DERMATOLOGICA SINICA 32 (2014) 133–136

Contents lists available at ScienceDirect

Dermatologica Sinica

journal homepage: http://www.derm-sinica.com

ORIGINAL ARTICLE

# Dermatological conditions in patients with brain damage

Joon Lee, Sang-Hyeon Hwang, Ji-Hye Park, Won-Serk Kim*

*Department of Dermatology, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, South Korea*

ARTICLE INFO

*Article history:*
Received: Jan 18, 2013
Revised: Nov 25, 2013
Accepted: Dec 2, 2013

*Keywords:*
brain damage
coma
inpatient consultations
skin disorders

ABSTRACT

*Background:* As a result of the focus on vital functions in patients with brain damage, dermatological symptoms are often overlooked during their period of admission to hospital. However, patients with brain damage are more likely to have dermatological diseases than the general population and other inpatients for various reasons, including immobilization, treatment with multiple drugs, long-term hospitalization, and their immunocompromised status.

*Objectives:* The purposes of this study were: (1) to analyze the frequency and characteristics of dermatological consultations among patients who were admitted to hospital as a result of brain damage; and (2) to compare these findings with other reports about inpatient dermatological consultations.

*Methods:* We analyzed data for 240 patients with brain damage who attended our department of dermatology between January 1, 2007 and December 31, 2011. The total numbers of male and female patients were 132 (55%) and 108 (45%), respectively (male to female ratio 1.22:1). We retrospectively reviewed medical records, demographic information, reason for dermatological consultation, and the diagnosis of the dermatoses.

*Results:* The age group most frequently seen was patients in the 7$^{th}$ decade of life and the most common underlying brain injury was traumatic intracranial hemorrhage. The mean ± standard deviation score on the Glasgow Coma Scale (GCS) was 6.8 ± 3.0. When the levels of brain damage of the patients were classified using the GCS, 68.3% of the patients were in the severe (GCS ≤ 8) category. The most common skin disorders were seborrheic dermatitis (17.9%), followed by mycoses (15.5%), and drug-induced skin eruption (13.2%).

*Conclusion:* The characteristics of dermatological consultations in patients with brain damage may be different from those of other inpatients attending dermatological clinics. The analysis of dermatological disorders in patients with brain damage can assist in understanding the "brain–skin connection".



## Introduction

Although the practice of dermatology has recently become a predominantly outpatient-based specialty, there continues to be a need for dermatological expertise within hospitals, where patients have a wider spectrum of severe and serious dermatological disorders associated with significant morbidity.[1,2] Many patients who are admitted to hospital for various nondermatological diseases often have underlying skin disease, whereas others develop acute dermatological problems during their stay in hospital. These general illnesses contribute to developing and worsening the primary dermatological diseases; the management of an underlying disease can also cause dermatological disease.

Patients with brain damage due to various causes, such as intracranial hemorrhage, hypoxia, metabolic disease, infection, or tumor, may have many dermatological problems, but these are often overlooked during their stay in hospital because of many other complicated medical problems. However, it is still important for doctors to have a consultation with patients with brain damage regarding their skin problems. Such patients are especially vulnerable to drug-induced skin eruptions or infections due to the administration of many different drugs and exposure to immunocompromised conditions including underlying disease and long term steroid use.

Several recent studies have independently shown that our skin is an unexpectedly prominent target organ for numerous neuroendocrine, neurotrophic, neurotransmitter, and neuropeptide signals, which have a profound effect on skin biology in health and disease.[3] The aim of this study was to characterize the profiles of patients with brain damage and the scope and referral pattern of

Conflicts of interest: The authors declare that they have no financial or non-financial conflicts of interest related to the subject matter or materials discussed in this article.

* Corresponding author. Department of Dermatology, Kangbuk Samsung Hospital, 108, Pyeong-Dong, Jongno-Ku, Seoul 110-746, South Korea.
*E-mail address:* susini@naver.com (W.-S. Kim).

1027-8117/$ – see front matter Copyright © 2013, Taiwanese Dermatological Association. Published by Elsevier Taiwan LLC. All rights reserved.
http://dx.doi.org/10.1016/j.dsi.2013.11.003

dermatology consultations in a tertiary hospital, which has not previously been well studied.

## Patients and methods

All consultations with patients in hospital were referred to the Department of Dermatology, Kangbuk Samsung Hospital, Sungkyunkwan University School of Medicine, Seoul, Korea, between 1 January, 2007 and 31 December, 2011. The data were collected retrospectively from the admission and daily progression notes provided by the attending doctor and the consultation notes made by the dermatological consultant. Final diagnoses were classified according to the English version of the International Statistical Classification of Diseases and Related Health Problems (ICD-10).[4] Only the dermatological disorder responsible for the consultation was recorded. During weekdays, each request was allocated to one of three different dermatology consultants, assisted by a 3rd-year dermatology resident. A potassium hydroxide smear test from skin scrapings, swabs for bacterial culture, and biopsy samples were taken as appropriate by the dermatologist to reach a definitive diagnosis. The severity of brain damage was classified into three groups (severe, moderate, and mild) based on the Glasgow Coma Scale (GCS) and these scores were evaluated by the attending doctors.

All statistical analyses were performed using SPSS 12.0 (SPSS Inc., Chicago, IL, USA). Absolute and relative frequencies were analyzed for all data. Continuous variables, such as age, were expressed as mean values with standard deviations. The difference in the prevalence of skin disease according to the GCS score was evaluated by the Chi-square test. In all instances, $p < 0.05$ was considered significant.

## Results

During the 5-year study period, 240 patients who presented with altered consciousness due to brain damage were referred to the dermatologists. We diagnosed 341 dermatological diseases, performed 45 skin biopsies, 11 bacterial cultures, 67 potassium hydroxide smear tests, and 13 dermatological procedures of various kinds (cryotherapy, intralesional injection, and wet dressing). Ninety-five patients (39.6%) were seen twice by a dermatologist for different dermatological symptoms. The most frequent age group was the patient's 7th decade of life (25.3%) and the next most frequent was the 6th decade (19.5%) (Table 1).

The most frequent cause of brain damage was traumatic intracranial hemorrhage (50.4%), followed by spontaneous intracranial hemorrhage (28.7%), hypoxia (10.4%), metabolic disease (4.6%), infectious disease (2.9%), and brain tumors (2.6%) (Table 2). The most frequent diagnosis was seborrheic dermatitis (ICD-10:L21; 17.9%), mycoses (ICD-10:B35～37; 15.5%), drug-induced skin eruption (ICD-10:L27.0, 27.1; 13.2%), xerosis cutis (ICD-10:L85.3; 9.1%), irritant contact dermatitis (ICD-10:L24; 5.3%), and pruritus (ICD-10:L29; 4.4%) (Table 3). It took a mean of 39.4 days for seborrheic dermatitis to become symptomatic and for the patient to be seen by a dermatologist after initial brain damage, 31.4 days for mycoses, 15.0 days for drug-induced skin eruption, and 47.1 days for xerosis cutis.

**Table 1** Demographic data of 240 patients (age, sex).

| Age (y) | Men ($n = 132$) | Women ($n = 108$) | Total, $n$ (%) ($n = 240$) |
|---|---|---|---|
| <30 | 4 | 5 | 9 (3.7) |
| 30–39 | 10 | 10 | 20 (8.3) |
| 40–49 | 18 | 18 | 36 (15) |
| 50–59 | 29 | 18 | 47 (19.5) |
| 60–69 | 36 | 25 | 61 (25.3) |
| 70–79 | 25 | 21 | 46 (19.2) |
| ≥80 | 10 | 11 | 21 (9) |

**Table 2** Causes of brain damage in patients referred to a dermatologist.

| Cause of brain damage | Patients, $n$ (%) | Mean GCS score |
|---|---|---|
| Intracranial hemorrhage | | |
| Traumatic intracranial hemorrhage | 121 (50.4) | 5.0 |
| Spontaneous intracranial hemorrhage | 69 (28.7) | 7.7 |
| Hypoxia | 25 (10.4) | 9.3 |
| Metabolic disease | 11 (4.6) | 9.8 |
| Brain tumor | 6 (2.5) | 10.6 |
| Infectious disease | 7 (2.9) | 8.6 |
| Total | 240 | 6.8[a] |

GCS = Glasgow Coma Scale.
[a] Average score of all patients.

Based on the level of brain damage using the GCS, 68.3% of patients were at the severe ($GCS \leq 8$) level (Table 4). The most common dermatological diseases in the severe group were mycoses (24.9%), seborrheic dermatitis (20.6%), and drug-induced skin eruption (18%). For the 25.5% of patients in the moderate ($9 \leq GCS \leq 12$) group, the common diseases were seborrheic dermatitis (20.6%), pruritus (13.8%), and drug-induced skin eruption (12.6%). For the 6.2% of patients in the mild ($GCS \geq 13$) group, the common diseases were seborrheic dermatitis (28.6%), pruritus (14.3%), and herpes simplex (14.3%). The incidence of mycoses is statistically significantly higher in the severe group ($p < 0.01$).

## Discussion

The dermatological diseases of patients with brain damage are often overlooked during their period of admission to hospital because of many other complicated medical problems. Patients with brain damage have difficulty in describing their symptoms because of an alteration in consciousness, and this tends to delay diagnosis. However, we should also consider the fact that the opportunity to develop dermatological problems is relatively high in patients with brain damage. Decreased movement, altered immunity, and long-term stays in hospital provide suitable conditions for the growth of microorganisms, and treatment with antibiotics or aromatic anticonvulsant drugs (e.g. carbamazepine, phenytoin, phenobarbital, primidone, and oxcarbazepine) can cause severe adverse drug reactions. In particular, a recent study has shown that the central nervous system and the skin are connected by various mechanisms.[3] The fact that the skin and nervous system develop from the same embryological origin, share common molecular syntax, and communally utilize the immune system to provide signals and regulation, is generally acknowledged.[3,5] The central nervous system is directly or indirectly connected to the functioning of skin.[5] The direct connection is via efferent nerves or mediators derived from the central nervous system, and the indirect connection is via the adrenal glands or immune cells.[5] We thus speculate that damage of the central nervous system can contribute to the development of dermatological diseases.

In our study, 68.3% of the patients who were seen by a dermatologist had a severe alteration of consciousness. We believe that dermatological disease is likely to occur when a patient's brain damage is severe. The severe brain damage can cause immobilization. In addition, the patients with more severe brain damage tend to be treated with a larger number of drugs, such as anticonvulsant drugs, antibiotics, and diuretics.

The most frequent diagnosis was seborrheic dermatitis in 17.9% of the patients. Previous reports for a diagnosis of seborrheic dermatitis ranged from 3.1% to 5.2% of patients referred to a dermatologist.[2,6] It has long been recognized that patients with Parkinson's disease and mood disorder who have been treated with neuroleptic drugs often develop seborrheic dermatitis.[7] The