

# The Study of Surgical Treatment for Acne Scars ; the Principle of a Three Staged Operation

Kyu Kwang Whang, M.D., Mi Ae Lee, M.D.

Department of Dermatology, Ewha Womans University College of Medicine,  
Seoul, Korea

**Background :** Acne scars are not effectively corrected by a single treatment modality because of their widely varied depths and widths.

**Objective :** This study was performed to assess the effectiveness of staged combinations of several surgical modalities in the treatment of various acne scars.

**Methods :** Chemical peeling, CO<sub>2</sub> laserabrasion, scar excision, punch grafting, and dermabrasion were included in this study as surgical modalities. Initially, chemical peeling was performed on all patients and then CO<sub>2</sub> laserabrasion, scar excision and punch grafts were used for deep scars. Finally, dermabrasion was done for the remaining scars. Questionnaires were completed for clinical assessments by the patients and clinicians.

**Results :** Clinicians assessed the results as "excellent and good" in 75% of patients. However, only 53% of patients gave this same result. The degree of satisfaction escalated as the follow-up periods and number of chemical peeling procedures increased and as the sequence of the 3 staged operation progressed.

**Conclusion :** We suggest that the principle of 3 staged operations would be effective in the treatment of patients with various types of acne scars. (Ann Dermatol 9:(2) 87~94, 1997).

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**Key Word :** Acne scar, Chemical peeling, Dermabrasion, Laserabrasion, Punch graft, Three staged operation

Acne scars vary from narrow to wide, shallow to deep, depressed to hypertrophic. Uniquely, pitted or ice-pick-like bounded down scars are present. Dermabrasion was the mainstay of therapy for acne scars, but ice-pick scars are difficult to correct, and textural changes can be easily elicited by dermabrasion. Since Mackee<sup>1</sup> used phenol for the correction of acne scars in 1930, chemical peeling has been used to treat acne scars. In 1986 Johnson<sup>2</sup> found punch grafting followed by a dermabrasion 3 to 4 weeks later would be very useful in the treatment of patients with pitted scars and achieved much greater improvement in pitted

scars than with dermabrasion alone.

We performed various modalities of surgical treatments for correcting atrophic acne scars and the results were assessed by the patients themselves and by a clinician.

## MATERIALS AND METHODS

Thirty eight patients with acne scars were included in this study. The average age of the patients was 26.5 years. Thirty-three were females and five were males. Thirty eight patients answered and 32 patients were evaluated by a clinician

The modalities of surgical treatment were chemical peeling, CO<sub>2</sub> laserabrasion, scar excision, punch grafting and/or punch elevation and dermabrasion. All patients received chemical peeling. Among them, CO<sub>2</sub> laserabrasion was performed in 6, scar excision in 2, punch grafting and/or punch ele-

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**Reprint request to :** Kyu Kwang Whang, M.D., Department of Dermatology, Ewha Womans University College of Medicine, Seoul, Korea.

**Table 1.** Assessment by clinician according to the number of chemical peeling procedures and period of follow-up

Assessment	No. of patients	Chemical peeling			Period of follow-up		
		1*	2**	3*	6mo	12mo	18mo
Excellent	10(31)	3(19)	4(46)	3(60)	5(31)	3(23)	2(67)
Good	14(44)	8(50)	6(55)	-	6(38)	8(62)	-
Fair	8(25)	5(31)	1(9)	2(40)	5(31)	2(15)	1(33)
Poor	-	-	-	-	-	-	-
Total	32	16	11	5	16	13	3

\*: number of chemical peeling

( ): %

mo: month

Excellent: marked improvement

Good: moderate improvement

Fair: slight improvement

Poor: no improvement or aggravation

**Table 2.** Assessment of satisfaction by patients themselves according to the number of chemical peeling procedures and period of follow-up

Assessment	No. of patients	Chemical peeling			Period of follow-up		
		1	2	3	6mo	12mo	18mo
Excellent	9(24)	3(13)	3(30)	6(60)	4(20)	3(21)	2(50)
Good	11(29)	6(26)	5(50)	-	4(20)	6(43)	1(25)
Fair	12(31)	8(35)	2(20)	2(40)	8(40)	3(21)	1(25)
Poor	6(16)	6(26)	-	-	4(20)	2(14)	-
Total	38	23	10	5	20	14	4

**Table 3.** Assessment of satisfaction by clinician according to the combinations of modalities

Assessment	CP	CP & (CO <sub>2</sub> laser or dermabrasion)	3 staged operation
Excellent	6(26)	1(20)	3(75)
Good	10(44)	3(60)	1(25)
Fair	7(30)	1(20)	-
Poor	-	-	-
Total	23	5	4

CP: chemical peeling

**Table 4.** Complications

Complication	No. of patients
Hyperpigmentation (longer than 3 mo)	2
Erythema (longer than 3mo)	3
Hypertrophic scar	1
Total	6/38(16%)

vation in 3, and dermabrasion in 5.

#### Chemical peeling

All 38 patients were treated with 50% trichloroacetic acid(TCA) focally to the depressed scar in order to form a new granulation tissue. A cotton-wrapped sharpened wooden stick was used on the pitted areas only. Before and after chemical peeling,

Fig. 1. a) Before treatment. b) Even with only once chemical peeling, marked improvement was seen.

Fig. 2. Comparison of the patient's assessment with doctor's.

0.025% or 0.05% tretinoin cream was applied for at least 2 to 4 weeks. According to the type of lesions, chemical peeling was performed between once and three times monthly.

#### **CO<sub>2</sub> Laserabrasion**

CO<sub>2</sub> laserabrasion was performed on 6 patients with 3-6 watts, superpulse and defocused mode, 0.05 seconds for each shot. This was applied on pitted scars for camouflaging the sharp border which was not corrected by chemical peeling only. Occasionally, nerves were regionally blocked for pain relief.

#### **Scar excision**

Scar excision was done on 2 patients. This modality was suitable for the large linearly arranged and isolated scars which occurred along the skin creases. The skin was incised in an elliptical shape along the skin creases and the scars were removed. Thereafter, the skin was sutured with 6-0 black silk.

#### **Punch graft**

Punch grafting was performed on relatively large ice-pick scars. Three patients received punch grafts. After the removal of ice-pick scars with the punch, full thickness skin grafts were done. The 0.5mm transplants which were larger than recipients, were obtained from postauricular area with the punch and were fixed with 5-0 nylon or Steri-Strip™ (3M, St. Paul). Some scar tissues were elevated without grafting to the patients who refused the graft, because they did not want to have scars in the postauricular area and to reduce the number of grafts required.

#### **Dermabrasion**

Dermabrasion followed 6 to 8 weeks after scar excision or punch grafting for resurfacing the remaining irregularities. Dermabrasion was performed with a motor-driven diamond fraise under local anesthesia with 2% lidocaine.

All the patients who received any kind of abrasive

Fig. 3. Comparison of the patient's assessment with the doctor's according to the treatment modalities(P:patient, D:doctor).

Fig. 4. a) Before treatment. b) After 2 times of chemical peeling, ice-pick scars changed to round shapes.

modalities were cautioned to avoid the sunlight and to use the sunblock.

#### **Assessment of effectiveness**

The results were observed at six to eighteen months after treatment. In order to assess the effec-

tiveness of the treatment, questionnaires were completed directly or by telephone. They included questions such as the following ; 1) How much are you satisfied? 2) Do you experience any complications? 3) What is the motivation of the treatment? The assessment of satisfaction was graded into ex-

**Fig. 5.** a) Before treatment. b) After chemical peeling, acne scars were much improved, but some deep scars remained on the temple. c) Immediately after punch grafting and scar excision. d) 1 week after punch grafting and scar excision.

**Fig. 6.** a) Before treatment. b) After the 3 staged operation.

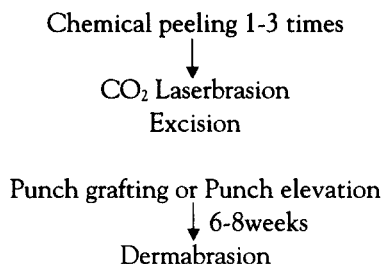
**Acne Scar : Principle of the 3 Staged Operation**

Fig. 7. Principle of staged operations for acne scars.

cellent, good, fair, and poor.

**RESULTS**

In the assessment by a clinician, 75% of the patients were categorized into the grade of excellent and good and the figures increased with time from 69% at the postoperative 6 month follow-up period to 85% at 12 months. Excellent and good results were noted in 69% of patients who received chemical peeling once; the grade of satisfaction increased with increasing numbers of chemical peeling procedures (Table 1, Fig. 1).

In the assessment by patients themselves, 53% considered the results "excellent and good". There were increments of satisfaction according to increasing number of chemical peeling procedures. The results following periods of follow-up were like the assessments made by the clinician, but the increments of patients' satisfaction was higher than those of the clinician's (Table 2). When comparing the assessment by clinician with those of the patients, the clinician tended to express higher degrees of satisfaction than the patients (Fig. 2, 3).

When comparing the satisfaction according to the combinations of modalities, chemical peeling alone and combinations of two modalities gave 70 and 80% excellent and good results. All 4 patients who received the 3 staged operation showed excellent and good results including 75% excellent results (Table 3, Fig. 4, 5, 6).

Complications developed in 6 patients as hyperpigmentation persisted longer than 3 months in 2 patients, erythema persisted longer than 3 months in 3 patients and hypertrophic scars in a patient (Table 4

**DISCUSSION**

Phenol and TCA have been used in skin peeling as chemical formulations. Their chief role are to obliterate fine rhytides, to improve the acne scarring, and to eliminate certain pigmentation of the skin<sup>3</sup>. TCA is not absorbed systemically and does not induce systemic toxicity unlike phenol<sup>4</sup>. In addition, the depth of TCA penetration is expected according to the concentration of TCA<sup>5</sup>, and TCA produces less bleaching of facial skin than phenol chemical peel<sup>6</sup>. Therefore, TCA might be more applicable in the peeling of patients with dark skin as well as being better suited for regional peeling.

Histological changes in peeled skin were studied by Baker and Gordon<sup>7</sup>. There was a remarkable improvement in the dermal architecture after peeling. A new band of dermis was formed between the epidermis and underlying elastotic tissue. This new band had fresh, parallel, organized bundles of collagen. These dermal changes persisted indefinitely. Although it is not fully satisfactory in large ice-pick scars, repeated focal applications of TCA was much more helpful as an initial procedure to improve atrophic scars.

Hevia *et al*<sup>8</sup> performed a double-blind, placebo-controlled, prospective human study examining the effects of tretinoin pretreatment on healing after TCA chemical peeling. They noted that during the peel, frosting was more pronounced and uniform and occurred earlier in tretinoin-pretreated skin in 94% of the patients and concluded that 0.1% tretinoin pretreatment for 2 weeks prior to the TCA peel will significantly accelerate healing. In addition, there are several reports that tretinoin stimulates collagen synthesis<sup>9,10</sup>. Schwartz *et al*<sup>9</sup> observed that type I and III procollagen increased twofold in 10 weeks of retinoic acid treatment. In our study, 0.025% or 0.05% tretinoin creams were applied 2 to 4 weeks before and after peelings for potentiating the neocollagen production and accelerating the healing process.

In 1993 Lee and Choi<sup>11</sup> reported that 93% of 27 patients represented good and excellent results by more than 4 times on focal treatment with 50-75% TCA. We also used the focal treatment with 50% TCA. Focal applications of TCA is advantageous because it can reach deeply pitted areas which cannot be improved by dermabrasion alone, and it does not damage adjacent normal skin. Al-

though the improvements of lesions were proportional to the number of chemical peeling procedures, there were moderate improvements after only one peeling, and atrophied areas elevated to the level of normal skin after 2 to 3 TCA peelings. As it generates less complications compared to the whole face peel, focal treatment is suitable for oriental people with skin types VI and V who are not suitable candidates for the whole face peel because of postoperative irregular hyperpigmentations. Acne scars did not pose any serious problems in focal treatment unlike pigmentary diseases such as melasma, lentigo, and freckles which are prone to develop postinflammatory hyperpigmentation.

CO<sub>2</sub> laserabrasion is useful on pitted scars which have sharp border and abrupt edges. The obvious scars become obscured by abrading the edge. For this purpose CO<sub>2</sub> laserabrasion is better performed under superpulse or ultrapulse with defocused mode, which has the advantage of less scarring. This is particularly beneficial when treating very thin epidermal lesions. In addition, the use of a mechanically shuttered pulse of 0.05 seconds is more effective than longer shuttered pulses in limiting thermal damage. The 0.05 seconds shutter between groups of pulses allow cooling of tissue periodically<sup>12</sup>.

Scar excision is one of the simplest surgical methods for acne scars. This method can be applied on the isolated linearly arranged large scars located on anatomically available sites and the lesion can be improved by subsequent dermabrasion<sup>13</sup>.

Facial dermabrasion is effective on defects which are shallow to moderate in depth, but ice-pick scars are difficult to correct. Therefore to achieve the best improvement of ice-pick scars, preoperative punch elevation or punch grafting can be performed. Various opinions exist concerning the best time to perform dermabrasion after surgery. Johnson<sup>2</sup> described graft punch transplants followed by a dermabrasion 3 to 4 weeks later to be very helpful in the treatment of patients with pitted scars. Katz et al<sup>13</sup> mentioned in a controlled study of the effectiveness of spot dermabrasion that scars improved at all time intervals, but the results were significantly improved at 8 weeks after surgery. But, Alt<sup>14</sup> said that scar elevation and punch grafting were best performed at a period of 4 to 6 weeks prior to facial dermabrasion. There is another technique, punch elevation, a modification of punch grafting<sup>15</sup>. This technique involves separating

the scar from the surrounding skin by a punch, allowing the tissue to elevate but remaining attached to the underlying tissue.

We obtained relatively satisfactory results with the surgical principle of this study. There were no serious complications. This treatment schedule does not require admission, thus is convenient for patient's ordinary life. Patients tended to express lower degrees of satisfaction than the clinicians. These differences were probably due to patients expecting higher outcomes.

Our principle for treatment of acne scars consists of three operational steps. Initially, chemical peeling is performed with 50% TCA from once to three times with one month intervals. Secondly CO<sub>2</sub> laserabrasion, scar excision, or punch grafting and/or punch elevation are used according to the type of remaining scars. Finally, dermabrasion follows 6 to 8 weeks later for resurfacing the remaining irregularities (Figure 7). Sometimes 1 or 2 steps can be abbreviated case by case.

In summary, we conclude confidently that our principle of a three staged operation on the surgical correction of acne scars will maximise the best results and produce relatively fewer complications with less costs.

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