Elevated Vacuum

## Suspension

The suspension technique used for your prosthesis is **elevated vacuum**. The vacuum is achieved by creating an airtight system over your limb and using a vacuum pump (mechanical or electric) to withdraw any trapped air from between the liner and the inner surface of the socket.

## Donning

- 1) Turn the liner inside-out.
- 2) Roll the liner onto the limb ensuring that no air is trapped between the bottom of your limb and the liner. Leave approximately 2-3'' of the liner reflected to expose the gel (which will be used to create the seal for the elevated vacuum).
- 3) Step into the socket and move your limb around to ensure total contact with the socket.
- 4) Pull the outer suspension sleeve up so that it rolls completely over the first liner (including the reflected and exposed gel) and onto the thigh.
- 5) For electric pumps, turn the pump on and set the vacuum level using the remote. For mechanical pumps, alternate weight-bearing and non-weight-bearing in your prosthesis several times (thus 'pumping' up the vacuum) to increase the vacuum level.

## Donning Tip

**CAUTION:** If the outer suspension sleeve is punctured, the vacuum will leak and you may lose suspension of your prosthesis. For electric pumps, you will most likely hear the pump run more frequently and for longer periods of time. Punctures or holes are typically so small that they are not visible to the human eye. If you lose vacuum, stop using the prosthesis immediately and contact your prosthetist.



# LINER CARE



The liner will act as a barrier to cushion and protect your limb from the applied forces within the socket. It is also often used as the suspension method to hold your prosthetic on. Since the liner is in direct contact with your skin it is prone to get dirty and damp (due to sweat). Proper hygiene is extremely important to prevent infection, bacteria growth and skin irritation.



## Washing Instructions

- The liner needs to be washed daily (best time is after use at the end of the day).
- Wash the liner inside-out (gel-side out) by hand with warm, soapy water.
- Pat dry with a cloth or towel or hang dry (Return the liner to normal, with the fabric on the outside, soon after washing).
- Allow for the liner to completely dry before wearing it again.



## Regarding your Liner...

- To reduce any irritation that may occur, contact your prosthetist to trim the liner. Scissors may leave a harsh edge that may cause skin irritation.
- Inspect the inside of the liner for foreign objects, tears, or embedded objects before putting it on.
- You are provided two liners. To prolong their life alternate wearing them day-to-day.
- To reduce the tackiness of the silicon try adding a little baby powder or talcum powder to the inside of the liner before donning. This will also help prevent irritation.
- On sensitive limbs, to reduce rubbing on the end of your tibia, knee cap or behind the knee, apply a little baby oil on the skin to reduce the shear forces of the liner rubbing on the skin.



# SOCKET HYGIENE



Sockets come in all different shapes, sizes, and colors to fit your limb and showcase your lifestyle.

## Washing Your Socket

Periodically scrub your socket inside and out with warm soapy water and dry with a towel. Allow the socket to completely dry before wearing. Report any cracks, chips or noises to your prosthetist as damage to the socket can affect the safety of the prosthesis.

# PROSTHETIC SOCKS



Prosthetic socks are to be used for daily volume fluctuation of your residual limb. Due to the trauma of surgery the residual limb tends to swell and collect fluid. As time goes on the residual limb will shrink as this fluid leaves causing the socket to no longer fit properly. When this happens prosthetics socks are to be worn to take up the extra space within the socket and to make the socket fit properly.

## Donning Tips

- If your prosthesis uses Lock and Pin Suspension, it should take a little effort to “click” into your socket. If it goes on effortlessly and “clicks” right to the bottom this is a sign that you probably need to add a sock.
- Add as many socks as necessary to create a snug fit.
- Be sure that the socks are away from the pin and don’t obstruct the pin from engaging with the lock.
- Machine wash the socks regularly to keep clean of dirt, skin oils and sweat.
- Prosthetic sheaths should also be laundered regularly.



- Prosthetic socks come in 3 thicknesses or plys
  - No Stitching/White..... 2 ply
  - Yellow Stitching..... 3 ply
  - Green Stitching..... 5 ply

# PROSTHETIC SOCK GUIDE

## Volume Gain

### Possible Causes

- General weight gain
- Heat
- Blood pressure
- Fluid retention
- Medication changes
- Decreased activity/increased appetite
- Decrease in wearing time of prosthesis and/or shrinker
- Dermatitis

### Potential Problems

- Leg feels too tight with sock(s)
- Improper fitting socket
- Pressure resulting in discomfort in new areas
- Pinching
- Leg seems taller
- Back Pain
- Discomfort

### Solutions

- Decrease sock ply
- See your Prosthetist

## Volume Loss

### Possible Causes

- General weight loss
- Diuretics (such as blood pressure medication)
- Cold
- Increased activity
- Longer wearing time

### Potential Problems

- Leg feels loose
- Pistoning (slipping of socket while walking)
- Greater pressure on bony areas
- Leg seems shorter
- Back pain
- Discomfort

### Solutions

- Increase sock ply
- See your Prosthetist

# SKIN CARE



Unfortunately sores and skin irritation is not uncommon among amputees. Always check your skin before and after prosthetic use and follow these guidelines to take care of your skin.

## DAILY SKIN CARE

1. Every day, or more often if necessary, wash your residual limb with a mild or antibacterial soap and lukewarm water. Rinse thoroughly with clean water to remove all soap.
2. Dry your skin by patting it with a towel. Be sure your residual limb is completely dry before putting on your prosthesis. Allowing 15 minutes of air-drying before applying your prosthesis should ensure that the skin is thoroughly dry.
3. Consult your prosthetist before using moisturizing creams or lotions. Vaseline or petroleum -based lotions degrade some types of prosthetic liners. Only use softening lotions when your skin is at risk of cracking or peeling. If a moisturizing lotion is needed, it is best to apply it at night or at other times when you will not be wearing your prosthesis. Do not apply lotions to any open area.
4. If needed, applying an antiperspirant to the residual limb can help you control perspiration. Do not apply antiperspirant to any open area. Consult your prosthetist for antiperspirant recommendations.
5. Gentle message and light tapping of the residual limb, will help toughen the leg and prepare it for a prosthesis. You can increase pressure as the leg heals.





# THINGS TO AVOID



1. Do not use alcohol-based products on your residual limb; they dry out the skin and can contribute to cracking or peeling.
2. Do not shave your residual limb; pressure from the prosthetic socket on “stubble” can cause the hair to grow inward, become painful, and, in the worst cases, even become infected. Never use chemical hair removers on your residual limb.
3. Avoid prolonged soaking in warm bathtubs or hot tubs because this may cause increased swelling in your residual limb.

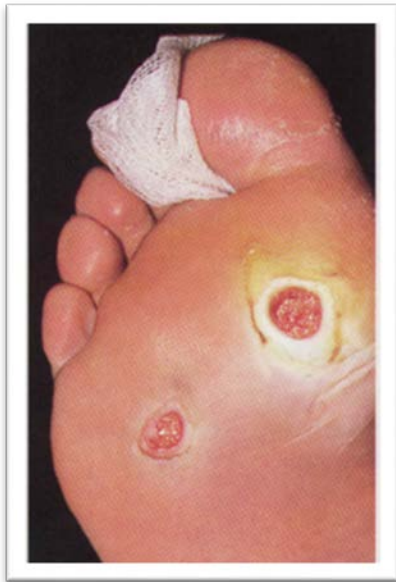
## Inspection of Your Residual Limb

1. Regular inspection of your residual limb using a long -handled mirror will help you identify skin problems early.
2. Initially, inspections should be done whenever you remove your prosthesis. Later on, most amputees find daily inspection sufficient for the early identification of skin problems.
3. Inspect all areas of your residual limb. Remember to inspect the back of your residual limb, the back of your knee and all skin creases and bony areas.
4. Look for any signs of skin irritation, blisters or red marks that do not fade within 15 minutes of removing your prosthesis. Report any unusual skin problems to a member of your rehabilitation team.

For further information on skin care visit the Amputee Coalition of America online

<http://www.amputee-coalition.org/>

# DAILY FOOT CARE

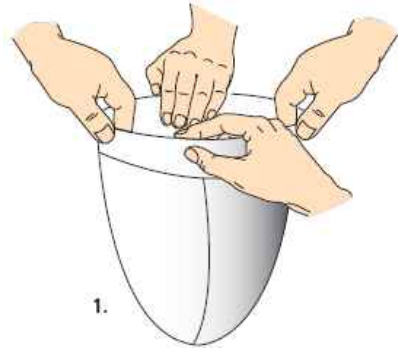


For lower-extremity amputees, it is important to maintain the health of your sound foot. This is especially important if you have diabetes or if you have decreased circulation or sensation in your lower extremities.

## Your Daily Routine Should Include the Following:

1. **Wash and dry your foot properly:** Use a mild soap, rinse thoroughly, and dry your skin by blotting or patting, making sure to dry between your toes.
2. **Inspect your foot daily:** Check for blisters, cuts and cracking.
3. **Protect your foot from injury:** Wear shoes or slippers at all times, and check your shoes every time you put them on for tears, rough edges or sharp objects.
4. Contact your physician or prosthetist with any concerns.

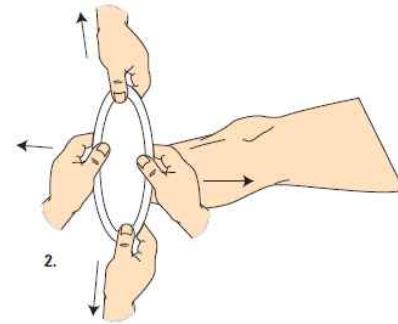
# SHRINKERS



Shrinkers are designed to help control “edema” or swelling within your residual limb by applying compression to your limb. The compression helps push the fluid within your leg away from your residual limb. Until the volume of your residual limb has stabilized, you should wear your shrinker anytime you have your prosthesis off.

## HOW TO PUT ON A SHRINKER

1. Roll Shrinker until it becomes flat like a pancake.
2. If another person is available pull on opposite corners to reduce any sheer friction on the incision.
3. Pull the sock over the limb and smooth out any wrinkles.



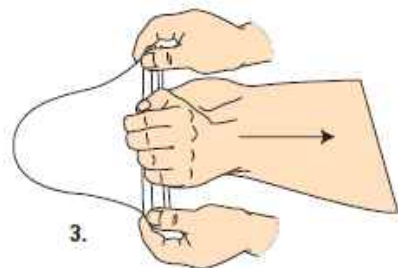
## Shrinker Tips

- Wear the shrinker any the time your prosthesis is not being worn.
- Machine wash regularly and lay flat to dry.
- Should be worn overnight to prevent swelling.

## Frequently asked Q's?

• *What if my shrinker slides off? Shrinkers will have a tendency to do this, especially at night as you move around while you sleep. Simply pull the shrinker back up. You may contact your prosthetist for a smaller size if the shrinker is excessively large.*

• *What if I can't fit into my leg? Often times if you neglect to wear your shrinker, especially at night, your limb will swell up making it difficult to fit into your prosthesis. Put on the shrinker or use an ace bandage to put compression on the limb for several minutes and then try putting on your prosthesis.*



# IMPORTANT POINTS/WEAR SCHEDULE

## IMPORTANT POINTS

- Catch any issues early, contact your prosthetist at the first sign of problems.
- Know your limb— be able to recognize when something unusual occurs (red spots, discoloration, tough skin, etc).
- While wearing the leg your skin may experience adverse effects like blisters, rashes, sores, etc. When this occurs immediately remove the prosthesis and contact your prosthetist.
- Report any malfunctions, failures or needed repairs to your prosthetist immediately.
- If there is a significant change to your health condition or weight loss or gain of more than 10lbs contact your prosthetist.
- Repairs on the prosthesis are under warranty for 3 months from the date of delivery. Individual components may have different warranties. Ask your prosthetist for details.
- Regular follow up appointments are important and should occur weekly until the adjustment period is completed and your prosthetist directs a change.

## INITIAL WEAR SCHEDULE

Your leg needs time to adjust to wearing the prosthesis. Do not wear your prosthesis all day the first day. Unless otherwise directed by your prosthetist follow these general wearing guidelines. Discontinue use if blistering or sores develop and contact your prosthetist.

First Week.....1-2 hours in am, 1-2 hours in pm

Second Week.....4-8 hours a day (gradually increasing use 30 minutes a day)

Third Week.....10-12 hours a day or as tolerable

# GOING ON VACATION

**Be prepared! Here is a quick checklist of some things you may want to remember.**

- ANTIBACTERIAL CREAM**— You may be walking more and as a result may develop sores from the increased activity. Antibacterial cream will help keep any sores clean.
- DUCT TAPE**— To temporarily hold together a broken strap, belt or other part of your prosthetic.
- SET OF HEX WRENCHES**— To tighten any bolts that may come loose (most common is 4, 5 & 6mm).
- PLASTIC BAGS**— To keep your prosthesis dry when there is a threat of your prosthetic getting wet.
- EXTRA PROSTHETIC SOCKS**— Your socks have a tendency to get dirtier with hot weather and increased activity. Extra socks allow you to change them more frequently.
- SPARE LINER**— In case your liner gets damaged or lost.
- SPARE SUCTION VALVE**— In case suspension is lost or your valve is not working properly (if your prosthesis has one).
- PHONE NUMBER OF YOUR PROSTHETIST**— In case of an emergency and you need to contact your prosthetist.
- DON'T FORGET YOUR CHARGER!!** (if your prosthesis requires charging).

# MY PROSTHESIS

I received my prosthesis on \_\_\_\_\_

My shrinker size is    I   II   III   IV   V   VI

My sheath size is \_\_\_\_\_

My liner size is \_\_\_\_\_ and the brand is \_\_\_\_\_

My sleeve is a \_\_\_\_\_

My sock size is    S   M   L

I was given 2-ply x \_\_\_\_\_ , 3-ply x \_\_\_\_\_, 5-ply x \_\_\_\_\_

**NOTES:** \_\_\_\_\_

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