Limb prostheses

Limb prostheses include both upper- and lower-extremity prostheses.

Upper-extremity prostheses

are used at varying levels of amputation: forequarter, shoulder disarticulation, transhumeral prosthesis, elbow disarticulation, transradial prosthesis, wrist disarticulation, full hand, partial hand, finger, partial finger. A transradial prosthesis is an artificial limb that replaces an arm missing below the elbow.

Upper limb prostheses can be categorized in three main categories:

Upper Limb Prostheses

Four categories of upper limb prosthetic systems:

1. *Passive system*
2. *Body-powered system*
3. *Externally powered system*

- A *passive system* is primarily cosmetic but also functions a stabilizer. A passive system is fabricated if the patient does not have enough strength or movement to control a prosthesis, or wears a prosthesis only for cosmoses.
- A *body-powered system* prosthesis uses the patient's own residual limb or body strength and ROM to control the prosthesis. This includes powering the basic functions of terminal device opening and closing by elbow and shoulder joint mobilization.
- An *externally powered system* uses an outside power source such as a battery to operate the prosthesis.
- A *hybrid system* uses the patient's own muscle strength and joint movement, as well as an external supply for power. An example of a hybrid system is one in which there is a body powered elbow joint but an externally powered terminal device.

Passive devices can either be passive hands, mainly used for cosmetic purposes, or passive tools, mainly used for specific activities (e.g. leisure or vocational). An extensive overview and classification of passive devices can be found in a literature review by Maat *et.al*[1] A passive device can be static, meaning the device has no movable parts, or it can be adjustable, meaning its configuration can be adjusted (e.g. adjustable hand opening). Despite the absence of active grasping, passive devices are very useful in bimanual tasks that require fixation or support of an object, or for gesticulation in social interaction. According to scientific data a third of the upper limb amputees worldwide use a passive prosthetic hand. Body Powered or cable-operated limbs work by attaching a harness and cable around the opposite shoulder of the damaged arm. A recent body-powered approach has explored the utilization of the user's breathing to power and control the prosthetic hand to help eliminate actuation cable and harness The third category of prosthetic devices available is myoelectric arms. These work by sensing, via electrode , when the muscles in the upper arm move, causing an artificial hand to open or close. In the prosthetics industry, a trans-radial prosthetic arm is often referred to as a "BE" or below elbow prosthesis

Lower-extremity prostheses

provide replacements at varying levels of amputation. These include hip disarticulation, transfemoral prosthesis, knee disarticulation, transtibial prosthesis, Syme's amputation, foot, partial foot, and toe. The two main subcategories of lower extremity prosthetic devices are trans-tibial (any amputation transecting the tibia bone or a congenital anomaly resulting in a tibial deficiency) and trans-femoral (any amputation transecting the femur bone or a congenital anomaly resulting in a femoral deficiency)

A transfemoral prosthesis is an artificial limb that replaces a leg missing above the knee. Transfemoral amputees can have a very difficult time regaining normal movement. In general, a transfemoral amputee must use approximately 80% more energy to walk than a person with two whole legs. This is due to the complexities in movement associated with the knee. In newer and more improved designs, hydraulics, carbon fiber, mechanical linkages, motors, computer microprocessors, and innovative combinations of these technologies are employed to give more control to the user. In the prosthetics industry, a trans-femoral prosthetic leg is often referred to as an "AK" or above the knee prosthesis.

Prostheses are manufactured and fit by clinical Prosthetists. Prosthetists are healthcare professionals responsible for making, fitting, and adjusting prostheses and for lower limb prostheses will assess both gait and prosthetic alignment.

Lower extremity prostheses are often categorized by the level of amputation or after the name of a surgeon:

- Transfemoral (Above-knee)
- Transtibial (Below-knee)
- Ankle disarticulation (more commonly known as Syme's amputation)
- Knee disarticulation
- Hip disarticulation
- Hemi-pelvictomy
- Partial foot amputations (Pirogoff, Talo-Navicular and Calcaneo-cuboid (Chopart), Tarso-metatarsal (Lisfranc), Trans-metatarsal, Metatarsal-phalangeal, Ray amputations, toe amputations).
- Van Nes rotationplasty

A transtibial prosthesis is an artificial limb that replaces a leg missing below the knee. A transtibial amputee is usually able to regain normal movement more readily than someone with a transfemoral amputation, due in large part to retaining the knee, which allows for easier movement. Lower extremity prosthetics describe artificially replaced limbs located at the hip level or lower. In the prosthetics industry, a trans-tibial prosthetic leg is often referred to as a "BK" or below the knee prosthesis.


Sockte
Pylon or tube
Foot
Stump