Identifying and Managing Skin Issues With Lower-Limb Prosthetic Use

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Fitting a prosthesis is complicated because parts of the human body are used for tasks for which they are not designed. The skin/prosthesis interface is at fault for many complications. Here, a synthetic material, such as silicone or plastic, is in constant contact with the skin. Skin is not well-suited for this type of material contact. Skin problems are one of the most common conditions affecting lower-limb prosthetic users today. Skin problems are experienced by approximately 75 percent of amputees using a lower-limb prosthesis. In fact, amputees experience nearly 65 percent more dermatological complaints than the general population.

Figure 1. Bony prominences with decubiti (pressure sores)

Abnormal mechanical and thermal conditions are introduced in a prosthesis, such as socket contact against the skin. This can traumatize tissue by excessive tension, friction or heat. Additionally, the skin reacts to increased temperature with perspiration, which is unable to evaporate because of the closed prosthetic environment. This results in more heat and moisture softening the skin, thereby disrupting normal integrity (maceration).

Pressure is another mechanical issue introduced in a prosthetic socket. Certain parts of the human anatomy are well-suited to disperse pressure, such as the fat pad of the heel. With amputation, the normal pressure-distributing anatomy is missing or altered. Therefore your prosthetist must use anatomic areas not well-suited for weight-bearing pressures. Improper socket fit can increase pressure and accelerate skin breakdown. Pressure sores can often be corrected with minor prosthetic adjustments. However, sometimes pressure areas can be more significant and require recovery time out of the prosthesis and/or a complete new socket fit.

Irritant contact dermatitis and allergic contact dermatitis are two more common problems affecting prosthetic users. Either of these can occur when the skin is exposed to a material that creates a skin aggravation. If a known irritant or allergic component exists in the patient's prosthesis, it should be switched to another material. Furthermore, both conditions can be treated with topical steroids or a barrier cream. Several over-the-counter (OTC) topical preparations are available for these conditions, such as hydrocortisone and zinc oxide. Untreated, dermatitis can lead to chronic inflammation, cellular damage and carcinogenesis (cancer). Therefore, we urge all

Figure 2. Allergic contact dermatitis

Figure 3. Irritant contact dermatitis with excoriation (excessive scratching which breaks the surface of the skin – circled)

prosthetic users to see a physician when they have failed conservative therapy or have a lesion that won't heal. It is imperative that these lesions are evaluated so that various forms of cancer can be ruled out.

Avoiding skin complications begins with good hygiene and daily skin inspections. Clean all parts of your prosthesis daily that contact your skin. The reverse is also true: Inspect and clean all parts of your skin daily that contact your prosthesis. Don't rely on feeling a problem as your primary means of detecting skin problems. Many patients are desensitized and can't feel damage to the skin. The best inspections make use of a mirror or a spouse who can view all aspects of your limb. Every amputee's needs are unique, so discuss your inspection needs with your provider.

If you encounter a skin problem that you are unable to resolve or that will not heal, then the first step is to see your prosthetist. The prosthetist can then determine if the problem can be resolved prosthetically or through other conservative means. If not, the prosthetist may refer you to your primary care physician or a specialist (*see flow diagram*).

Skin issues are very common among amputees. Because amputees require an unusually high demand from their skin, and because not wearing a prostheses is often not an option, they sometimes dismiss the importance of hygiene and monitoring of their skin. Skin issues need to be taken seriously. A simple skin breakdown can lead to more severe problems, such as infection, cancer, osteomyelitis (bone infection), and ultimately revision surgery. Start with your prosthetist to determine, and hopefully resolve, the problem. If your prosthetist cannot find a solution, you may need to consult a specialist, such as a dermatologist.

Photos provided by James Highsmith, Jason Highsmith and Jason Kahle

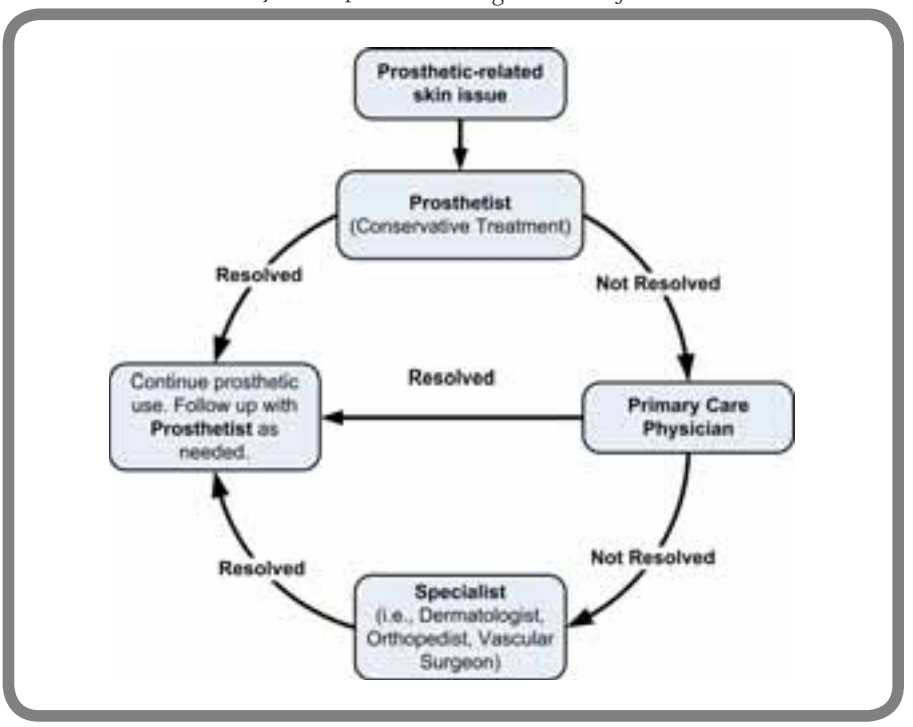

Photo	Diagnosis (Name)	History [Signs/Symptoms]	Physical Exam Findings	Acute Management	Long-Term Management
Figure 1	Pressure sores (Decubitus ulcers)	Pain and/or redness over bony prominences	Erythema (redness) or ulceration over bony prominences	• Stop using prosthesis • Antibiotic ointment (e.g., Polysporin*)	• Prosthetic adjustment • New socket
Figure 2	Allergic Contact Dermatitis	• First exposure causes no reaction (type IV delayed hypersensitivity reaction) • Itching and redness appears 1-5 days after second exposure and affects everywhere the allergen contacts the skin • May extend beyond allergen contact areas if severe	• Acutely, may have well-demarcated erythema, weeping or blisters • Subacutely, erythema, less well-demarcated, maybe scaly skin • Chronically, erythema and dry, thick, scaly skin	• Moisturizer • Topical steroids (e.g., hydrocortisone)	Allergen avoidance (substitute allergen for materials that do not aggravate symptoms)
Figure 3	Irritant Contact Dermatitis	• Itching and redness typically appear immediately after contact (even with first exposure) • Severity related to duration & amount of exposure • Never extends beyond contact area	Same as allergic contact dermatitis	• Barrier cream [zinc oxide] • Moisturizer • Topical steroids	Avoid or minimize irritant exposure (e.g., perspiration from heat or friction)
Figure 4	Negative Pressure Hyperemia	• Negative pressure socket, pain and erythema under prosthesis in a well-circumscribed pattern • Usually a history of limb volume change (i.e., weight gain/loss, edema)	Well-demarcated erythema that is exquisitely tender to palpation	• Stop using prosthesis • Moisturizer	• Correct underlying problems: • Curb weight gain (diet/exercise) • Treat edema • New socket?
Figure 5	Folliculitis	Itching, possibly pain, "pimple" (properly termed pustule)	• Direct visualization of folliculocentric pustule • Typically with erythema	• Decrease heat and friction (remove prosthesis if possible) • Topical or systemic antibiotics	Avoid shaving area (increases incidence)
Figure 6	Abscess	Inflammation with erythema and severe pain	Visualization of erythematous nodule that is exquisitely painful	Incision and drainage absolutely necessary by physician, may also need systemic antibiotics	• Keep area clean • Avoid shaving affected area
Figure 7	Xerosis	Dry skin, may have erythema and/or itching	Dry scaly or flaky skin, may have excoriations or erythema	Moisturizers (over-the-counter)	• Keep area clean • Maintain hydration (systemically and locally)

* Polysporin® is recommended over Neosporin® due to a high incidence of allergic contact dermatitis. Consult your dermatologist for more information.

Figure 4. Negative pressure hyperemia in an above-knee limb

Figure 5. Folliculitis

Figure 6. Infected abscess on a below-knee residual limb

Figure 7. Xerosis