

Dermatologic problems in amputees

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Improvements in surgical techniques and prosthetic devices and the establishment of prosthetic clinics have altered the outlook for the amputee. A cooperative effort on the part of professionals looking after amputee patients, as carried out in these clinics, offers the best means of recognition and treatment of difficulties as they arise.

Until the "bionic man" becomes a reality, amputees will continue to have skin problems. In describing a number of illustrative cases, we have attempted to: (a) renew interest in these problems; (b) demonstrate the value of the group approach; and (c) encourage the participation of interested dermatologists in the prosthetic clinic team to facilitate earlier recognition and treatment of troublesome skin disorders in the amputee.

Les perfectionnements apportés aux techniques chirurgicales d'amputations et à la fabrication des prothèses, ainsi que l'aménagement de consultations externes pour les amputés, ont de beaucoup amélioré le sort de ces derniers. Les différents spécialistes oeuvrant dans ces cliniques fournissent un effort commun dans le dépistage des complications et leur traitement.

Les problèmes cutanés sont toujours à surveiller chez les amputés. Dans ce court exposé, nous voulons donc: (a) renouveler l'intérêt de notre profession dans ces problèmes; (b) mettre de l'emphase sur la technique de groupe; et (c) encourager les dermatologistes à faire partie d'une clinique pour les amputés, afin qu'ils apportent leur contribution au bien-être de ces malades infortunés.

The problems facing the amputee are complex. Loss of a limb necessitates functional, psychologic and socio-economic readjustment by the patient. The rehabilitative process requires the combined efforts of various professionals. The organization of prosthetic clinics for amputees has improved the outlook for these patients.

Various skin complications associated with wearing a prosthesis have long been recognized,^{1,2} but it was not until Levy and others³⁻⁶ reported the first comprehensive studies in the field that

any substantial progress was made. We propose to report the cutaneous diseases encountered at the prosthetic clinic of the Ottawa General Hospital during a 1-year period. We compare the types of lesion seen today with those previously reported, and review some basic principles of amputee stump dermatology.

The prosthetic clinic was held monthly. In attendance were two orthopedic surgeons, a dermatologist, a prosthetist and a physiotherapist. Fifty patients were seen during a 1-year period. Each patient was seen by all members of the group, and photographs were taken of most of the skin lesions. Treatment and follow-up were continued on subsequent visits to the clinic.

Patients

Seventeen of the 50 patients (34%) had dermatologic problems (Table I). There were 16 men and 1 woman, whose ages ranged from 15 to 80 years, the mean being 39 years. Only two patients had upper extremity amputations. Of the 15 lower extremity amputations, 9 were below-knee, 2 were Chopart's amputation and 4 were above-knee. The indication for amputation had been peripheral vascular disease, trauma or neoplasm (listed in order of decreasing frequency). The specific lesions can be classified in three general categories.

Group 1

This group (patient nos. 1 to 12)

comprises lesions attributable to poor prosthetic fit, poor hygienic routine or a combination of the two factors. The commonest lesions were callus formation and skin breakdown with or without ulcerations. A callus is an acquired, circumscribed, slightly elevated area of hyperkeratosis that appears at points of friction or pressure. This is the mildest skin problem seen in amputees and was seen in four patients. In most cases the callus was not bothersome. A painful callosity necessitated prosthetic alteration to relieve pressure over the area. Skin breakdown, with or without ulcer formation, was seen in five patients. This prompted a review of the patient's routine of stump hygiene and a search for pressure points in the prosthesis. Patient no. 3 had developed a pressure ulcer after altering the subliner, which had caused a defect in the prosthesis. Stump edema was present in three patients and was associated most often with a loose-fitting prosthesis.

An interesting variant of stump edema was seen in patient no. 5 (Fig. 1), a man aged 52 years who had had recurrent swelling of both legs since the age of 12 years. In 1970 a diagnosis of Milroy's disease had been made. Skin ulcers developed over the lower anterior aspect of the left leg in 1972 and these did not respond to conservative measures. Excision and skin grafting were planned, but at the time of surgery tumour tissue was noted beneath the ulcerations. The pathologist found this to be fibrosar-

Table I—Dermatologic problems in amputees

Patient	Age (yr)	Sex	Amputation	Lesion
Group 1				
1	37	M	Bilateral Chopart's	Painful callus
2	34	M	Above elbow	Painful stump (keloid)
3	40	F	Below knee	Pressure ulcer
4	27	M	Below knee	Neurotrophic ulcer
5	51	M	Above knee	Lymphedema and intertrigo
6	47	M	Below knee	Callus
7	38	M	Below knee	Pressure ulcer
8	52	M	Above knee	Stump edema with skin breakdown
9	17	M	Below knee	Callus
10	47	M	Below knee	Stump edema with pressure ulcers
11	40	M	Chopart's	Callus
12	47	M	Below knee	Skin breakdown
Group 2				
13	15	M	Above knee	Contact dermatitis
14	31	M	Upper limb	Contact dermatitis
Group 3				
15	80	M	Below knee	Eczéma craquelé
16	38	M	Above knee	Eczematous dermatitis (nonspecific)
17	20	M	Below knee	Verruca of stump

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coma, and the patient underwent above-knee amputation. He had an uncomplicated postoperative course, but definitive prosthetic fitting was delayed owing to the lymphedema. When he was seen in the prosthetic clinic edema had caused fissuring of the incision at the lateral aspect of the stump. When the fissures were spread open, an erythematous component was evident with an accumulation of keratinaceous debris, as seen in intertrigo. The patient was instructed to cleanse and dry the areas within the fissures morning and night, and afterwards to apply one drop of hydrocortisone lotion, 0.5%. This treatment brought about prompt healing.

Group 2

This group consisted of two patients with allergic contact dermatitis. A short case history best illustrates this problem (patient no. 13; Fig. 2).

A 15-year-old boy had undergone mid-thigh amputation of the right leg

for osteogenic sarcoma in 1966. The stump was revised in 1968 owing to the overgrowth of the femur. The patient was fitted with an above-knee prosthesis with a Silesian bandage. Four years later, he presented with a weeping eczematous dermatitis of the stump and waistline. This was diagnosed as a contact dermatitis caused by the prosthesis or suspension apparatus or both. The use of the prosthesis was discontinued and the condition was treated with aluminum subacetate compresses and the application of a fluorinated steroid cream. When the patient was seen 2 weeks later only mild residual hyperpigmentation was present. The suspension belt, which was made of horsehide, was replaced with one made of cowhide, and the patient had no further difficulties. Patch testing was not performed as an integral part of this study, but should certainly be considered as a useful adjunct for arriving at a definitive etiologic diagnosis.

Group 3

There were three miscellaneous lesions. Eczéma craquelé (the disorder of patient no. 15) is a common dermatosis of elderly patients occurring most frequently on the legs during the winter months. It presents as patches of dehydrated skin showing redness and fine fissuring that resembles cracked porcelain. One patient (no. 16) manifested nonspecific eczematous dermatitis of the amputation stump. Both these conditions responded well to applications of hydrocortisone cream. Verruca vulgaris of the stump in one patient (no. 17) was treated successfully with liquid nitrogen.

Discussion

A prosthesis must provide comfort, function and cosmesis. Most important is comfort, for without it the amputee will fail to obtain function or cosmesis, or both, and ultimately will either limit the use of his prosthesis or find it impossible to wear at all.⁹ Despite advances in amputation technique and improvements in prosthetic design and material, some amputees continue to have skin disorders. This is not surprising when one considers the demands a prosthesis exerts on the skin of the stump: (a) the stump is placed in a total contact socket where air circulation is minimal and perspiration is increased and trapped; (b) weight-bearing and contact pressure areas (depending on the type of prosthesis) apply unaccustomed stress to the skin areas concerned; (c) the stump skin supports a larger population of bacteria than the normal limb;¹⁰ and (d) prosthetic materials and products such as cleansers used in their maintenance may have irritant or allergenic potentials.

Moreover, special considerations arise in the case of the geriatric amputee¹¹ and the amputee with impaired circulation. The latter now constitutes 85% of the lower extremity amputee population.¹²

The problems encountered by Levy⁹ basically were due to poor skin hygiene or poor prosthetic fit, or both. Adequate routine hygiene is therefore mandatory for the socket as well as the stump. Soaps containing hexachlorophene are usually adequate and, nightly or on alternate nights, washing the skin and gently patting it dry is sufficient. The socket should be washed with a mild detergent, rinsed and dried carefully with a clean cloth. Any cleaning substance that can leave a residue in the socket should be avoided. The prosthesis should never be put on unless it is completely dry, and the stump sock, if worn, should be changed daily.

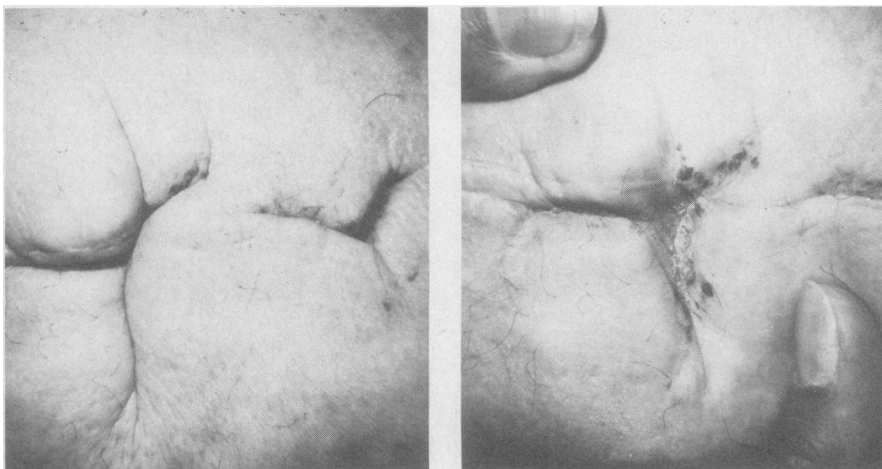


FIG. 1—Stump edema in 52-year-old man. Prosthetic fitting delayed after amputation because of lymphedema, which caused deep fissures around incision (left). Spreading of fissures demonstrated erythematous area, which contained accumulation of keratinaceous debris (right).

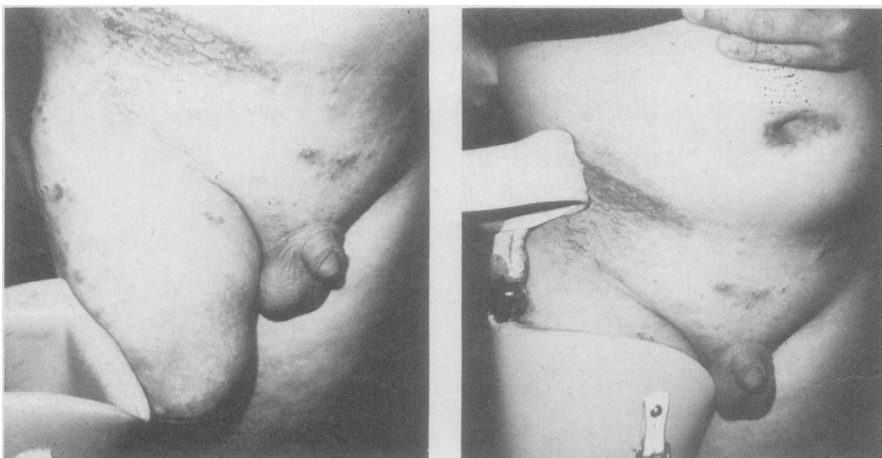


FIG. 2—Allergic contact dermatitis of stump and waistline caused by above-knee prosthesis and suspension belt.

Problems caused by poor skin hygiene

Bacterial and fungal infections: These are prone to occur in amputees because perspiration and friction lead to maceration of the stump skin, predisposing to invasion by organisms. The process usually begins as a folliculitis, more commonly in patients with hairy and oily skin, and is worse in the summer, when perspiration is maximal.⁶ Folliculitis has been cited as the commonest cause of an amputee's absence from work.¹⁰ Fungal infections, once established, may be difficult to eradicate because of the reasons cited above. We did not encounter either of these conditions in the groups of patients studied, either because of the small number concerned or the fact that most of our patients followed a reasonable routine of hygiene.

Nonspecific eczematization: This condition appears as a weeping, itching, nonhealing area of dermatitis over the distal portion of the stump,⁵ the cause of which may be difficult to discover. It responds to topical corticosteroid therapy but recurrences are frequent.

Intertriginous dermatitis: This is likely to develop at the end of the stump if there is infolding of skin. Friction produced by movement of the two constantly opposed skin surfaces removes the outer layer of keratin. Poor stump hygiene will allow this disorder to progress, and a chronic condition, with fissuring of the skin and secondary infection, will ensue. In most cases this disorder will respond to careful local hygiene with particular attention to keeping the area dry, and application of a mild hydrocortisone preparation, 0.5% to 1.0%.

Epidermoid cysts: These are characteristically found near the upper end of the prosthesis along the inguinal folds and the skin of the outer thigh. Various theories as to their origin have been put forward. Some investigators believe that they represent sebaceous adenomata.¹⁰ They appear to be more common in the patients with above-knee amputations, possibly because of the torque produced by the normal gait,¹³ which may force surface keratin and epidermis inward so that it is trapped in the dermis. As a result, a foreign body reaction takes place and eventually a cyst is formed. The cyst may become enlarged, tender and infected, when it will drain. Treatment usually consists of antibiotics and the application of compresses in the acute stage, followed by surgical removal of the entire cyst, if warranted. No such cyst was seen in this group of patients, perhaps reflecting a decreased frequency of this lesion compared with 20 years ago, but more likely because the pa-

tients studied were younger and had been wearing their prostheses for a relatively short period.

Problems caused by poor prosthetic fit

Stump edema: This is almost always present during the early phase of prosthetic use. This edema is usually mild and disappears once the stump has matured. Occasionally it may persist and increase, leading to pigmentation and superficial erosion and ulceration of the distal skin of the stump. In most cases these changes occur because the socket has become loose-fitting distally due to stump shrinkage or loss of weight by the patient.

Pressure areas: Small calluses are the first manifestation of pressure points. When seen, a search should be made inside the prosthesis directed to the point overlying the callus, and an alteration in the prosthesis is called for. The callus may be pared down if it causes discomfort. Superficial erosions take a long time to heal and cause prolonged morbidity. To ensure good prosthetic fit, an amputee should maintain his weight within 2.3 kg above or below his fitting weight.¹³

Verrucous hyperplasia: Rarely stump edema may develop into a condition known as verrucous hyperplasia,^{3,4,6,13} in which many darkly pigmented hyperkeratotic lesions appear on the distal surface of the stump. This disorder is not due to the virus that causes verruca vulgaris, but is a hyperplastic reaction possibly due to stasis and edema plus infection.³ When the condition was first described, it was most commonly associated with the lack of distal contact of the stump with the prosthesis. Treatment at that time consisted of control of the infection, if present, and the provision of counterpressure at the distal end of the stump. We did not encounter any cases of verrucous hyperplasia in the patients we studied, and we believe that this disorder is less common now owing to increased use of total-contact prosthetic sockets. Recently, we have seen what may be an early form of this disorder in a patient with a below-knee prosthesis that had not been changed for nearly 3 years, and there was loss of distal contact between the stump and the socket.

Contact dermatitis may be due to materials in the prosthesis itself, or to materials in the straps or attachments, that produce an allergic reaction in a patient previously sensitized. This usually presents as an erythematous, weeping, painful eruption. Symptomatic therapy with compresses and steroid creams should be given and a thorough search made for a possible contactant; investigation should ideally include well controlled patch testing. The def-

initive treatment is still the removal of the offending, sensitizing agent. In this situation help from a prosthetist is invaluable.

References

1. SCHAMBERG IL: Dermatitis of lower limb amputation stumps. *JAMA* 150: 1653, 1952
2. CONN HR: Amputation stumps of lower extremities: the causes and treatment of prolonged disability. *Surg Gynecol Obstet* 43: 524, 1926
3. LEVY SW: The skin problems of the lower-extremity amputee. *Artif Limbs* 3: 20, 1956
4. LEVY SW, ALLENDE MD, BARNES GH: Skin problems in the leg amputee. *Arch Dermatol* 85: 65, 1962
5. BARNES GH: Skin health and stump hygiene. *Artif Limbs* 3: 4, 1956
6. LEVY SW, BARNES GH: Verrucous hyperplasia of amputation stump. *Arch Dermatol* 74: 448, 1956
7. ALLENDE MF, BARNES GH, LEVY SW, et al: The bacterial flora of the skin of amputation stumps. *J Invest Dermatol* 36: 165, 1961
8. INMAN VT, BARNES GH, LEVY SW, et al: Medical problems of amputees. *Calif Med* 94: 132, 1961
9. MITCHELL CL: Lessons in lesions. *Artif Limbs* 3: 1, 1956
10. SLOCUM DB: *An Atlas of Amputations*, St. Louis, Mosby, 1949, pp 254-88
11. HAMILTON EA, NICHOLS PJR: Rehabilitation of the elderly lower-limb amputee. *Br Med J* 2: 95, 1972
12. JAMES U: Unilateral above-knee amputees. *Scand J Rehabil Med* 5: 23, 1973
13. THOMPSON RG: Complications of lower extremity amputations. *Orthop Clin North Am* 3: 323, 1972

BOOKS

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SEIZING OUR BODIES. The Politics of Women's Health. Edited by Claudia Dreifus. 321 pp. Random House, New York, 1977. \$4.95, paperbound. ISBN 0-394-72360-0

SURGERY OF THE PANCREAS: a Text and Atlas. Edited by Avram M. Cooperman and Stanley O. Hoerr. 257 pp. 111. The C.V. Mosby Company, Saint Louis, 1978. \$48.25. ISBN 0-8016-1032-X

SYMPOSIUM ON OCULAR THERAPY. Vol. 10. Under the auspices of the American Academy of Ophthalmology and Otolaryngology and the Association for Research in Vision and Ophthalmology. Edited by Irving H. Leopold and Robert P. Burns. 123 pp. 111. John Wiley & Sons, Inc., Somerset, 1977. \$14. ISBN 0-471-03306-6.

THROMBOEMBOLISM. A New Approach to Therapy. Proceedings of a Symposium Organized by Geigy Pharmaceuticals. Edited by J.R.A. Mitchell and J.G. Domenet. 200 pp. 111. Academic Press Inc. (London) Ltd., London, 1977. \$11. ISBN 0-12-500050-2

TOWARD AN EDUCATED HEALTH CONSUMER: Mass Communication and Quality in Medical Care. Carter L. Marshall, A Report of Conferences Sponsored by the John E. Fogarty International Center for Advanced Study in the Health Sciences, National Institutes of Health, U.S. Department of Health, Education, and Welfare, Bethesda, 1977. Price not stated. DHEW publ. no. (NIH) 77-881

TRACHEOSTOMY AND ARTIFICIAL VENTILATION IN THE TREATMENT OF RESPIRATORY FAILURE. 3rd ed. Edited by Stanley A. Feldman and Brian E. Crawley. 212 pp. 111. Edward Arnold (Publishers) Ltd., London; The Macmillan Company of Canada Limited, Toronto, 1977. \$33.50, clothbound; \$16.50, paperbound. ISBN 0-7131-4288-X, clothbound; ISBN 0-7131-4289-8, paperbound

WAREHOUSES FOR DEATH. The Nursing Home Industry. Daniel Jay Baum. 191 pp. 111. Burns & MacEachern Ltd., Don Mills, 1977. \$4.95, paperbound. ISBN 0-88768-072-0

WOMEN IN MEDICINE. A Bibliography of the Literature on Women Physicians. Compiled and edited by Sandra L. Chaff, Ruth Haimbach, Carol Fenichel, and others. 1124 pp. The Scarecrow Press, Inc., Metuchen, NJ, 1977. \$35. ISBN 0-8108-1056-5

THE YEAR BOOK OF CANCER. 1977. Compiled and edited by Randolph Lee Clark and Russell W. Cumley. 493 pp. 111. Year Book Medical Publishers, Inc., Chicago, 1977. Price not stated. ISBN 0-8151-1785-X