



HHS Public Access

Author manuscript

Arch Dermatol. Author manuscript; available in PMC 2015 May 13.

Published in final edited form as:

Arch Dermatol. 2012 November ; 148(11): 1283–1286. doi:10.1001/archdermatol.2012.3004.

High Prevalence of Stump Dermatoses 38 Years or More After Amputation

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Abstract

Objective—To highlight the prevalence and impact of skin disease at the stump site in patients who have undergone amputation.

Design—A cross-sectional health questionnaire of Vietnam War veterans with stump dermatoses at least 38 years after major limb amputation.

Setting—A research registry of veterans with combat-related amputations who agreed to participate.

Participants—Recruitment began January 1, 2006, and ended December 31, 2009, with a registry of 416 veterans.

Main Outcome Measures—Results of a self-reported 35-item questionnaire. Participants were later contacted by telephone or asked to complete a Web survey.

Results—Of the 247 veterans, 119 (48.2%) reported at least 1 skin problem within the preceding year. The most common were skin breakdown (25.2%), rash (21.8%), and abrasion (21.0%). In addition, 25.2% experienced skin problems more than 50% of the time, and 37.1% had to alter or

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Conflict of Interest Disclosures: None reported.

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Author Contribution: Drs Foote and Meyerle had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Yang, Garza, and Meyerle. *Analysis and interpretation of data:* Yang, Foote, Kang, and Meyerle. *Drafting of the manuscript:* Yang, Foote, and Meyerle. *Critical revision of the manuscript for important intellectual content:* Yang, Garza, Kang, and Meyerle. *Statistical analysis:* Yang, Foote, and Meyerle. *Administrative, technical, and material support:* Yang, Garza, Kang, and Meyerle. *Study supervision:* Kang and Meyerle.

Additional Contributions: The Indiana-Ohio Center for Traumatic Amputation Rehabilitation Research and its codirectors Mark Sothmann, PhD, and Stephen Wilson, PhD, supported conduct of this research under terms of grant W81XWH-09-1-0375.

replace their prosthesis. Stump dermatoses limited or prevented prosthesis use in the preceding year for 55.6% and caused pain or discomfort at the stump site in 61.5%.

Conclusions—More than 38 years after major limb amputation, skin complications at the stump site continue to cause significant morbidities and contribute to prosthesis abandonment. The high prevalence of stump dermatoses stresses the importance of disease prevention, early management, and advanced treatment of skin disease.

Two million patients who have undergone amputation reside in the United States alone, with more than 130 000 new amputations occurring each year.^{1,2} Despite the high number of individuals living with amputations (hereinafter referred to as amputees), the skin conditions they experience are underappreciated. For this reason, specific skin questions were included in the Indiana-Ohio Center for Traumatic Amputation Rehabilitation Research health survey of Vietnam War veterans to assess skin disease at the stump site at least 38 years after major limb amputations.

Amputations are performed owing to disease (eg, diabetes mellitus, peripheral vascular disease, and cancer), traumatic injury (eg, combat and motor vehicle accidents), congenital limb deformities, and anomalies of residual limbs.^{3–5} During the past 10 years, the wars in Iraq and Afghanistan have resulted in a significant number of veterans living with amputations, demonstrating that amputees are often one of the most visible symbols of war. According to US Military Casualty Statistics through April 2010, 987 Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) veteran amputees had undergone a total of 1230 limb amputations. Of these, 233 veterans (23.6%) underwent multiple limb amputations, 10 had 3-limb involvement, and 2 had all 4 limbs amputated.⁶ In comparison, current estimates place the number of Vietnam War veterans living with amputations at 2500.⁷

Amputations present daunting psychological, social, functional, and financial challenges to patients and their communities. In addition to these challenges, prosthesis use is often complicated by recurring stump site dermatoses with a prevalence rate ranging from 34% to 74% (Table 1) that often prevent the regular use of the prosthesis and even lead to prosthesis abandonment.

Skin dermatoses at the stump site represent a broad spectrum of clinical skin disease that is often challenging to treat. Given the high incidence of skin dermatoses at the stump, the Indiana-Ohio Center for Traumatic Amputation Rehabilitation Research included specific questions in their amputee health assessment questionnaire to address skin conditions in their Vietnam War veteran cohort. We herein discuss these findings in the context of published literature regarding stump dermatoses.

METHODS

The Indiana-Ohio Center for Traumatic Amputation Rehabilitation Research conducted a retrospective health assessment survey of Vietnam War veterans 38 years or longer after undergoing amputation. The study consisted of the following 2 parts: the creation of a research registry and administration of the survey. The research registry database included

Vietnam War veterans with combat-related amputations who agreed to participate in studies conducted by the Center. Invitations to join the registry were shared through various veteran service organizations and meetings to maximize recruitment. The veterans could enroll online or by mail. When enrolling, they were asked to complete a brief self-reported 35-item questionnaire that captured demographic and health-related data, including the veterans' age at amputation, time since the amputation, and the nature of their amputations. Recruitment began January 1, 2006, and ended December 31, 2009, with a registry of 416 Vietnam War veterans who sustained major combat-related limb loss (we excluded 37 cases who did not report the type of limb loss or who reported only missing fingers or toes).

The survey questionnaire included 159 items designed to document the long-term health and psychosocial issues associated with combat-related amputations. Sociodemographics, including age and race, were collected. Health-related questions centered on the veterans' experiences in the previous 12 months. Among these questions, 8 items assessed the dermatological and prosthesis-related issues associated with traumatic amputation in the past year.

First and second, the veterans were asked if they had experienced skin breakdown or a skin rash at the stump site, followed by an open-ended question that asked the veterans to describe the broken skin or skin rash at their stump site. Third, they were asked how often they had experienced any skin problems at their stump site, with responses of rarely (<10% of the time), sometimes (10%–50% of the time), often (>50% of the time), and always. The fourth and fifth questions asked if skin problems at the stump site limited or prevented the use of the prosthesis and, if so, how many days they had not been able to wear their prosthesis in the past year owing to skin problems. The final 3 questions asked whether they ever had to alter or to replace their prosthesis because of skin problems, whether skin problems at their stump site ever caused them pain or discomfort, and, if so, the number of days they had experienced pain or discomfort at their stump site due to skin problems.

After approval by the Indiana University institutional review board, the survey instrument was pretested by the Indiana University Survey Research Center. Survey research center staff began telephone interviews in November 2009. Anyone in the registry who was not interviewed by telephone was sent an e-mail invitation to complete the same questionnaire online. The Web survey began December 1, 2009, and ended February 28, 2010. Nonrespondents to the Web survey were mailed a paper version of the questionnaire. In all, every registry participant was contacted through at least 1 of the 3 modes of administration.

RESULTS

Of the 416 men in the Indiana-Ohio Center for Traumatic Amputation Rehabilitation Research Vietnam War veteran registry, 247 completed the survey for a 59.3% response rate. Results of χ^2 analysis showed no statistical differences between the responders and nonresponders on a variety of health, amputation level, and demographic characteristics. The average (SD) age of the 247 Vietnam War veterans was 62 (3) years. The average (SD) time since war-related amputation was 38 (3) years. All of the subjects were men and nearly

all (n = 227 [91.9%]) were white. The most common level of amputation was the unilateral lower limb (n = 153 [61.9%]) and bilateral lower extremity loss (n = 54 [21.9%]).

Table 2 shows that nearly half of the 247 Vietnam War veteran respondents who participated in the survey (n = 119 [48.2%]) reported experiencing skin breakdown or rash in the preceding year. A quarter of these veterans experienced such problems more than 50% of the time (n = 30 [25.2%]) or all of the time (n = 7 [5.9%]) in the preceding year. When asked to describe the nature of the problems, the veterans described a wide array of skin complications. For example, they described staphylococcus infection and sores, recurrent cyst, blisters at the end of the stump, broken skin, an abrasion, skin infection requiring a stump revision, sore spots and small boils, constant discoloration, crusty wartlike areas, skin rash, breaking open of the closure scar, calluses that break off and bleed, skin irritation, raw skin that causes pain, hemorrhagic blister, rawness, boil type bumps, bone against skin sore, and pressure sores. Among these complications, the most common were skin breakdown, scars, and wounds (n = 30 [25.2%]); rash (n = 26 [21.8%]); and abrasion or “rubbing off” of the skin (n = 25 [21.0%]).

Some of the 119 veterans who reported skin problems also added an explanation for the cause of the problem (n = 67 [56.3%]). More than half of these 67 men (n = 46 [68.7%]) attributed the cause of their skin problems to use of their prosthesis. A small percentage of veterans attributed their skin problems to problems associated with heat (n = 12 [17.9%]), stump/bone complications (n = 5 [7.5%]), and complications from their initial or subsequent limb loss related surgeries (n = 4 [6.0%]).

Of those reporting skin problems, more than half (n = 64 [55.6%]) reported that skin problems at their stump site limited or prevented use of their prosthesis for an average of 28 days in the preceding year. Nearly half of those veterans (n = 43 [37.1%]) also had to alter or replace their prosthesis because of skin problems during that time. Finally, 150 of 244 respondents (61.5%) reported pain and discomfort at the stump site due to a skin problem, thus affecting their quality of life for more than 2 months (average, 79 days) during the preceding year.

COMMENT

During the last decade, multiple studies have reported a high prevalence rate of stump dermatoses ranging from 34% to 74% and a rate of 48% in the most recent Vietnam War veteran study.^{4,5,8-10} The prevalence rate of stump dermatoses that we report in Vietnam War veterans (48.2%) is consistent with that found in the published literature. However, our study is unique because the veterans underwent assessment at least 38 years after major limb amputation. Our results show definitively that stump dermatoses are a long-term problem in amputees.

The spread of the prevalence rate data from the different studies may be explained by the different study methods, variables, and data sources. For example, the higher prevalence rate (74%) found by Koc et al⁵ may be due to the more inclusive nature of a descriptive study, which incorporates even minor types of dermatoses. A higher percentage of the Vietnam War veterans in our study reported pain due to a skin problem (61.5%) compared with

specific skin breakdown or rash (48.2%), which demonstrates how more general sampling and questions can lead to increased reporting. The use of clinical notes by Dudek et al⁴ may have contributed to the lower reported prevalence rate of dermatoses (41%), because this form of data collection relies on reporting by a physician or caregiver, and skin diseases may not have been recorded in the clinical note. Despite these variations between studies, even with the modern advancements in prosthesis and medical technology, stump dermatoses still affect about half of amputees.

A possible contributing factor in the continuing high incidence of stump dermatoses may be the more aggressive and regular use of the prosthesis by the amputees as a result of improved prosthesis technology. Nearly all of the 67 survey respondents who provided an explanation of their skin problems in the open-ended question attributed these problems to the use of the prosthesis.

Unfortunately, current medical technology has not resolved the challenges of customization, fit, and comfort of the prosthesis for the amputee as noted in the report from the US Army Dismounted Complex Blast Injury Task Force.⁹ These challenges resulted in OIF/OEF veteran amputees' reporting high rates of dissatisfaction and even abandonment of their prosthesis. More than half of OIF/ OEF veteran amputees have reported stump skin complications. Unfortunately, many of these recent veterans from the wars in Iraq and Afghanistan will continue to experience stump dermatoses, given that as many as 48% of the Vietnam War veteran population in this study have skin disease at the stump site at least 38 years after major limb amputation.

The finding in this study that Vietnam War veteran amputees continue to struggle with the frequent recurrence of stump dermatoses demonstrates that there is limited natural adaptation of the stump skin to the prosthesis over time. Stump dermatoses will be a lifelong health problem and financial burden for an amputee if more permanent interventions are not found.

Current clinical studies indicate that frictional and mechanical trauma to the stump skin by the prosthesis is believed to cause most of the stump dermatoses.^{4,10} The treatments for many dermatoses such as the use of antibiotics for superinfection, emollients and topical corticosteroids for contact dermatitis, and even surgery for epidermal inclusion cysts merely alleviate these dermatoses. No therapy addresses the root cause of the inability of stump skin to withstand the mechanical and frictional forces generated by the prosthesis and the socket-limb interaction. More research is needed to develop interventions to prevent stump dermatoses from occurring altogether. Such interventions are critically needed to greatly reduce the psychological, social, and functional challenges, and financial costs associated with the maintenance and treatment of stump dermatoses and improve the quality of life for all amputees who use a prosthetic device.

Acknowledgments

Funding/Support: This study was supported by grant W81XWH-09-1-0375 from the US Department of Defense, Defense Advanced Research Projects Agency (Dr Garza), and by grant 1K08AR055666-01A1 from the National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health (Dr Garza).

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Table 1

Prevalence of Skin Dermatoses at Stump Site in Amputees

Source	Type of Study	Dermatoses Prevalence, %	Location of Study
Lyon et al, ³ 2000	Questionnaire	34	United Kingdom
Dudek et al, ⁴ 2005	Retrospective medical record review	41	Canada
Meulenbelt et al, ⁸ 2007	Literature review	63	The Netherlands
Koc et al, ⁵ 2008	Questionnaire and retrospective medical record review	74	Turkey
Dismounted Complex Blast Injury Task Force, ⁹ 2011	Questionnaire	58	United States

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Table 2

Reported Prevalence of Stump Dermatoses in the Past Year in 247 Vietnam War Veterans

Incidents	No. Responding/ No. Reporting Problem (%)
Skin breakdown or rash	119/247 (48.2)
How often experienced any skin problems at stump site	
Rarely (<10% of the time)	27/119 (22.7)
Sometimes (10%–50% of the time)	55/119 (46.2)
Often (>50% of the time)	30/119 (25.2)
Always	7/119 (5.9)
Descriptions of breakdown or rash ^a	
Skin breakdown, scars, wounds	30/119 (25.2)
Rash	26/119 (21.8)
Skin abrasion	25/119 (21.0)
Other (eg, blisters, sores, infection) ^b	81/119 (68.1)
Descriptions of cause of problems	
Prosthesis	46/67 (68.7)
Heat-related	12/67 (17.9)
Stump/bone complications	5/67 (7.5)
Subsequent related operations	4/67 (6.0)
Skin problems limited or prevented prosthesis use ^c	64/115 (55.6)
Ever altered or replaced prosthesis due to skin problems	43/116 (37.1)
Pain or discomfort ^d	150/244 (61.5)

^a Some veterans described more than 1 condition so the total number exceeds 119.

^b Includes 13 different skin complications.

^c Experienced by these patients a mean of 28 days.

^d Experienced by these patients a mean of 79 days.