



Osseointegration: An Overview

What Is Osseointegration?

Osseointegration is an alternative method of attaching a prosthetic limb to an amputee's body. Osseointegration is a procedure that many transfemoral and transtibial amputees are looking to when running into issues with socket prostheses. Many upper limb amputees are looking to this procedure as well for the potential of increased stability with their arm prosthesis.

The term osseointegration refers to a direct connection between human bone and an artificial implant. Osseointegration for amputees involves implanting a metal anchor directly to the bone of an amputated limb that extends out of the residual limb. A prosthesis is then attached to the metal extension (abutment).

Many amputees who have undergone osseointegration feel what is known as osseoperception – the sensation that their prosthesis is an actual part of their body. This helps many people overcome a psychological hurdle that prevents them from regularly wearing their prosthesis.

Is Osseointegration Right for You?

You may consider exploring osseointegration if you:

- Find your walking distance with a socket prosthesis is limited
- Develop chronic skin problems with socket prostheses that prevent you from wearing them regularly
- Struggle with your socket prosthetic in general or don't wear it as a result

A study conducted by the Radboudumc AOFE Clinic in 2011 of [socket prosthetics vs. osseointegration](#) for lower-limb amputees helped solidify the benefits of the procedure. The study found that in those with osseointegration:

- Prosthesis use increased from 56 to 101 hours per week
- Walking speed increased by 32% and used 18% less energy
- Quality of life rating improved from 39 to 62 on a 100-point scale

However, this is an intensive procedure with some risks involved, and the need for regular maintenance that may make the procedure less appealing. Read on to learn more about the potential pros and cons of this procedure and what you can expect.

Brief History

The first attempts at osseointegration were begun in Sweden in the late 1950s by Dr. Brånemark through the use of dental applications. This technique was then applied to facial prostheses such as ears, noses, and hearing aids, as well as subsequent joint replacements in the hand, and silicone prosthetic attachments for thumbs and fingers.

Fast forward to the 90s. Brånemark's team at the Sahlgrenska University Hospital and Integrum AB in Gothenburg performed the first osseointegration procedures for both lower and upper-limb amputees. Since then, thousands of amputees have undergone the procedure in facilities all around the world.

How Does It Work? Process & Timeline

There are two primary types of osseointegration procedures currently available for amputees. OPRA was pioneered by Brånemark and his team in Sweden. A competing system known as ILP has also been developed by Orthodynamics GmbH, Lübeck, Germany.

Some patients may require more than one surgery. All osseointegration procedures require time for the bone and residual limb to fully heal and strengthen around the metal implant.

Screw shape prosthesis (OPRA): This system uses a screw shape design and the implant length within the body is relatively short (80mm). Patients will not be able to start wearing a prosthesis on their abutment fully unsupported for 6-12 months.

Press fit prosthesis (ILP): This system uses an alloy rod with a 3D tripod surface structure with a longer implant length (140-180mm). The healing process is quicker – some patients are able to start putting full weight on their prosthesis as soon as 6 weeks.

During rehabilitation you will learn to use your new prosthesis with the aid of crutches. Rehabilitation can take 3-5 weeks, depending on the patient and whether the surgery was for transfemoral or transtibial amputation.

Once you're able to fully support yourself with your new prosthesis, you can resume a normally-active lifestyle with the exception of avoiding aggressive contact sports. There are no issues with getting your abutment wet, so bathing and swimming aren't an issue.

Pros & Cons of Osseointegration

Osseointegration [has both pros and cons](#). It can change a life for the better, but it is also a major surgical procedure with a long recovery time and rehabilitation.

Potential Pros of the osseointegration procedure include:

- Increased use of a prosthesis
- More stability in walking and standing
- Ability to walk longer distances

- Avoiding the skin problems associated with socket prosthetics
- Easy to remove and replace a prosthesis

Potential cons of osseointegration include:

- Surgical procedure with a potentially long recovery time
- Need to regularly maintain and clean the interface between the skin and implant
- Risk of superficial skin infections or deep tissue infections
- Potential for the abutment to bend or break
- Limitations on participation in high impact sports

There is also the potential for muscle pain in the first year. This is because your residual limb needs time to strengthen around the abutment through regular use of your prosthetic.

Osseointegration Prosthetics & Managing Your Abutment

Most prosthetics companies now design prostheses designed for those who have undergone osseointegration. Connection to the abutment is easy, and most amputees report being able to attach or remove their prosthesis in 30 seconds.

There is some minor care required for your abutment. The area of skin surrounding the abutment (also known as a stoma) needs to be regularly cleaned.

Get More Resources on Osseointegration

We hope this guide has provided you with some food for thought on osseointegration, but you likely still have lots of questions. For more information, [reach out to one of our information specialists](#). They will be able to provide you with personalized support and how to access any financial supports you may be eligible for.

- **Osseointegration: Coming Soon to the United States?**
https://www.amputee-coalition.org/inmotion_online/inmotion-29-05-web/40/
Nikki Grace-Strader & Solon Rosenblatt, MD. InMotion (September-October 2019, 40-43).
- **Osseointegration for Patients With Amputation in the United States**
https://www.amputee-coalition.org/inmotion_online/inmotion-27-06-web/43/
Richard J. O'Donnell, MD, and Rickard Brånemark, MD, PhD. InMotion (November-December 2017, 42-43).
- **Walter Reed National Military Medical Center Osseointegration FAQs**
https://tricare.mil/mtf/WalterReed/Health-Services/M_S/Osseointegration/Osseointegration-FAQs

† Maguire, Peter, and Parkes, Colin M. "Surgery and loss of body parts" in *British Medical Journal*. 1998 Apr 4; 316(7137): 1086–1088. doi: 10.1136/bmj.316.7137.1086

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National Limb Loss Resource Center, a program of the Amputee Coalition, located at 900 East Hill Ave., Suite 390, Knoxville, TN 37915 | 888/267-5669

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