

# Soft Tissue Revision of Amputated Limbs

## Christian Ertl, MD

Caring for prosthetics patients who have recurrent skin breakdown or enduring pain is difficult. Dedicated prosthetists spend many hours making adjustments and multiple sockets for patients with persistent problems; however, when conservative measures have been exhausted, the next course of action is to refer them to an experienced physician to be evaluated for revision surgery or other medical treatment.

The decision to revise an amputation surgically is not taken lightly and is based on several complex factors. These include medical and prosthetic history, physical and diagnostic findings, as well as each patient's personal needs and goals.<sup>1,2,3</sup>

## Medical and Prosthetic History

Relevant information should be gathered from as many sources as possible so that the decision to operate is not made in a vacuum. When evaluating a patient for surgical revision, we typically start with the broad medical history and then focus on the details of prosthetic use, including the patient's state of mind. In this process, it is always best to engage spouses, relatives, and everyone who provides care to the patient. Immeasurable insight can be gleaned from the patient's initial walk through the office door. Physical signs can include limping, using a cane/crutch, or exhibiting a change in behavior not noticed during previous visits. It is imperative that providers have open communication with their patients. This means asking pointed questions that can help us understand patients' symptoms and their point of view. Patients may not know how to tell you that they are not wearing their prosthesis, and many believe that their discomfort is normal. Questions such as, "Is there anything else bothering you?" and "What is it you don't want to tell me?" can help reveal details that are critical in determining the correct course of action.

Active communication between the prosthetist providing regular care and the surgeon is critical to a good outcome. As a "frontline" provider, prosthetists are uniquely obligated to have regular and frequent contact with their patients. As such, they can observe the normal dynamic changes that occur while a residual limb matures as well as any abnormal events. The prosthetist's referral to a physician is best accompanied by a report with details about the history of all procedures and adjustments performed. Important facts that will inform the decision to revise a patient's residual limb include location and frequency of skin breakdowns, specific description of pain, volume changes, and patient compliance. A consultation with the patient together with the doctor and the prosthetist can be most useful.

## Physical and Diagnostic Findings

Referral for soft tissue revision should be contemplated on patients with the following scenarios:

Chronic, non-healing ulcers despite off-loading and advanced wound-care treatment.

Bony prominences or overgrowths, especially with thin, soft tissue coverage.

Pain that persists even after the prosthesis is removed.

Excess of redundant skin or soft tissue that pleats and folds, making hygiene very difficult, or which results in prosthetic instability.

Adequate prosthetic fit cannot be obtained despite the patient having multiple adjustments, socket changes, and trying various prosthetic systems.

Even higher-functioning amputees can benefit from myoplastic revision (see *The Academy TODAY, February 2010*). In my experience, this surgical procedure usually results in fewer socket problems and improved coordinated muscle control, which permits patients to increase their physical activities. This is especially evident among those patients who require a prosthetic socket design with high proximal pressures to compensate for their lack of distal end-bearing capacity.

A thorough physical exam is imperative for an accurate diagnosis and treatment plan. Laying hands on the patient and palpating the underlying anatomy is an art that is sometimes overlooked, yet it is a very important part of a complete evaluation. This exam helps to determine if a patient's problem requires only a simple procedure such as the excision of a neuroma, a superficial scar release, or a more extensive revision and reconstruction surgery.

Patients must be appropriate surgical candidates before being considered for a revision procedure. Elderly, debilitated, or dysvascular patients may not survive general or even regional anesthesia needed to undergo an extensive revision. Those with severe congestive heart failure, coronary artery disease, and/or poor ability to heal may find few surgeons willing to operate. Nonetheless, there are ways of getting patients safely through an operation if they decide that the benefits in terms of quality of life and daily activities are worth the risk. In cases of complex regional pain syndrome or phantom pain, surgery may not provide relief or may exacerbate symptoms.

The next step is to evaluate the patient's ability to heal from the surgical incision. Accepted methods of assessment are transcutaneous oxygen measurement (TcOM), as well as standard non-invasive vascular studies. The patient's general health, age, comorbidities, nutrition, tobacco use, and glucose management help to develop a profile of healing potential.

## **Patients' Needs and Goals**

Surgery can range from finding and removing neuromas to complex repairs and

reconstruction. Some patients may only want minimal surgery despite the benefits of a more extensive revision. Many factors go into a patient's decision:

Current level of pain, impaired function, and/or recurrent problems.  
Anticipated recovery time, including time away from work.



**Case 1: Before revision surgery (top). After revision surgery**

**(middle). Redundant tissue removed (bottom).**

Expected degree of improvement.

Risks and pain associated with surgery.

Availability of an experienced surgeon.

Past history, including the circumstances surrounding their primary amputation(s).

Insurance coverage.

A thorough, informed consent helps patients to make decisions they are comfortable with so that their expectations are consistent with the projected surgical outcome.

## **Case Histories**

***Case 1: Revision for Soft Tissue Problem*** A 56-year-old female with a transfemoral amputation secondary to a motor vehicle accident (MVA). This patient had a prior osteomyoplastic reconstruction, yet she still had difficulty with prosthetic fit. She also experienced skin irritation. The initial exam did not reveal a significant issue until the patient stood, and there was an obvious redundancy. The patient reported a wrapping sensation in her socket. Surgery was performed to remove excess soft tissue (1.2 lb.) and an inclusion cyst that had developed (see images at right).

***Case 2: Revision for Pain*** A 30-year-old male with an above-knee amputation secondary to trauma with a nine-month history of poor prosthetic fit and weight gain secondary to increased inactivity. The patient has redundant soft tissue and also complained of exquisite posterior pain. Surgical revision included a resection of exostosis, sciatic neuroma, and soft tissue excision, with osteomyoplastic reconstruction. The clinical exam revealed a suspected sciatic neuroma, which was confirmed by pathologic specimen. This neuroma was not visible on multiple MRIs (see images below).



**Case 2: Before revision surgery (above left). Preoperative x-rays revealed multiple exostosis, also in the area of pain described by the patient and confirmed by pain on palpation (above right). Large sciatic neuroma heavily invested in the exostosis (right).**





**Case 3: Revision for Overgrowth of the Tibia** A 50-year-old female patient who had her left leg amputated secondary to a pedestrian motor vehicle collision more than 20 years ago. Following the amputation, this patient had a good return to function, but her ability to stand continuously diminished over the years from 4–6 hours per day to 2–3 hours per day. An exam revealed tenderness at the extreme tip of her residual limb, and efforts to off-load using a patellar-tendon-bearing (PTB) socket helped only for 9–12 months.

Her clinical exam demonstrated marked atrophy of her residual limb musculature.



**Case 3: Before revision surgery (left). Extosis of tibia (middle). Post revision surgery (right).**

Pre-operative evaluation included plain x-rays, which revealed a rather prominent, buck-toothed shaped exostosis as the source of her pain and inability to weight bear.

Osteomyoplastic revision with resection of the exostosis was performed with a subsequent return to function and continued employment (see images above).

**Case 4: Deep Ulcer Treated without Surgery** A 50-year-old female with diabetes mellitus, who was noted by caregivers to be avoiding prosthetic wear. Despite having been ambulatory, this patient remained continuously in a wheelchair. She had not seen a prosthetist in two years. She was sent to a wound center for "ulcer" evaluation and treatment. She presented with a deep, full-thickness ulcer affecting the medial epicondyle as shown. Her prosthetic liner demonstrated a large hole in the same area. Off-loading for three weeks and appropriate dressings healed the wound without surgery (see image below).



## References

1. Sheffield PJ, Fife CE, eds. *Wound Care Practice*. 2nd ed. Flagstaff, AZ: Best Publishing Company; 2007.
2. Carroll K, Edelstein, J. *Prosthetics and Patient Management: A Comprehensive Clinical Approach*. Thorofare, NJ: SLACK Incorporated; 2006.
3. Sussman C, Bates-Jensen B. *Wound Care: A Collaborative Practice Manual for Health Professionals*. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2006.