Evaluation of the Cosmetic Acceptability and Efficacy of Various Topical Corrective Cosmetics When Applied to a Transparent Polyurethane-Based Wound Dressing

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A keloid is a common skin imperfection, usually caused by scarring, that can be difficult to treat. One treatment option is the application of a transparent polyurethane-based wound dressing. However, a method of concealing keloids that are undergoing treatment is needed. This study's aim was to assess if a keloid could be concealed during treatment with a polyurethane-based dressing by using any of the various corrective cosmetic products available. The results, based on evaluator assessments on a visual analog scale and the use of a chromometer, showed that not only is there a definite aesthetic improvement when a cosmetic product is applied on the dressing, but the various products tested also performed well after being exposed to physical challenges of heat, water, and smearing. We concluded that a cosmetic product should be recommended for patients treating keloids with a polyurethane-based wound dressing but that the patient should decide on a product based on personal preferences and cost.

Many different brands of cover-up cosmetics are available to conceal skin imperfections. One such imperfection is a keloid scar, an overgrowth of fibrous tissue that usually develops during the healing process of injured skin.[1] Keloid scars are very prevalent in society. They cause psychological distress to those patients affected, and it is very costly to treat and/or diminish their appearance. Treatment of keloids can involve application of a thin, sterile, transparent polyurethane-based wound dressing, such as Tegaderm™. When this dressing is applied on a keloid, it has been shown to reduce the associated signs and symptoms[1]; however, the keloid is still readily visible. This study was designed to assess if the appearance of a keloid could be concealed while being treated with a polyurethane-based wound dressing. Our objective was to evaluate if corrective cosmetics enhanced concealment when applied to a polyurethane-based wound dressing and to assess if they resisted environmental variables such as heat, water, and smearing. Four different brands of corrective cosmetics were evaluated: Covermark®, Dermablend™, Linda Seidel®, and Studio Direct®. Each product was also compared with the others to determine if one was statistically superior.

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MATERIALS AND METHODS

Four photographs of the same keloid image were used per cover-up product being tested. A 2 × 2.5-cm piece of the polyurethane-based wound dressing was applied over

TABLE 1

The 4 Corrective Cosmetic Products Applied Over the Polyurethane-Based Wound Dressing on the Photograph of a Keloid

Brand Name	Recommended Product	Condition Treated	Colors	How to Use	Proposed Benefits	Price
Covermark®	Leg Magic	Scars	7 shades	1. Apply evenly over the area, blending with the edges 2. Allow to dry for 3 minutes 3. Remove excess with a sponge or cleansing pad	Sun protection factor of 16, won't rub off, no setting powder needed, natural looking	2.25 oz for $16.00
Dermablend™	Cover Crème + Setting Powder	Scars	21 shades of crème, 3 shades of powder	1. Cover with crème 2. Set with powder 3. Remove with Dermablend removal product	Variety of shades, "natural-looking coverage"	1 oz Cover Crème for $27.50; 1 oz Setting Powder for $18.00
Linda Seidel®	Natural Cover Cream + Performing Powder	Blemishes	20 shades of cover, 12 shades of powder	1. Moisturize 2. Apply 3. Use Performing Powder 4. Remove with soap and water	100% waterproof and lasts all day	0.60 oz Natural Cover Cream for $19.95; 0.60 oz Performing Powder for $13.95
Studio Direct®	Paramedical Kamaflage Makeup	Scars	9 shades	Apply evenly over desired area	Blendable and moisturizing	10 g for $11.99

the keloid photographs, and then each cover-up product was applied on the wound dressing per the instructions on its product label (Table 1). Physical challenges (heat, water, and smear) were performed on the products following air-drying (Table 2).

Three evaluators blinded to these different manipulations compared the 3 photographs treated with heat, water, and smearing with the baseline-treated photograph that did not undergo manipulations. The photographs with the cosmetic cover-up products were also compared against the photographed image with just the polyurethane-based wound dressing (control). The evaluators assessed the results of each cover-up product using a visual analog scale from 0 (the cover-up had no effect on appearance) to 10 (the cover-up concealed the keloid completely, blending perfectly with the surrounding skin). The control photographed image was rated a 0.

In addition to this visual analysis, we assessed the efficacy of the products with the Minolta Chromometer (CR-400/410). This chromometer has been used to evaluate skin pigmentation by assessing skin brightness and color, and its data have been found to be reliable and valid in previous studies.[2] The same treatment process was performed, but with the polyurethane-based wound dressing applied on plain white paper (Boise X-9 8.5 × 11-in, 75-g/m^2 white paper) instead of a photograph. The chromometer was calibrated to the white paper, and then the treated samples were evaluated.

Statistical analysis was performed with the mean values of the 3 evaluators using the analysis of variance test. We compared the 3 treated groups (heat, water, and smearing) to the baseline treatment (no intervention) to evaluate the efficacy of the cover-up products. We also

TABLE 2

Treatment Protocol to Assess the Efficacy of Corrective Cosmetic Products in Concealing the Image of a Keloid

Specimen	Treatment
CONTROL Photographed image + polyurethane-based wound dressing	A 2 × 2.5-cm piece of polyurethane-based wound dressing was applied on the photographed image of a keloid
BASELINE TREATMENT Photographed image + polyurethane-based wound dressing + cosmetic product	The cosmetic product was applied to each specimen according to its instructions
HEAT Photographed image + polyurethane-based wound dressing + cosmetic product	Placed under direct halogen light for 20 minutes at a distance at which the surface temperature is 36°C
WATER Photographed image + polyurethane-based wound dressing + cosmetic product	Sprayed once with water using a spray bottle at a distance of 4 in. The volume delivered with 1 spray was 0.85 mL to cover the wound dressing, which has an area of 5 cm^2
SMEAR Photographed image + polyurethane-based wound dressing + cosmetic product	Placed a Kimwipe® over the specimen. A standard 5-mL measuring glass with a diameter of 3.5 cm was placed on top of the Kimwipe and then slid off by pulling on the Kimwipe

compared the treatment groups with the control image to see if the application of a corrective cosmetic concealed the skin imperfection. The same statistical analysis was performed with the results of the chromometer.

RESULTS

All evaluators agreed that the application of any corrective cosmetic to the polyurethane-based wound dressing was visually more pleasing than applying no cosmetic product at all (Figure). Table 3 shows the associated mean scores of the 3 evaluators for each of the 4 selected products based on their performance on each individual test compared with those of the control group. There was no individual statistical significance among the 4 products and their performance on the different physical challenges. There was also no difference in the evaluator ratings of the product before and after the 3 interventions. Overall, on average, Linda Seidel received better marks than the other 3 products and reached statistical significance over Dermablend based on the mean evaluator scores (P=.03) (Table 4).

Interesting to note are the differences in the average rating of each evaluator for the products. Evaluator 3 gave the highest scores overall, with a mean score of 9.0; the average values for evaluators 1 and 2 were 7.2 and 7.9, respectively. This difference was statistically significant between evaluator 3 and evaluator 1 (P=.0011).

Appearance of the image of a keloid covered with the polyurethane-based wound dressing and no cover-up product (left) and with Dermablend™ Cover Crème applied (right).

TABLE 3

The Mean Score of the 3 Evaluators for Each Product's Efficacy in Concealing the Image of a Keloid and the Physical Challenge Performed

Product	Control	Heat	Water	Smear
Covermark®	7.2667	7.6667	9.1667	8.6000
Dermablend™	6.3333	7.0000	7.2000	7.5000
Linda Seidel®	9.9000	7.3333	9.1000	7.5333
Studio Direct®	8.1000	9.2333	9.3333	6.6667

TABLE 4

The Overall Mean Performance Score for Each Product's Efficacy in Concealing the Image of a Keloid

Product	Mean Performance Score
Covermark®	8.1750
Dermablend™	7.0083
Linda Seidel®	8.5667
Studio Direct®	8.3333

The results of the chromometer readings revealed that there was no difference among the 4 cosmetic products before or after the application of the physical challenges, which correlated with the evaluator scores.

DISCUSSION

Based on the mean evaluator scores of all 4 products with and without the interventions, it is clear that the application of any of the 4 corrective cosmetics tested resulted in a better visual result than applying no cosmetic make-up at all to the polyurethane-based wound dressing. It is also important to note that there was no individual statistically significant difference among the 4 products and their performances on the different variables tested. Overall, Linda Seidel, an over-the-counter cover-up in the median price range, was superior to the rest of the products, and its superiority over Dermablend was statistically significant. The results showed that Dermablend, a popular cover-up marketed to physicians and the most expensive of the 4 products tested, had the lowest ratings. Even if there was a difference that was missed in our study, this difference was not clinically significant, as this is what the visual scale was evaluating.

In our study, evaluator 3 gave higher results each time. This presents some bias brought in by the third evaluator and must be noted. Also to be considered is that this study was performed on a 2-dimensional picture, whereas in reality a keloid is a 3-dimensional structure. In the future, we would like to expand this study and apply the polyurethane-based wound dressing and corrective cosmetic products on an actual keloid.

In light of an overall aesthetic improvement when any of the corrective cosmetic products were applied to the polyurethane-based wound dressing, we conclude that it is beneficial to apply a corrective cosmetic on this dressing. Although Linda Seidel performed statistically superior to Dermablend on the overall evaluation, it was not statistically superior to the other 2 products, Covermark and Studio Direct. All products had superior performances before and after the physical challenges when compared with the control photographed image. Therefore, we suggest that the patient decide on a corrective cosmetic product based on personal preferences and cost.

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