

Examination of skin irritation factors using three types of adhesive plasters for the elderly

高齢者を対象とした3種絆創膏による
皮膚刺激要因の検討

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Abstract

The present study compared three most frequently used adhesive plasters for the elderly in clinical settings. Three types of general-purpose adhesive plasters were used for 6 and 24 hours experimentally to examine their functions and the skin irritation level. The results clarified a kind of adhesive plaster that maintains fixation and causes low level skin irritation.

抄録

本研究では、臨床において使用頻度の高い3種の絆創膏を取り上げ、高齢者皮膚に優しい絆創膏を明らかにするために、絆創膏の機能と皮膚刺激について比較検討を行った。汎用3種の絆創膏を用い、6時間、24時間の貼付実験を行い、3種絆創膏の機能と皮膚刺激状態を明らかにした。結果、固定性は保たれながらも、皮膚への刺激が低い絆創膏が明らかとなった。

Key Words: adhesive plaster, skin irritation factors, elderly

キーワード：絆創膏、皮膚刺激要因、高齢者

1. Introduction

Since the aged person's skin is vulnerable, it can easily lead to irritation. Adhesive plasters are by far the most frequently used item for skin and therefore can become a cause of skin irritation. However, not enough research has been conducted on this topic. Thus, it is worthwhile to examine adhesive plasters which are aged-person-friendly while still maintaining such basic functions as fixation and adhesiveness.

2. Purpose

In order to determine what constitutes an aged-person-friendly adhesive plaster, functions and skin irritation were compared among the three most frequently used adhesive plasters in clinical settings.

3. Methodology

3.1. Method

Three types of general-purpose adhesive plasters were used experimentally for 6 and 24 hours to examine their

functions and skin irritation level.

3.2. Term definitions

The functions of the adhesive plaster include both basic and added functions. The basic functions refer to fixation while the added functions refer to low skin irritation, which means a low amount of stripped stratum corneum and no flare.

3.3. Subjects

The subjects were 62 elderly persons aged 65 or over. Their average age was 79.4±8.2 years. They were not to have any skin diseases including flare, blisters or infections on the adhesive plastered area (upper arm).

3.4. Evaluation contents and the method

3.4.1. Evaluation contents

Three types of adhesive plasters (A, B, and C) were pasted on the inner upper arm after it was cleaned and wiped with a warm wet towel. After 6 and 24 hours, the resiliency, moisture and oil content level were measured. Considering

the abruption effects after pasting, measurements were taken after 15 minutes had elapsed. Furthermore, in order to assure the consistency of the implementation techniques, the measurements were taken by the same experimenter for 3 times and their mean was calculated.

3.4.2. Measurement method and equipment used

The skin condition was examined by using the MORITEX Triple Sense[®], measuring the resiliency, moisture and oil content level. The Triple Sense[®] indicates the resiliency with the ultra-sound vibration method, the moisture with the static electric capacity method, and the oil level with the optometric method, all in a 99-digit format. Measurements can be taken easily by contacting the skin surface, which minimizes invasion to the body. However, measurement and other errors may be caused unless the measurement surface has concavity and convexity and the skin contact be made with a 90-degree angle. Thus, the experimenter practiced how to make a contact with the skin surface for a number of times in order to prevent errors and master the measurement techniques.

As fixation and flare measurements were made subjectively, a 4-level interval scale was used.

The condition of stripped stratum corneum was examined by using a microscope in order to calculate the amount of stripped stratum corneum. First, the adhesive surface was dyed after being stripped(See Figure 1). The dyeing solutions were Gentian Violet (1.0%), Brilliant Green (0.5%), and purified water (98.5%). After the pigmentation, the adhesive surface was cleansed with sufficient water, dried in a room temperature, observed and taken pictures of using a microscope (magnifying power of 100, KEYENCE VH-Z100). The photo images were processed by using Adobe Photoshop[®] Elements 2.0. The images of the dyed stratum corneum (purple) were shown in monochrome and those of the rest in black. The proportion of the black from the monochrome histogram was shown as the stratum corneum area (%).

3.5. Experimental procedure

The experimental procedure was as shown in Figure 2. When the adhesive plasters were detached or skin irritation was caused, the experiment was halted.

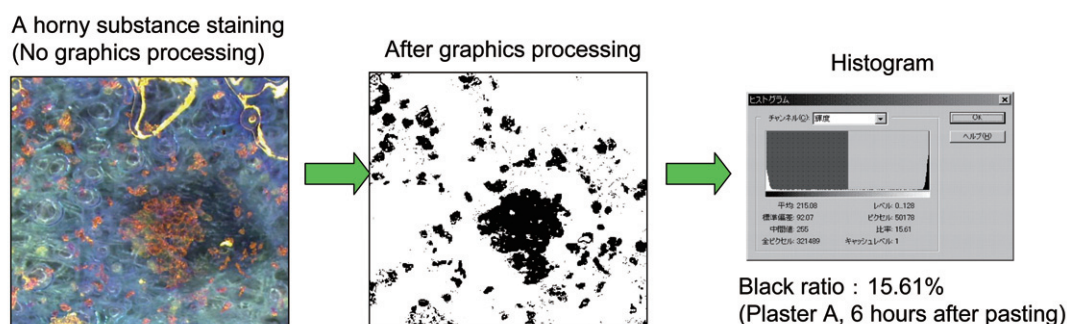


Figure 1. Measurement Method of the Horny Substance Detachment

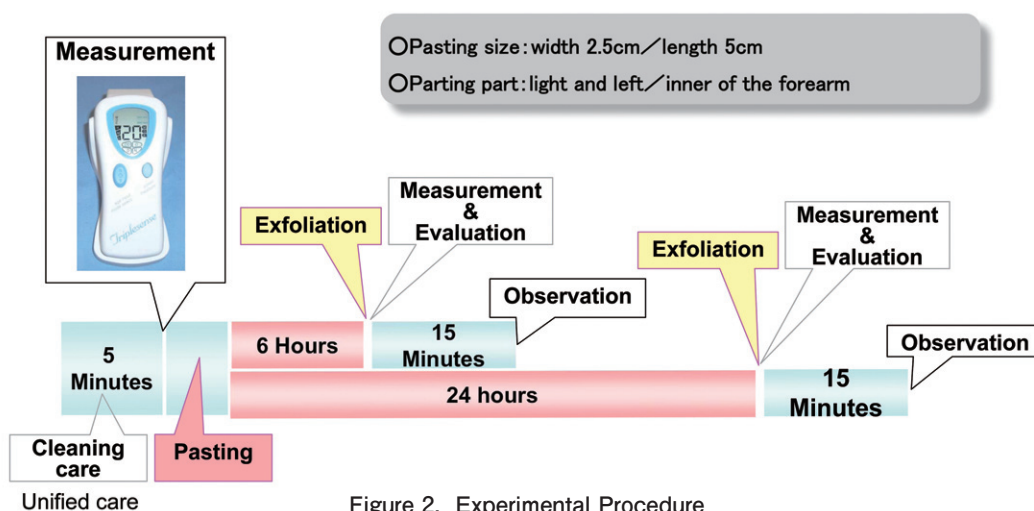


Figure 2. Experimental Procedure

3.6. Ethical considerations

The study was conducted with the approval of the Life Ethics Committee of Yamaguchi Prefectural University. The purpose of the study was explained verbally as well as in writing to the patients and their families, after which written consent was obtained. If skin trouble was caused by adhesive plasters during the experiment, the experiment was to be discontinued immediately and a specialist doctor's treatment was to be sought.

3.7. Interest conflicts

In measuring the amount of stripped stratum corneum, cooperation of Nitto-Denko Corporation was sought. However, their involvement was absent during the research design, data collection, or the preparation of the present paper.

4. Results

In the 6-hour adhesion experiment, each adhesive plaster showed excellent fixation (See Figure 3). The resiliency was 12.2~86.3 with 55.3 as the median while the moisture level was 22.5~56.5 with 41.3 as the median and the oil content level 0~10.3 with 0.8 as the median. By using these standards, the skin conditions of the 62 subjects were categorized (See Figure 4).

As shown in Figure 5, the relationships between the skin condition and the amount of stripped stratum corneum did not have any significant relationship with the skin condition; however, they had a significant correlation with the selection of a adhesive plaster and the amount of stripped stratum corneum was low with the adhesive plaster A.

In terms of flare, which is a symptom of skin irritation, there was no strong indication in all skin conditions. In the skin condition with a low oil-level, a tendency to show flare was observed at the significance level of .01 after 6 hours of adhesion (See Figure 6).

5. Discussion

In this study, the three types of adhesive plasters with clinically high versatility were examined for their adhesiveness in relation to the aged persons. The results showed that, regardless of the skin condition, the amount of stripped stratum corneum was correlated with the kind of adhesive plaster selected. In single-pasting experiments, however, no correlation was found with flare which is easy to detect as a skin irritation symptom.

This showed that when the adhesive plaster selection calls for high fixation but does not consider skin irritation, it is likely to cause skin irritation and other problems and that it makes it difficult to indicate abnormalities.

As one ages, endogenous ageing of skin advances, causing a number of symptoms. Since "it requires more time than restructuring of each stratum corneum" (1), it is important to take caution not to harm the skin of the aged person. However, in the clinical setting where adhesive plasters are often used, the first priority is fixation, and thus it seems, unfortunately, that skin irritation is not taken into consideration.

The experiment identified a kind of adhesive plaster that maintains fixation and causes low level skin irritation. Therefore, in order to protect the aged person's skin which is vulnerable even under a normal condition, it is important, from the QOL perspective in the elderly care, to examine the selection and use of such a kind of adhesive plaster that is gentle to skin.

6. Summary

It is important to conduct skin condition assessment and make a proper choice of adhesive plaster when it is repeatedly pasted on a given region.

References

- 1) 川田暁「成長・老化に伴う皮膚変化（エージング）～皮膚老化のメカニズム～」(今山修平編集『スキンケアを科学する-皮膚本来の機能を発揮させるセルフメディケーション-』南江堂 2008:113-114)

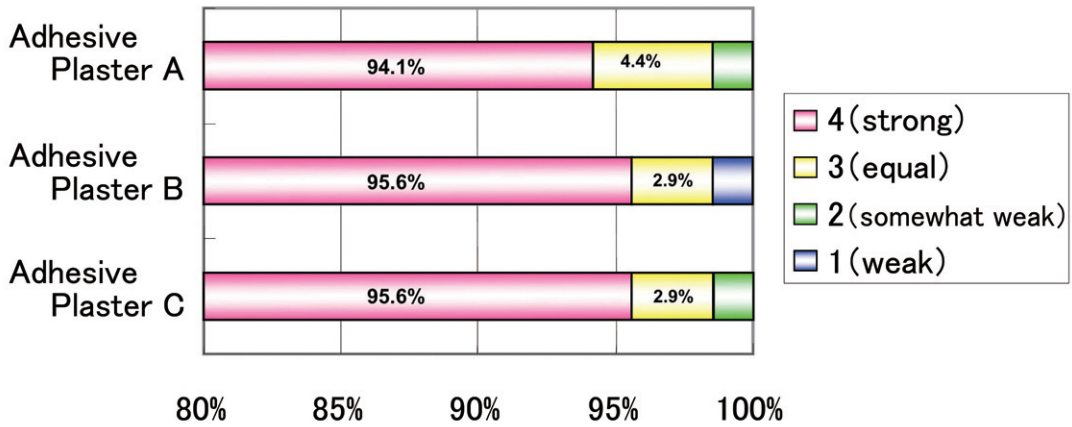


Figure 3. Results of Fixation Measurements (6 hours after pasting)

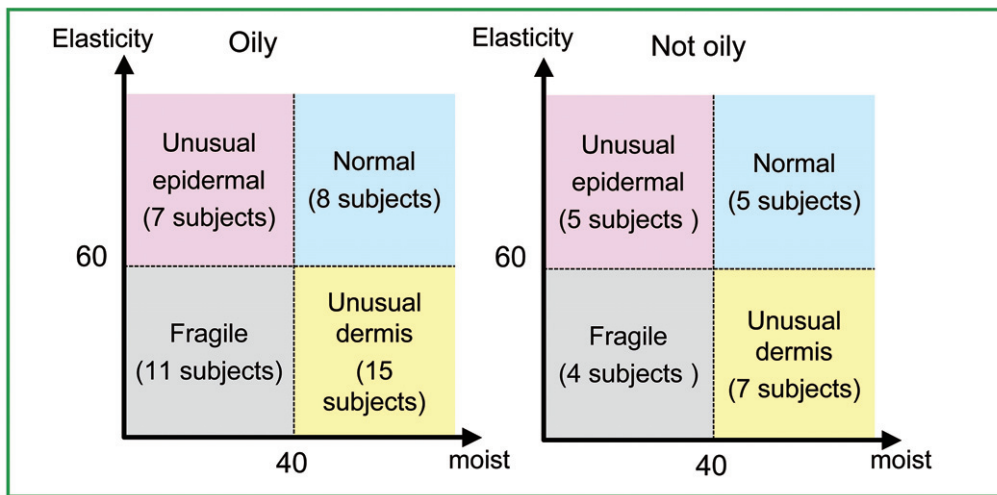


Figure 4. Classification of Subjects' Skin Conditions

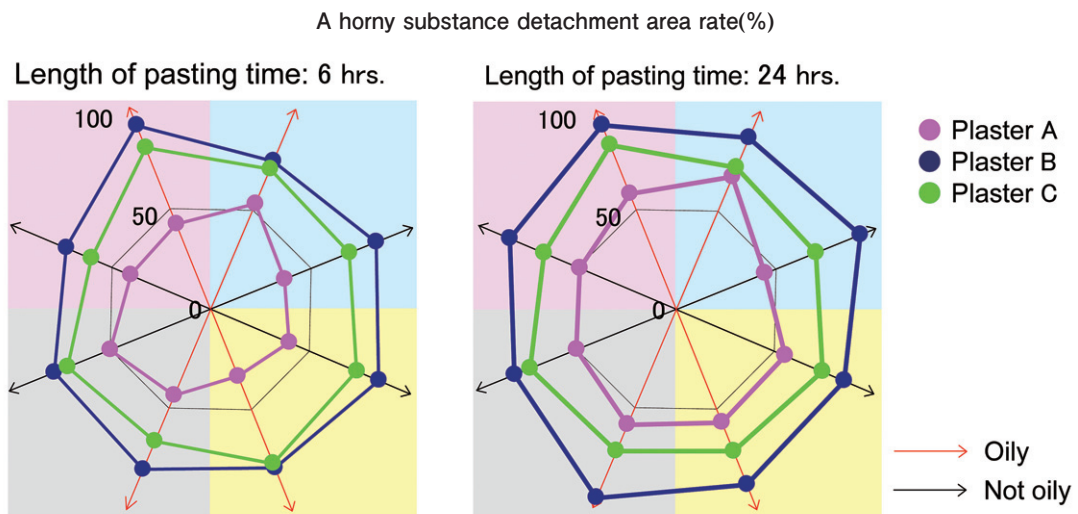


Figure 5. Comparisons of Horny Substance Detachment among the Three Adhesive Plasters in Relation to the Skin Conditions

Flare (Means of Plasters A, B, and C)

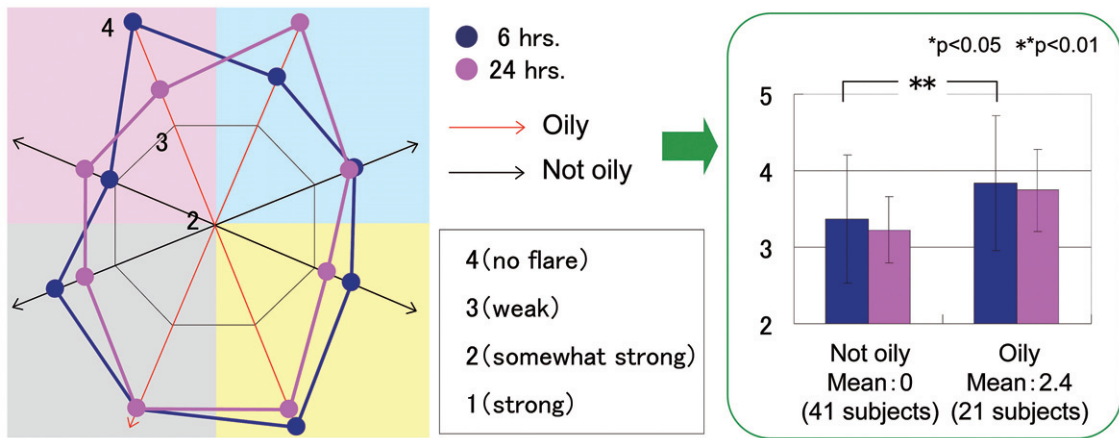


Figure 6 . Comparisons of the Flare among the Three Adhesive Plasters in Relation to Skin Conditions

