High concentration TCA versus Subcision for treatment of Acne Scars

A Thesis

Submitted for fulfillment of Master Degree
in Dermatology, Andrology and STDs

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2009

(اللَّهُ الَّذِي جَعَلَ لَكُمُ الْأَرْضَ قَرَارًا وَالسَّمَاءَ بِنَاءً
وَصَوَّرَكُمْ فَأَحْسَنَ صُوَرَكُمْ وَرَزَقَكُم مِّنَ الطَّيِّبَاتِ
ذَٰلِكُمُ اللَّهُ رَبُّكُمْ فَتَبَارَكَ اللَّهُ رَبُّ الْعَالَمِينَ)

صدق الله العظيم

سورة غافر-٦٤

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ABSTRACT

BACKGROUND: Facial acne scarring has been treated with multiple methods with varying degrees of improvement. Although acne scars are recalcitrant to many therapeutic interventions, subcision is a technique that had been reported to provide significant long-term improvement in treating rolling acne scars. 100%TCA CROSS also had appeared to be valuable in treating atrophic acne scars.

OBJECTIVE: To compare the efficacy of 100%TCA CROSS method and subcision as different therapeutic modalities in treatment of rolling acne scars.

METHODS: Twenty patients with facial rolling acne scars were treated with 100%TCA CROSS on left side of the face and subcision on right side. They received 1-3 sessions at intervals ranging from 1-4 months and were followed up for up to 10 months.

RESULTS: Subcision showed better response regarding improvement of size and depth in comparison to 100%TCA CROSS which was statistically significant, (p<0.001) and (p=0.001) respectively. Mean percentage of improvement according to blinded physicians was 81% for subcision side and 64% for 100%TCA CROSS side. Mean percentage of improvement according to patients was 81% for subcision side and 69% for 100%TCA CROSS side. Minimal, transient side effects occurred in both techniques with slightly higher frequency on TCA side.

CONCLUSION: Both subcision and 100%TCA CROSS can improve the appearance of facial rolling acne scars; however subcision was found to be superior in its results with fewer side effects.

(Key Words: Rolling acne Scars, 100% TCA CROSS, Subcision**).**

Acknowledgments

Thanks to ALLAH; the most gracious; the most merciful.

To my dear supervisors,

Prof. Dr. Shahira Abd El-Rahman Ramadan, for whom I owe the great pleasure I had doing this study, of which the idea was her bright suggestion. My profound thanks for her help, continuous encouragement and support.

Assistant Prof. Dr. Mohamed Hussein Medhat El-Komy, for whom I'm deeply grateful for giving me the best support and trust, for his kind supervision and for being so patient and generous in his time and effort to teach me explicitly. His precision and meticulous corrections were the most beneficial to my study.

Lecturer Dr. Dalia Bassiouny, whose help was so sincere, giving me by her cheerfulness, the best inspiration and support I needed.

To Dr. Dalia Ahmed, lecturer of community, for her valuable help and effort in the statistical analysis of this work.

To all my colleagues and every person in the dermatology department, I'm so thankful for their support and cooperation.

Deepest gratitude to my mother for her everlasting devotion, to my father -God's mercy upon him- for everything in my life and to my brothers for their continuous encouragement and support.

Seham El-tobshy
2009

List of Abbreviations

AM	Ante- Meridiem (before noon).
BID	Bis in die (twice daily).
BP	Benzoyl peroxide.
CAPE	Caffeic acid phenethyl ester (NF-κB inhibitor).
cc	Cubic centimeter.
CD	Cluster of differentiation.
CD45RA+	Naive T-cell subset in infants.
CD45RO+	Activated/memory T-cell subset in adults.
cm	Centimeter
CO_2	Carbon-dioxide.
CROSS	Chemical Reconstruction Of Skin Scars.
CYP21	Gene encodes cytochrome P450 which is involved in synthesis of steroids by hydroxylation at the 21 position.
DAX-1	Sex determining gene.
ECCA	echelle d'evaluation clinique des cicatrices d'acne.
ECLA	echelle d'evaluation Clinique des lesions d'acne.
Er:glass	Erbium: glass.
Er:YAG	Erbium: yttrium-aluminum-garnet.
ERK	Extracellular signal-regulated kinase.
Fig.	Figure.
FP	Fractional photothermolysis.
GC	Glucocorticoids.
H/E	Hematoxylin/ eosin stain.
HLA-DR	Human leukocyte antigen. (DR: a molecule of cell surface receptor and a maker for immune stimulation.)
HSPs	Heat shock proteins.
IGF-	Insulin-like Growth Factor.
IL-	Interleukin.
IL-R	Interleukin receptor.
INF	Interferon.
IPL	Intense pulsed light.
J	Joules
JNK	C-Jun-N-terminal kinase.
KTP	Potassium-titanyl-phosphate.
MAPK	Mitogen-activated protein kinase.

MKP-1	MAPK phosphatase-1.
mm	Millimeter
Nd:YAG	Neodymium: yttrium-aluminum-garnet.
NF-κB	Nuclear factor kappa-light chain enhancer of activated B cells.
nm	Nanometer (nm = 10^{-9} meter).
NS patients	Patients who were not prone to develop scarring.
$NSAID_S$	Nonsteroidal anti-inflammatory drugs.
P. acnes	*Propionibacterium acnes.*
P. granulosum	*Propionibacterium granulosum.*
P. parvum	*Propionibacterium parvum.*
PCI	Percutaneous collagen induction.
PDL	Pulsed dye laser.
PPAR	Peroxisome proliferator activating receptor.
PSR	Plasma skin regeneration.
RF	Radiofrequency.
RSTLs	Relaxed skin tension lines.
S. aureus	*Staphylococcus aureus*.
S patients	Patients who were prone to develop scarring.
SOX-9	Sex determining gene.
TCA	Trichloroacetic acid.
TIMP	Tissue inhibitors of metalloproteinases.
TLRs	Toll-like receptors.
TNF-	Tumor necrosis factor.
TNFR	Tumor necrosis factor receptor.
US FDA	United state food and drug administration.
W/V	Weight-in-volume.
ZTD	Zone of thermal damage.
ZTM	Zone of thermal modification.
˚ C	Degree Celsius (degree Centigrade).
µm	Micrometer (µm = 10^{-6} meter).

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INTRODUCTION

Acne lesions arise from the pilosebaceous follicles, which initially become obstructed with horny cells. Then a closed or opened comedo usually develops, which may later become inflamed. The presence of Propionibacterium acne is essential in the development of inflammatory acne. The follicular thinning of the wall may result in rupture of the hair follicle with stimulation of foreign body reaction and activation of the complement cascade. At this point, an attempt to limit the inflammatory reaction by epidermal encapsulation occurs. It is the degree of inflammation that determines the risk and amount of post-acne scarring. Acne scarring originates from a deep inflammatory reaction, and involves the destruction or loss of connective tissue, with dermal atrophy and fibrosis. During the maturation phase, the scar contracts and pulls the surface layers, causing indentation of the skin. Even though atrophic scars are the most common type of post-acne scarring, some patients may also present with hypertrophic scars and keloids **(Choi *et al*., 2006)**.

Acne scarring is common but surprisingly difficult to treat. Scars can involve textural change in the superficial and deep dermis, and can also be associated with erythema, and less often, pigmentary change. In general, treatment of acne scarring is a multistep procedure. It is important to emphasize to the patient that acne scarring can be improved but never entirely reversed **(Alam and Dover, 2006)**.

There are several classifications of acne scars. A recent, comprehensive and functional scheme was proposed, whereby scars are classified as rolling, ice-pick, shallow box-car, and deep box-car **(Alam and Dover, 2006)**.

There are several treatments for atrophic acne scarring. Topical retinoids, dermal fillers (including bovine collagen, human collagen, hyaluronic acid, autologous fat, among others), chemical peeling and microdermabrasion are the most popular while other procedures like punch excision (icepick, deep boxcar scars), punch elevation (wide boxcar scars), Subcision (rolling, depressed scars), dermal grafting, and laser surgery may also be used in treating acne scars **(Choi *et al*., 2006; Batra**, **2005; Alam *et al*., 2005)**.

Medium-depth chemical peels can cause regeneration of the epidermis and dermis, resulting in an increase in collagen, elastin and glycosaminoglycans. Dermal collagen remodeling continues to occur for several months **(Brody**, **1989; Cho *et al*., 2006)**. High concentration trichloroacetic acid (95-100%TCA) applied focally to atrophic acne scars, has been histologically shown to increase collagen fibers in the dermis and to result in decreased depth of acne scars **(Yug *et al*., 2006)**. This is also called the 'chemical reconstruction of skin scars' (CROSS method) **(Lee *et al*., 2002)**, in which high concentration TCA application has been shown to induce epidermal and dermal rejuvenation by stimulating deposition of collagen **(Cho *et al*., 2006)**.

Subcision is a procedure that releases subcutaneous fibrotic strands that tether the overlying tissue. The controlled trauma creates new connective tissue formation under the defect for additional support. The technique severs the fibrous bands while initiating a reactive fibrosis that gradually, over several weeks, propels the depressed scar upwards **(Alam *et al*., 2005; Alam and Dover, 2006)**. Bruising following subcision can last 1–2 weeks, but the procedure is well-tolerated with local infiltration of anesthetic. A benefit of subcision is the absence of any epidermal injury, except for minute needle insertion points **(Alam and Dover, 2006)**.

Although acne scars are recalcitrant to many therapeutic interventions, several therapeutic modalities either alone or in combination had to be studied for treatment of acne scars. A combination of treatments is often required to achieve satisfactory results **(Jacob et al., 2001)**.

AIM OF WORK

To compare the efficacy of high concentration TCA “CROSS” method and subcision as different therapeutic modalities in treatment of rolling acne scars.

ACNE

Definition

Acne is a chronic inflammatory disease of the pilosebaceous units. It is characterized by seborrhoea, the formation of comedones, erythematous papules and pustules, less frequently by nodules, deep pustules, or pseudocysts and in some cases, is accompanied by scarring **(Simpson and Cunliffe, 2004)**.

Incidence

- Acne vulgaris affects more than 45 million people in the United States alone.
- Acne vulgaris has a peak incidence during adolescence, affecting 85% of young people between the age of 12 and 24 years.
- 12% of women and 3% of men will continue to have clinical acne until 44 years of age
- Acne vulgaris is more common in males than in females during adolescence.
- It is more common in women than in men during adulthood.

(Zaenglein and Thiboutot, 2008).

Pathogenesis

The pathophysiology of acne involves a complex interaction of multiple factors, both internal and external to the pilosebaceous apparatus. The role of genetic predisposition and hereditary factors in the development of acne is uncertain, but is decidedly multifactorial. It is known that the number and size