

AK Prosthetics: Definitions and Troubleshooting

Some common definitions:

1. **Trochanter**- this is the upper part of the femur. It is the bone that you feel on the side of your hip.
2. **Femur**- this is the only bone in the thigh.
3. **Ischial Tuberosity (IT)**- this is commonly referred to as the “seat bone.” You notice this bone when you sit on a hard surface such as a wooden bench. It is the lower part of the pelvis.
4. **Shrink**- a term used to refer to a residual limb that is decreasing in size. Shrinking of the muscles or soft tissue is especially common with a newly amputated limb.
5. **Suspension**- this refers to how a prosthesis is held onto your residual limb. Some of the most common types of suspension are:
 - a. 3S - Silicone suction suspension
 - b. Straight suction
 - c. Partial suction + silesian belt
 - d. Hip joint, pelvic band and waist belt
 - e. Vacuum
6. **3S = Silicone Suction Suspension**- this refers to a type of prosthesis that uses a roll-on silicone liner with a **locking pin (plunger) or a pull strap** on the end to hold the prosthesis onto your limb. The liner can also be made of a gel material or hybrid gel/silicone. The **locking pin (plunger)** inserts into a locking mechanism called a **shuttle lock** that is in the end of the prosthetic socket. A pull strap would feed through a slot in the bottom of the socket and attach onto the outside of the socket.
7. **Straight Suction**- this refers to the prosthetic socket being in direct contact with the skin of the residual limb. There is a small valve at the end of the socket that allows air to escape. Because of this intimate fit and an absence of air, a vacuum effect results, and the prosthesis is held in place on the residual limb.
8. **Silesian Belt**- this is a lightweight cotton-webbing belt that wraps around the waist and attaches to the front and top of the prosthetic socket with an adjustable strap. It helps to suspend an AK prosthesis.

9. **Partial Suction + Silesian Belt**- there is a small valve at the bottom of the socket that allows air to escape. However, a prosthetic sock is used with this type of suspension and this allows a certain amount of air to always be in the socket. Because you do not have the strong vacuum effect that you have with ***straight suction*** suspension you need extra suspension. This is provided by the addition of a ***Silesian belt***.
10. **Hip Joint, Pelvic Band and Waist Belt**- this refers to a joint (usually metal) that is attached to the side and top of the prosthetic socket. It is attached to a pelvic band, which is a metal band shaped to fit the waist on the amputated side. This is then attached to a leather belt that circles the entire waist. This type of suspension is heavy and cumbersome and is rarely used. This may be used with an AK amputee who has weak hip musculature or has a very short residual limb.
11. **Piston**- if a prosthesis pistons, it is not held (suspended) properly in position on your leg. Your prosthesis should be held snugly to your limb and not pull away when you walk. If there is exaggerated motion between your limb and your prosthesis when you walk this is referred to as pistoning.
12. **Ply**- a term used to signify the thickness of a prosthetic sock. One ply is approximately the thickness of a thin cotton sock. You refer to a prosthetic socket fit in terms of ply. For example, "I am wearing 5 ply with my AK prosthesis"
13. **Flexion**- this refers to the position of the hip when it moves from a straight position to a ***bent position***. While sitting in a chair, your hip is in flexion. Flexion is the opposite of extension.
14. **Extension**- this refers to the hip being in a ***straight position***. When you stand up, your hip goes from flexion to extension. Extension is the opposite of flexion.
15. **Shuttle lock** (see 3S=silicone suction suspension)
16. **Plunger or locking pin** (see 3S=silicone suction suspension)

TROUBLESHOOTING:

If you begin to experience discomfort, remind yourself that ***your prosthesis has not changed.*** Your body or more specifically, ***your residual limb may have undergone a physical change.***

Your prosthetic socket is designed to fit your residual limb's unique shape. If your limb is not in the proper location in your prosthetic socket or if the shape of your residual limb has changed, it can be uncomfortable. Oftentimes, the solution to this discomfort is to try different sock combinations. Use more or less socks until you feel comfortable.

NOTE: An exception to this would be with **straight suction** suspension, where the skin is in direct contact with the socket, i.e., there is no sock between the skin and the socket.

WHEN DO I GO TO SEE MY PROSTHETIST?

- If it is painful; you should see your prosthetist ASAP.
- If it is uncomfortable and **persists**, no matter what sock combinations you use, you should consider seeing your prosthetist for an adjustment.

Problems Arising from Wearing too Many Ply of Sock

1. Residual limb throbs, feels constricted and choked.
2. End of limb becomes weepy (moist) and red/purple in color. NOTE: this may be a result of a lack of contact (touching) on the end of your residual limb
3. Feeling that the prosthesis is too tall.

Problems Arising from Not Wearing Enough Ply of Sock

1. Uncomfortable pressure in these areas:
 - a. The groin (ramus) area
 - b. Ischial tuberosity
 - c. The bottom of the femur
 - d. The front end of the femur
 - e. The outside end of the femur

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2. Expelling air at top of socket
3. Prosthesis may “spin” on your residual limb causing your foot to turn excessively inward or outward
4. Feeling that the prosthesis is too short.

The Heel Height of Your Shoe Makes a Difference

Your prosthesis was designed to be straight or vertical when it is sitting in your shoe. If you try new shoes and the walk it different, or unstable, schedule with your prosthetist to align the prosthesis to your new shoes.

1. What happens when your AK prosthesis leans forward in the new shoes you just bought? The heel height is too high. What will you notice?
 - a. When you step down with your prosthesis it will push your prosthetic knee forward (**flexion**) quicker than when your prosthesis is vertical in your shoe. You may have difficulty preventing your knee from buckling forward.
2. What happens when your prosthesis leans backward in the new shoes you just bought? The heel height is too low. What will you notice?
 - a. When you step down with your prosthesis it will push your knee backward (**hyperextension**) quicker than when your prosthesis is vertical in your shoe
 - b. You may also experience extra pressure on the top front of your residual limb
 - c. You may have the sensation of “walking uphill”

Problems Arising from Poor Suspension

1. **Pistoning** is a common problem with poor suspension. The exaggerated in and out motion of your residual limb in your prosthesis causes additional friction and shear that leads to skin chafing and blistering.
2. **Slow, laborious walking** can result from poor suspension. With each step your prosthesis pulls down and away from your residual limb and you experience “waiting on your prosthesis” before you can actually take a step with it. Your prosthesis may feel heavier than usual.

Miscellaneous Problems

The end of my limb is reddish/purple and moist and my socks are moist in this area when I take my prosthesis off.

You may have a void or lack of contact at the very end of your prosthetic socket. This creates a vacuum effect and actually pulls the body's fluids through the skin.

- a. You may be wearing too many ply of sock, not allowing your limb to settle into the bottom of your prosthetic socket.
- b. The end of your limb may have shrunk; leaving a void that was not there originally. Contact your prosthetist to restore contact to the end of your residual limb.

3S-Silicone Suction Suspension Prosthesis

Because the 3S prosthesis utilizes a liner and a locking pin there are some unique problems associated with them.

1. **Rash on residual limb**

- a. It is important to thoroughly clean the inside of your liner every day with mild soap and water. Rinse out all soap residue.
- b. Daily cleaning of your liner should prevent rashes. Also, do not use any deodorant, perfume, lotion or soaps containing these ingredients on your residual limb.
- c. Make sure to roll the liner gently up onto your residual limb. Do not tug or pull the top part of the liner. This could cause a rash or blisters around the upper portion of the liner.

2. **Silicone liner slips off residual limb**

- a. Your limb probably has shrunk, and you may need a smaller liner. See your prosthetist.
- b. You may have excessive sweating inside the liner. Talk to your prosthetist about possible options to reduce sweating.

3. **Locking pin (plunger) problems**

a. Noise when walking

1. Pin may be worn and require replacement
2. Shuttle lock may be worn and require replacement

b. Pin sticks, difficult to disengage from shuttle lock

1. Shuttle lock may be rusty. ***Spray lightly with WD-40***
2. Shuttle lock may be clogged with dirt or residue. Blow out with compressed air.

Prosthetic Knee Problems

Except where noted, the problems listed below are common problems attributed to most knee units

1. The knee extends (straightens) too quickly and has a strong impact when totally straight.
Solution: The friction adjustment on the knee may be inadequate or if you have a hydraulic knee, the settings may need to be adjusted. See your prosthetist for an adjustment.
2. After your knee flexes (bends), you have to “wait” on the knee to extend (straighten). It feels as though the knee is slow.
Solution: The friction on the knee may be inadequate or if you have a hydraulic knee, the settings may need to be adjusted. See your prosthetist for an adjustment.
3. The knee’s braking mechanism or resistance to flexing (bending) when you misstep does not engage. (Note: not all knees have a braking mechanism. See specifications for your particular knee.)
Solution:
See your prosthetist for an adjustment.
 - a. Rebuild braking mechanism
 - b. Adjust braking mechanism
 - c. **Hydraulic knee**- hydraulic unit may have to be refurbished if adjustment does not work
4. Excessive movement or looseness in knee when standing.
Solution:
See your prosthetist for an adjustment.
 - a. Rebuild or replace knee
 - b. Replace rubber bumpers
 - c. **Hydraulic knee**- hydraulic unit may need plastic bushings replaced at their points of attachment to the prosthetic frame
5. Hydraulic unit has a whooshing or a gurgling sound during walking.
Solution:
See your prosthetist for an adjustment. The hydraulic unit may need to be refurbished.