Comparison of the Skin Protectant Properties of Various Film-Forming Products

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Abstract:
A comparison was made of four different film-forming skin protectants, which were used in conjunction with two different medical adhesive products. The comparative study included two commonly-used alcohol-containing skin sealant products and two nonalcohol sealants developed by 3M. No skin preparation served as a control. Two commonly used adhesive products were chosen for study: a waterproof adhesive tape and a plastic-backed medical tape. Additionally, one site on each test subject was left untreated.

The study was conducted on 12 adults between the ages of 51 to 72. The study was two weeks in duration with treatments and evaluations performed once each weekday. Daily tape removal was modeled after a daily dressing change protocol, which is often used to manage a draining skin ulcer. The degree of skin stripping was measured by transepidermal water loss and skin redness.

The results of this study demonstrate that the nonalcohol formulations provided clinically significant protection from skin stripping compared to the “no prep but taped” sites and, in a few cases, were equivalent to the “no tape” control sites. The alcohol-containing protectants provided no demonstrable protection from the adhesive products tested.

In a subjective assessment of stinging sensation, reports of stinging were extremely rare with the 3M nonalcohol skin preparations. Both the frequency and severity of stinging were significantly greater with the alcohol-containing skin preps. Additionally, many of these alcohol-containing skin prep treated sites exhibited an extreme irritation reaction and were prematurely discontinued from the study.

Background:
Maintenance of healthy intact skin under conditions of frequent adhesive dressing changes is a constant challenge to health care providers. Skin surrounding stomas, external catheters and appliances, or skin that is already compromised from excessive stripping or abrasion is particularly vulnerable to breakdown.

Alcohol-based protective barrier films have, in the past, been purported to be useful as both preventative and therapeutic tools in alleviating skin breakdown under such adverse conditions. However, these barrier films contain alcohol-based carrier solvents such as isopropyl alcohol (isopropanol). Isopropanol, when applied to broken or otherwise compromised skin, creates a stinging sensation that often cannot be tolerated by the patient and can be irritating to regenerating epidermis.

3M has developed skin care formulations that incorporate skin protectants into hexamethyldisiloxane (HMDS), a fast-drying, non-stinging, non-cytotoxic solvent. This study examines the relative effectiveness of the 3M nonalcohol, HMDS-based protectant formulations against two commercially available alcohol-containing skin sealants.

Materials and Methods:
Test subjects were 12 older adult males (mean age = 64.25; range = 51 to 72) whose skin was more likely to be traumatized by repeated skin stripping. Cross-comparisons were made between two alcohol-containing and two nonalcohol skin protectants, used in conjunction with two adhesive tapes. The controls used were no skin protectant with tape application and no tape application.

The study lasted two weeks, with treatments and evaluations made once each weekday. Assessment was
by expert grader’s rating of skin irritation, Chroma Meter readings of skin surface redness (erythema) and computer measurement of Transepidermal Water Loss (see graph). Panelists also rated the amount of stinging with each skin protectant application on a scale of 0 to 3.

Results:

Overall results indicate significantly reduced mechanical and physiological damage to skin protected with the nonalcohol formulations. The study found little or no benefit in the prevention of skin stripping from using the alcohol-containing skin protectants with the medical adhesive tapes tested. The assessments of this group and the “no protectant but taped” group were statistically equivalent.

In self-assessment of stinging sensation by study subjects, only two reports of a slight stinging sensation were reported in 293 applications of the 3M nonalcohol formulations. There was a significantly greater incidence of stinging sensation with the alcohol-containing skin protectants (12.3% of all applications), with the pain ratings reaching levels 2 and 3 in 5.6% of applications, (scale of 0 = no sting, to 3 = severe sting).

Conclusions:

The data clearly shows that the 3M nonalcohol skin protectants significantly reduced the degree of skin damage caused by repeated application and removal of two commonly used dressing tapes. Furthermore, stinging sensations during application of these preps were virtually nonexistent.

In contrast, no significant differences were found between alcohol-containing skin protectants and the “no protectant but taped” sites. This suggests that alcohol-containing protectants provide very little, if any, protective value against skin stripping under the adhesive products studied.

Bibliography

