

Effects of Dermabrasion on Acne Scarring

A Review and a Study of 25 Cases

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Acne scarring is often treated with dermabrasion and results are evaluated using photographs. We have studied 25 patients before treatment and up to 1 year after dermabrasion for acne scars. Comparisons of results evaluated in different ways show that dermabrasion works best for superficial scars, results for more severe forms of scarring being less predictable. Key words: skin replicas; stylus instrument; human skin roughness.

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Methods for ameliorating disfiguring scars of the face have been described for over two thousand years. The use of rotating dental drills for this purpose was first described by Kromayer (1). The technique has been refined since then, and nowadays diamond buffing-tools with very high rotation speeds are used (2).

Most authors in this field have demonstrated the benefits of dermabrasion by showing photographs taken before and after the operation. To the best of our knowledge, no studies in which the results have been evaluated with other techniques have been performed. We therefore decided to perform a detailed investigation of a group of patients who had already been considered for dermabrasion. The results were evaluated in three ways: 1) from the overall impressions formed by the patients and the investigators; 2) by photographic documentation; and 3) by counting and measuring lesions in specified areas. Replicas of these areas were made and the positive casts studied using a stylus instrument.

MATERIALS AND METHODS

The operating surgeon (S.J.) was not involved in the evaluations, which were made by a plastic surgeon (L.S.) and a dermatologist (A.A.) working independently. After informed consent, patients underwent skin examinations with estimates of the degree of acne scarring, the types of scars and pigmentation. They were questioned about the duration of their acne, earlier and present treatment, other medications including contraceptive pills, smoking habits and were asked to state their feelings about the scarring. Skin type was determined using the classification of Fitzpatrick (3).

Areas on the cheek, 30 mm square, with the most evident scarring were selected and photographed in various standardized projections. Squares were examined with a hand-lens and the lesions in them counted and classified. Next, silicon impressions were made. Positive casts were analysed with the help of a stylus instrument used industrially for surface measurement (4).

Patients were examined with the same procedures on three occasions: shortly before dermabrasion and 3 months and 1 year after the operation. At the last visit, they were asked if they were satisfied with the result, if the operation had affected their social life and if they were interested in another dermabrasion.

Twenty-five patients (7 males and 18 females), aged from 20 to 42 years, took part in the study. Ten of them were aged between 20–25 years and 3 were older than 35. One patient used an antidepressant and 9 of the females used contraceptive pills. Seventeen were smokers before dermabrasion; another 2 managed to give up smoking during the period. Ten were of skin type II, 13 of type III and 2 of type IV, in accordance with the distribution of skin types in the Swedish population. Eleven had had acne for more than 10 years, 9 for more than 5 years and 5 for more than 2 years. Thirteen had still some activity in their acne before dermabrasion and a few were treated with antibiotics prior to operation. Four patients had never had any medical treatment for their acne. Four others had been treated with topical tretinoin and 5 with peroral isotretinoin, but not during the 6 months prior to dermabrasion (5). Twelve patients felt that their acne scarring was severe and influenced their social life. Only one of them denied having psychological problems.

Surgical procedures

The operations were performed at the Department of Plastic and Reconstructive Surgery, Malmö, all but one by the same surgeon (S.J.). Dermabrasion was performed cautiously down to levels where bleeding started to occur. Depending on the types of scars present, there were variations in the depths. After treatment, the crusts were left undisturbed; healing was in all cases uncomplicated, the epithelial surfaces appearing after about a week.

Preparation of casts and lesion counting

To permit assessment of the results, casts of patients' cheeks were made prior to the operations and at 3 months and 1 year postoperatively. To facilitate localizing the same area each time, we used a flexible but not stretchable transparent plastic sheet. With the help of the contours of facial structures such as the nostril, the ear lobe, the corner of the eye and mouth, naevi or other permanent characteristics, we were able to find the selected squares with good reproducibility. A two-component silicone dental material (Xantopren, Bayer Dental) was used in forming replicas. The positive casts were made out of high-quality gypsum (Silky Rock). A hand lens was used to count the lesions.

Technical analysis of the casts

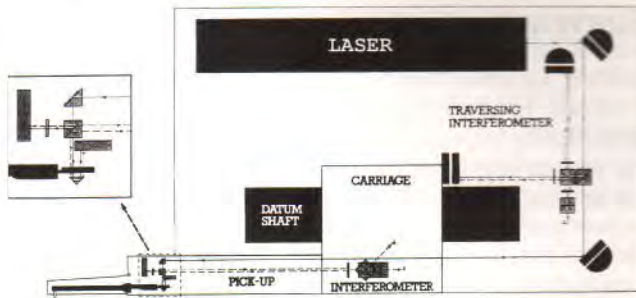
Technical analysis of the casts was performed with a stylus instrument (Form Talysurf-Taylor Hobson, England) used industrially for analysis of form and surface texture (4).

Its principle is as follows:

The movements of a diamond-tipped stylus arm ("the pick-up") traversing the surface being examined influence a laser interferometric transducer, whose filtered signals are transmitted to a microcomputer for detailed processing (Fig. 1). The casts from each patient before and 1 year after operation were examined in identical ways. Samples selected at random were analysed repeatedly to ascertain the reliability and reproducibility of the method. The central parts of the casts were used for the assessments. In each, 21 traces spaced 1 mm apart, corresponding to an area of about 250 mm², were recorded.

The technical parameters used were as follows:

- Ra the arithmetic mean of vertical departures from the mean line through the readings—the "roughness"
- Rt the maximum peak to valley height in the profile



Schematic diagram of traverse unit.

Fig. 1. Principles of the apparatus used for measuring the casts. (Reproduced by permission of the manufacturers, Rank Taylor Hobson.)

Sm the mean spacing between profile peaks—the wave-length, a horizontal characteristic
 dq the root square of the slope in the profile.

Statistical methods

Comparisons of data were made using the Mann-Whitney U-test. Groups of data were considered to differ significantly when $p < 0.05$.

RESULTS

Numbers of lesions (Fig. 2)

The numbers of lesions of different types (superficial, deep, small or wide (~2 mm)) were counted.

Superficial scars: Significant reductions in total numbers were seen at both 3 months ($p < 0.01$) and 12 months ($p = 0.05$) postoperatively.

Deep scars: For the material as a whole reductions were seen at both 3 ($p = 0.05$) and 12 months ($p < 0.1$ NS). There was a tendency for the 12-month values to revert towards preoperative ones.

Small scars: Significant decreases were seen at both 3 ($p = 0.01$) and 12 months ($0.05 < p < 0.1$), but the significances weakened with time.

Wide scars: Decreases in total count were seen, but here too

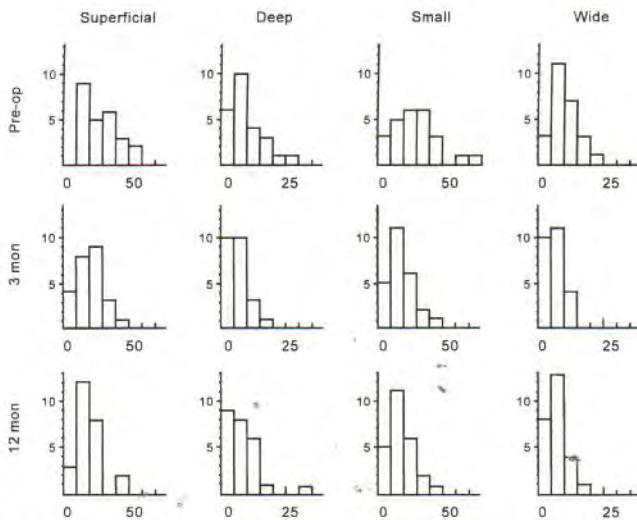


Fig. 2. Statistics of scars of different types recorded at various times during the investigation. The number of scars is plotted along the x-axis and the number of cases along the y-axis.

significances weakened with time; 3 months ($p = 0.01$), 12 months ($0.05 < p < 0.1$).

We also looked for hypertrophic scars, milia and pigmentary disturbances. A few patients had a slight tendency to hypertrophic scarring. In most cases milia were seen during the immediate postoperative period, but they never persisted. There were few problems with pigmentary disturbances, probably because most patients had rather fair skin. Slightly mottled pigmentation was observed in 2 females with rather severe scarring.

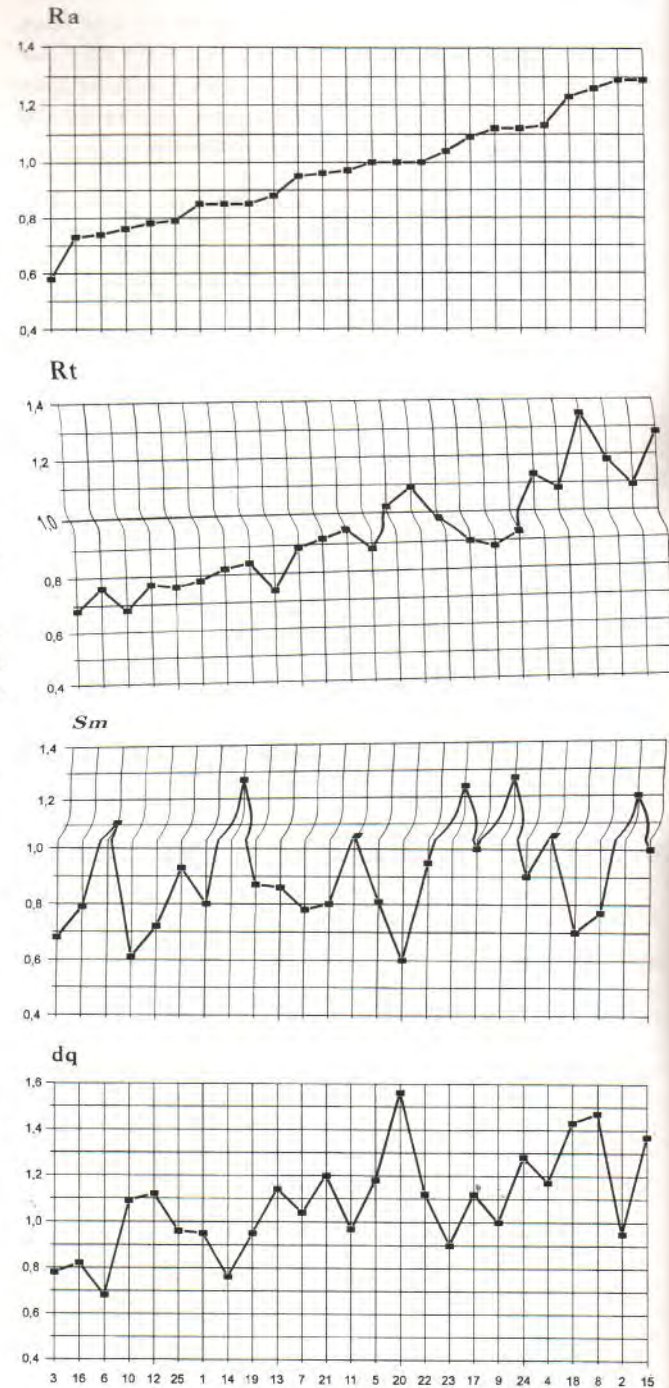


Fig. 3. Results from technical measurements on the casts sorted in order of increasing Ra. Ratios < 1 are improvements. For further explanation, see text.

Scores

Since the investigators made their observations independently, their scores sometimes differed. There were no specific trends in the differences. The results were classified as very good in 4/25, good in 10/25, satisfactory in 7/25 and bad in 4/25 patients. Taking all patients together, there is an evident trend towards smaller scores, i.e. for the better. Closer analysis of our evaluations of various types of scars revealed different results.

Superficial scars: A definite improvement was seen.

Deep scars: Our impression was that deep scarring became more pronounced after dermabrasion.

Small scars: There is an unmistakable tendency for a net improvement.

Wide scars: The visual impression was that the situation became worse.

Of the patients, 9 were satisfied with the result, 12 declared themselves content and 4 were clearly discontented. Eleven patients were prepared to undergo another dermabrasion, while 8/25 stated that their self-confidence had been enhanced by the operation.

The opinions of the investigators and the patients sometimes differed. On the whole patients were more positive in their judgements than the investigators.

Technical measurements on the casts (Fig. 3)

Quotients of the pre- and postoperative mean values of the four parameters were used as indications of the result, quotients < 1 being interpreted as improvements and those > 1 as evidence of impairment.

Ra: 13/25 patients had quotients < 1 .

Rt: The values largely follow Ra. 17/25 values were improved.

Sm: Sixteen of 25 had quotients < 1 .

dq: This is to a high degree influenced by the other parameters. Just 8/25 had quotients < 1 .

If averages of all four parameters are considered, improvements were seen in about half the patients.

Photographs of one patient before and 1 year after dermabrasion and the result of the corresponding technical measurement are shown in Figs. 4 and 5.

DISCUSSION

We have described the results of an investigation of the effects of dermabrasion in a group of 25 patients.

As the results show, improvements were seen in about half the patients. It is particularly noteworthy that the results 3 months postoperatively seem to be better than those after 1 year. This has been reported by other investigators (6, 7), especially when wrinkles have been treated by dermabrasion (7), but certainly also applies to other contexts. In his survey, Ayres (6) states that during the first 3 months patients look very good ("they never look as good again as they do at this time"). The reasons for this are probably the slight erythema and oedema, both of which slowly fade away with time. Histologically, the regenerating epidermis is separated from the dermis by an oedema.

The regeneration of the dermis results in an immature tissue, rich in capillaries, young fibroblasts and reticulate fibres. Scar contraction and remodelling of the skin structures are not completed until about 6 months postoperatively, at which time

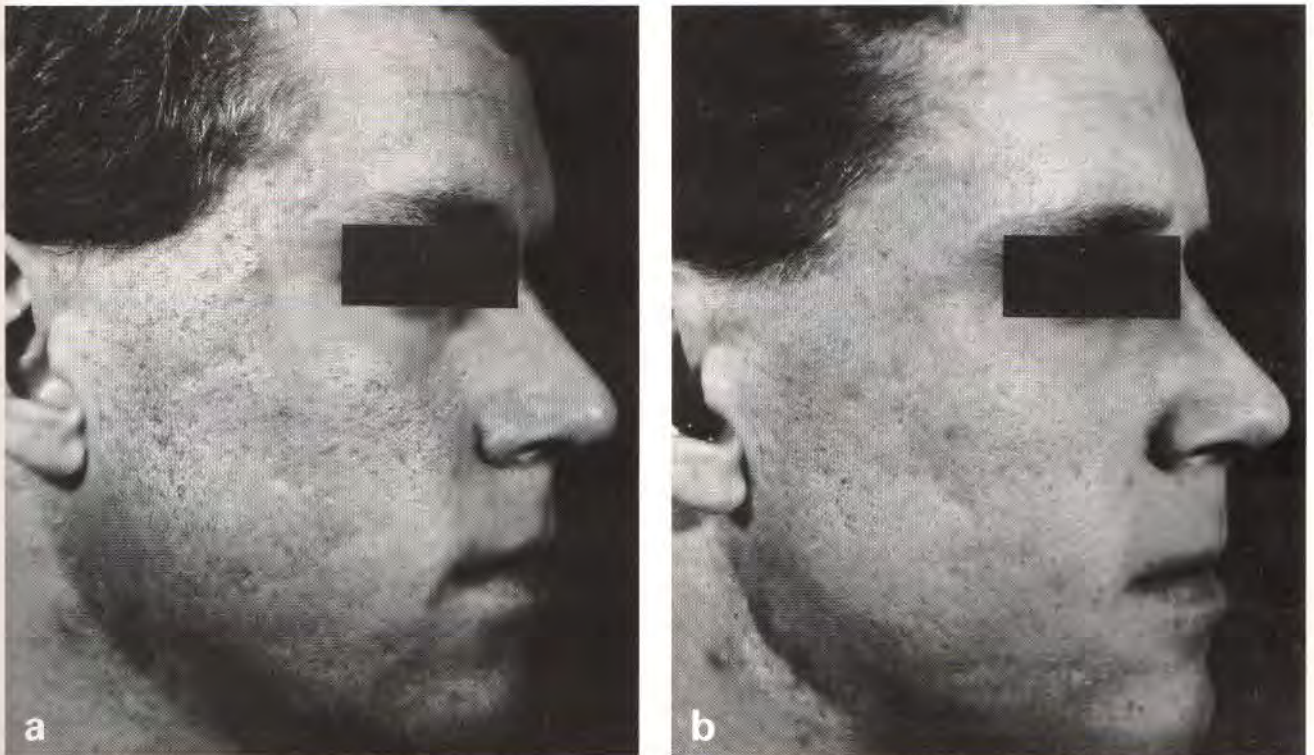


Fig. 4. Before (a) and 1 year after (b) dermabrasion. The photograph shows improvement of the scarring.

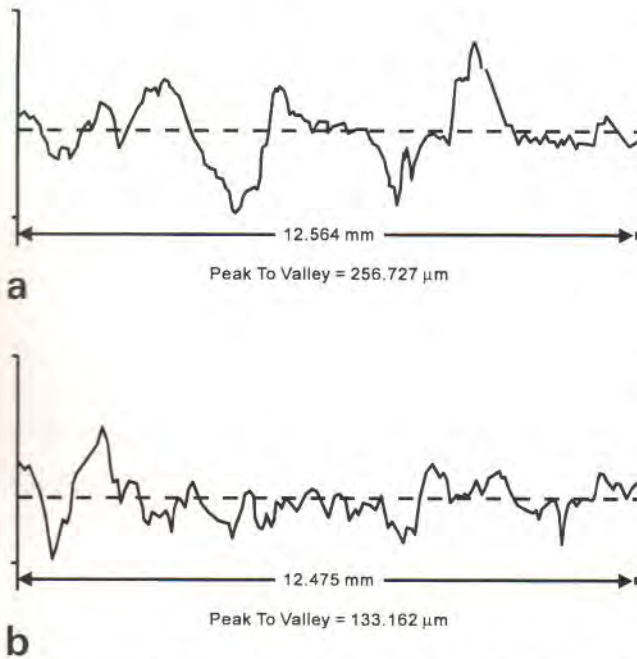


Fig. 5. Technical measurement before (a) and 1 year after (b) dermabrasion of the patient in Fig. 4, showing decrease in amplitudes.

the final appearance can be discerned and much of the original relief has reappeared.

In comparisons of the results of counting with those from the technical analyses, individual results were sometimes different and it was not always the same patients who appeared to be improved (or impaired) in both sets of data. There are many possible explanations for this. Clinical observations – including counting – involve a good deal of subjectivity with – inevitably – variability and the objective values given by a stylus instrument need not always correspond to the visual impression. Since various parameters influence one another, the results are not easy to interpret and the amplitudes and wavelengths often gave opposite results. The patients with the roughest skin (and usually the deepest scars) often seemed to have the most significant changes in amplitude. If, however, the values of dQ are unchanged or increased, the visual impression is probably one of impairment or at most no change.

In most patients we found improvement in some aspects, but impairment in others. This complexity makes definitive assessment very difficult.

In conclusion, our investigation confirms earlier observations (6, 8, 9, 10) that patients with small and superficial scars benefit most from dermabrasion. However, it can be objectively demonstrated that even those with deep scars experience some amelioration. Most patients have mixtures of various types of scars and the chances of obtaining satisfactory results must be weighed together.

ACKNOWLEDGEMENTS

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