

# AMPUTATION

---

(Also called Limb Difference, Extremity Absence)

## *Description of the Disability*

An amputation is the removal, usually by surgery, of a limb or part of a limb. The term **Limb Difference** is used for the congenital malformation of a limb or congenitally missing limbs. Amputations may involve the upper extremities (hands, arms), the lower extremities (feet, legs), or both. Lower extremity amputations are further subdivided into the categories "above the knee" and "below the knee."

Following amputation, most individuals will go through a period of grieving and adjustment of body image. In addition to physical and occupational rehabilitation, counseling may be involved in recovery. For major amputations (removal of a foot, leg, hand, arm, etc. as opposed to a finger or toe), individuals will usually be fitted for a prosthetic replacement soon after surgery.

Functional issues can vary tremendously, depending on the extremities involved and whether the amputation is bilateral or not, and the type of prosthesis. But there are some general issues experienced by most amputees.

Most individuals experience **Phantom Limb Pain** or phantom limb sensation following an amputation. This is any type of sensation that seems to be coming from the missing body part. The sensations can include tingling, warmth, cold, pain, cramping, or constriction. Researchers are not sure exactly why this happens but it seems to be a reaction of the brain or spinal cord to the lack of signals from a previously active nerve path. Fortunately, most of the time the phantom limb sensation or pain fades with time.

Some individuals also experience **Stump Pain** following an amputation. As its name implies, this is pain in the part of the limb closest to the portion removed and seems to be caused by nerves damaged during the amputation. The pain is described as a "sharp," "burning," "electric-like," or "skin-sensitive" pain, and it may fade as the nerves heal. In some cases, the damaged nerves may form a Neuroma, or neural tumor, which will continue to cause pain and sensitivity. In those cases, the doctor may need to surgically remove the neuroma. In a few cases, the neuroma grows back and hurts even worse following surgery.

When the amputation involves a limb, rather than a smaller extremity like a finger, the change in body mass can cause some problems. Individuals may have trouble with body temperature control because of the reduced skin surface. In addition, the flow of fluids in the remaining limb may be affected. This is especially significant if diabetes and a peripheral vascular condition contributed to the need for the amputation (see entry on Diabetes). The build up of liquids in the limb (edema) can make prosthetic devices fit improperly and contribute to skin problems (see below).

Individuals experiencing the amputation of a limb or limbs may also have difficulty with weight control. The reduced body mass means that basic nutritional needs are lower, so eating at previous levels could cause weight gain. A more significant issue is reduced activity because of

the loss of one or both legs. In either case, the person may need to pay close attention to his or her diet and small weight gains.

Following amputation, individuals will need to learn new exercises to maintain body flexibility and strength. Contracture of the muscles in the remaining portions of a limb is very common. In amputation of the lower extremities, hip and gluteal muscles need to be stretched regularly in an upright standing position. In amputations of the upper extremities, the strength and flexibility of the biceps and triceps need to be balanced. In addition, neck and back muscles may get unusual use as the body compensates for the missing limb or limbs. Exercises can help prevent future problems in those areas. Many physical therapists recommend water exercises for amputee because balance and weight issues are reduced.

For those individuals with prosthesis, skin care can become a serious concern. The connection between the stump and the prosthesis is often a strap, cup or socket - which can become hot and sweaty. The person will need to practice careful hygiene of the skin beneath the prosthesis. The skin of the stump may also be rubbed and chafed from weight of the prosthesis. A few individuals have allergic reactions to the materials used to make the prosthesis. Any of these problems can cause a variety of skin problems including ulcers, dermatitis, eczema, bacterial infection, cysts, and even tumors. In extreme cases, the individual may not be able to wear a prosthesis because of skin complications. For individuals with diabetes and related circulatory and sensory problems, these kinds of skin problems can lead to further amputations if not taken care of immediately. For the same reason, the health of a remaining foot must be carefully watched in individuals who have lost one foot or leg through amputation due to complications of diabetes.

## ***Prostheses***

The fitting and adjustment of the prosthesis is the single most important factor in functional ability of the individual. For most people, the size, shape, strength, and coordination of their residual limb(s) will change in the weeks and months after the amputation, requiring regular adjustments of the prosthesis and possible replacement. Most people go through at least three changes of sockets (the attachment between the residual limb and the prosthesis). In order to properly fit and support the residual limb, each socket is custom fabricated to the prosthetist's specifications, based on a cast and/or careful measurements of the amputee.

It is also common to go through several sets of the other prosthetic components. For example, a person with an above-knee amputation may start with a simple, lower-cost knee joint. Later, when the person is able to walk better, a higher tech knee joint may be more appropriate. In the years that follow, changes are less frequent and less dramatic, but most individuals have regular check-ups with their prosthetist.

It is very important to take good care of the prosthesis and the residual limb. Both have to be inspected and washed with warm water on a daily basis. The outer parts of the prosthesis should be cleaned with soap and water, and movable parts are cleaned and oiled. If there is a removable liner it should also be washed daily with soap and water.

Most prostheses for below-the-knee amputations have three major parts: a socket; a shank, and a foot. The socket is held in place by a cuff extending above the knee, by the brim of the socket, or by suction between the limb and the socket of an elastic sleeve or silicone liner on the prosthesis. Sockets are usually made of plastic. There are two types of shanks, exoskeletal and endoskeletal (see definitions below). Any of several types of artificial feet may be used. Some individuals may have several prostheses, each for a different activity.

The above-the-knee prosthesis has four major parts: the socket; the knee system; the shank; and the foot/ankle system. Most sockets for above knee prostheses cover the entire stump. The usefulness of an above knee prosthesis mostly depends on the fitting and alignment of the prosthesis with the body. This is difficult and may require several rounds of trial and error.

Many prosthetic devices now use new materials that are stronger and lighter than ever before. Computer technologies and small-but-sturdy circuit boards allow more function and, in a few cases, the beginnings of sensory feedback. The appearance of prosthetic limbs is improving through the use of new materials and cosmetics as well.

### ***Incidence Statistics***

- There are approximately 400,000 individuals in the US with amputations or limb difference. There are approximately 135,000 new amputees each year
- 53% of amputations are of the leg below the knee. 33% are of the leg above the knee. 2% are of the arm above the elbow. 4% are of the arm below the elbow.
- Causes of lower extremity amputation in the U.S. are disease (70%), trauma (22%), birth defects (4%) and tumors (4%).
- 75% of amputations are due to disease, primarily diabetes, but also including cancer. Most of the remainder are due to car accidents and workplace accidents.
- Most amputations of upper extremities are due to trauma.
- Most upper extremity amputations are loss of fingers.
- 50% of non-traumatic amputations are due to diabetes.
- Phantom pain affects 60-70% of new amputees and may last a year or more.
- After an amputation, the chance of another amputation of the same extremity or of the opposite extremity within 5 years is as high as 50 percent.
- The 5-year mortality rate after lower extremity amputation ranges from 39 to 68 percent

### ***Amputation Terms:***

- Endoskeletal (pylon): A type of shank where the weight is carried through a central structure, usually a tube, and a foam covering provides the shape of the leg. Aluminum, titanium and graphite are used in the central structure.
- Exoskeletal (crustacean): A type of shank where the weight is carried through the outside walls of the hollow shank shaped like a leg. This is an older version of prosthesis with a hard plastic outer cover and it is difficult to modify.

- Prosthesis (plural, prostheses): Something that is used to replace a missing part of the body.
- Prosthetic sock (also stump sock): A fabric cover that fits over the person's residual limb to absorb perspiration when wearing a prosthesis.
- Prosthetist: Specialists who design prostheses. The prosthetist is responsible for selecting, fitting and adjusting the prosthetic components to meet the particular needs of each customer.
- Shank: The portion of a leg prosthesis between the knee system and the foot/ankle system.
- Socket: The part of the prosthesis where the residual limb fits.
- Trans-Femoral (above knee) amputation: Amputation between the knee and hip joint.
- Trans-Tibial (below-knee) amputation: Amputation between the knee and ankle.

### ***Common Treatments, Medications, and Side Effects***

Pain Management and Skin Care are the primary medical issues following amputation.

#### Pain Management

- Evaluation and adjustment of the prosthesis is always a first consideration when dealing with stump pain.
- Medication is the primary tool in pain management. Other treatments include biofeedback, self-hypnosis, relaxation, and use of electrical stimulation.
- Nonsteroidal anti-inflammatory drugs (NSAIDs): The first choice for treating chronic pain associated with stump or skin irritation. They can reduce swelling, inflammation and soreness with no risk of addiction. See drug entry for side effects.
- SSRI Antidepressants: Also useful for treating phantom limb pain. See drug entry for side effects

#### Skin Care

- Conscientious hygiene - the heat, moisture, and close quarters of the attachment points for prostheses can cause a lot of problems if the skin there is not kept clean and dry and is not regularly inspected.
- Evaluation and adjustment of the prosthesis is always important when even the skin is showing a reaction.
- Topical Steroids can frequently help control skin inflammation.

## ***Possible Functional Issues***

### Upper Extremity Amputation:

- Lifting, reaching
- Fine motor coordination
- Gross motor coordination
- Eye-hand-foot coordination
- Work Tolerance (strength, holding objects)
- Writing, signing documents
- Heat tolerance

### Lower Extremity Amputation:

- Walking, climbing,
- Balancing,
- Stooping, kneeling, crouching,
- Lifting,
- Twisting
- Eye-hand-foot coordination
- Work Tolerance (stamina, strength, carrying heavy objects)
- Heat tolerance

## ***Initial Interview Considerations***

### Initial Questions

- How did their amputation occur?
- Do they have diabetes? (see entry on diabetes)
- What problems do they have, if any, with the residual limb(s)? Do they have any skin sores? Any pain? Have they had any in the past?
- What problems do they have with their prosthesis, if any? Is it adjusted and balanced well?
- How often do they see their prosthetist and their physician?
- What problems do they have with phantom pain or phantom sensations, if any?
- Are they taking medications? Are there any side effects?
- What problems do they have with coordination or balance?
- If the amputation involved their dominant arm or hand, how has the adjustment been?

- If the amputation involved a lower extremity, do they have trouble walking? How long can they walk or stand? Do they have trouble with stairs?
- What sorts of activities do they participate in since they got the prosthesis?
- Can they drive a car? Does driving require any modifications of the car?
- How does their amputation effect their activities of daily living?

#### Initial Observations

- Do they seem to have problems walking, sitting, or standing?
- Do they seem to have any coordination or fine motor problems?

#### ***Possible Accommodations and Assistive Technology***

- One-handed lever operation and safety switches for machinery
- Hand controls to replace foot controls
- Appropriate car modifications
- Lifting tools if heavy lifting is involved
- Scooters or other on-site transportation if walking long distances is involved
- Specialty prosthesis for specific job tasks - a quick change end fitting on an arm, a Specialized foot piece (common for runners)
- One-handed specialized tools
- Remote control devices for lights, machines
- Reaching devices
- Speech recognition software (for computer control as well as typing)
- Signature stamps for signing documents
- Transfer benches, grab bars
- Hand-held or around-the-neck emergency call signals
- Adaptations for desks and other spaces to accommodate wheelchairs
- Ramps
- Automatic door openers

Occupational therapists, technology specialists, and prosthetists are often good resources for more information about appropriate assistive devices.

### ***Career Planning Issues***

- The physical capabilities of the individual and their residual limb(s) may change over time. Most of this change will happen in the first weeks and months following the amputation, but gradual changes may happen later on as well.
- The work history of the person is probably good
- Learning, problem solving, and memory skills are usually not affected.
- Social skills and communication skills are usually not affected.
- Motivation is usually not affected.
- Ability to work independently as well as in groups is usually not affected.
- Any issues associated with secondary conditions, such as diabetes, need to be addressed

### ***Emerging Issues***

- Improved prosthetics
- Adaptive technology

### ***Additional Information Resources***

- Amputee Coalition of America (ACA): [www.amputee-coalition.org](http://www.amputee-coalition.org)
- In Motion Magazine (a publication of ACA): [www.amputee-coalition.org/inmotion\\_about.html](http://www.amputee-coalition.org/inmotion_about.html)
- Amputee Information Resource Center (Amputee Resource Foundation of America): [www.amputeerresource.org/](http://www.amputeerresource.org/)
- Amputation Online Magazine: [www.amputee-online.com/](http://www.amputee-online.com/)
- The Amputee Website: [www.amputee-online.com/amputee/amputee.html](http://www.amputee-online.com/amputee/amputee.html)
- New Mobility Magazine: [www.newmobility.com/](http://www.newmobility.com/)