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Tissue Glue (Octyl 2-Cyanoacrylate), A New Tool in Management of Facial Scar

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INTRODUCTION

Control of facial scarring is one of the most difficult challenges in surgical practice and presents a difficult therapeutic problem facing plastic surgeon in order to achieve good results [1].

Principles of wound closure focus relieving tension on the wound bringing the skin edges together in an everted orientation [2].

Application of sutures requires passage of a foreign material through the skin that is usually left in place for 5 to 10 days, if sutures are tied too light or left in too long; they may leave permanent suture tracks, also if sutures are removed before adequate healing may result in wound dehiscence. Additionally suture removal in sensitive areas of the face such as the nose, eyelids and lips can result in significant discomfort [3].

New technology in surgical adhesives may provide the option of sutureless skin closure [4].

The ideal adhesive should be, safe for topical application, easily applied, polymerize rapidly and also support the approximated skin edges eversion necessary for maximum wound healing [5].

Cyanacrylate adhesive despite their availability has failed to gain popularity due to the histotoxic effect associated with their use. The histotoxicity is related to the byproducts of the polymer degradation length of alkyl group of cyanocrylate derivatives and the rate at which degradation occur [6].

The shorter chain methyl and ethyl 2 cyanoacrylate degrade at a faster rate than their longer chain resulting in significant tissue histotoxicity [7].

The longer chain cyanoacrylate (octyl 2 cyanoacrylate was formulated to correct the deficiencies of the shorter chain as followed:

a- Slower degradation of octyl derivatives may decrease the concentration of cyanoacrylate polymer in surrounding tissue resulting in less inflammation.

b- Additionally plasticizers are used to produce a stronger, more pliable tissue compatible end product.

c- Also octyl 2 cyanoacrylate has a three dimensional breaking strength that is three times that of butyl 2 cyanoacrylate [8].

PATIENTS AND METHODS

This study was carried upon 30 patients suffering from post-traumatic facial scars admitted in Plastic Surgery Department, Assiut University Hospital from January 2001 to March 2003. Their ages ranged from 8 ys to 45 ys with a mean age 21.5 ys eighteen of them were males and twelve were females. The following sheet was filled for every patient:

Personal history: Name, age sex, marital status, special habit.

Complaints: and its duration.

Present history:

Aetiology of the scar:

1- Type of the trauma:
   a- M.C.A.
   b- Sharp object.

c- Blunt object.

d- Surgical wound.

2- Immediate management of the wound:

a- Sutured.

b- Not sutured.

Site of the scar:

a Forehead.

b- Cheek.

c- Nose.

d- Chin.

e- Neck.

Previous kenacort injection:

Medical history:

a- Hypertension.

b- D.M.

c- Ischemic heart disease.

d- Corticosteroid therapy.

Examination of the scar:

a- Site.

b- Length and width.

c- Shape (linear, semilunar, star shaped, H shaped).

d- Nature (atrophic, hypertrophic, wide spread scar).

Preoperative assessment using Hollander wound evaluation scale:

This score addresses six clinical items:

1- Step off borders.

2- Contour irregularities.

3- Scar width.

4- Edge inversion.

5- Excess inflammation.

6- Overall cosmetic appearance.

Each of these items was graded from 0-1; the optimal score was 6 and any score less than this was suboptimal.

Operative data:

Anesthesia:

1- General.

2- Local.

Type of excision:

1- Elliptical.

2- W or Z plasty excision.

Type of closure: Subcutaneous sutures and tissue glue.

Type of dressing:

a- Open.

b- Closed.

Postoperative data:

- Type of antibiotic - local steroid cream.

- Wound evaluation using (Hollander wound evaluation scale); every month for 6 months.

Each patient underwent complete surgical fitness investigations and preoperative photography. Local anesthesia was applied for 24 patients and general anesthesia for 6 patients. Elliptical excision was done for 26 patients and 4 of them underwent small “w” excision.

Surgical technique: After application of local or general anesthesia, the borders of the surgical site were marked with a marking pen and then the surgical site was cleaned with an antiseptic agent, excision of the scar either elliptical or W-plasty according to the surgical indication and surgical defect was created. Meticulous haemostasis was obtained using electro cauterization, Subcutaneous dead space was closed by competent 5-0 vicryl. Forcepes was used to maintain skin edge eversion during the application of the tissue glue the 2-octylcyanoacrylate was packed in a sterile pack that allow easy application through a permeable tip after breaking the internal capsule containing the glue.

The adhesive was applied in multiple thin layers over the incision site with a 10 to 30 second delay to prevent pooling or running, initial application of a thin layer of adhesive acted as a barrier which minimized any heat dissipation to the tissues while polymerization occurred. Also, the adhesive should be applied on and around the incision by 5 to 10 mm to ensure tissue stability.

Once the procedure was completed, the patient was under broad-spectrum antibiotic, anti-inflammatory and avoid any soaking or scrubbing in the surgical wound for at least 5 days. The wound was exposed from the second day post-operative and low dose of week corticosteroid cream was used to inhibit any allergic reaction.

Follow-up: Ranged from 5 months to 20 months with a mean 12 months. This was done in outpatient clinic weekly in first month and monthly for 6 months. Also immediate and late postoperative photography was taken for every patient, which also was evaluated by two blind surgeons for the technique.

RESULTS

Site of the scar: The most common site was forehead (14 patients) and the least one was chin (2 cases) (Table 1).

Relation of the scars to Langerhan's lines: There were 20 cases parallel to the Langerhan's lines and 10 cases perpendicular to the lines (Table 2).

Nature of the scar: There were sixteen patients presented by atrophic scars, seven cases by hypertrophic scars and seven cases presented by wide spread scars (Table 3).

Shape of the scar: The linear shaped scar was the most common shape in this study (22 cases) and the least one was the semi-lunar one (2 cases) (Table 4).

Preoperative evaluation using Hollander wound evaluation scale: According to this score all our patients were suboptimal (less than 6 in score) in different degrees (Table 5).

All patients were evaluated as regard the following:

Early follow-up:

Includes:

a- Wound dehiscence.

b- Heamatoma and seroma.

c- Wound infection.

d- Hypersensitivity to the glue.

Late follow-up:

1- Postoperative scar evaluation using (H.W.E.S).

2- Patient and surgeon satisfaction according to (H.W.E.S).

As regard wound dehiscence or infection, there was no case developing these complications during the period of the study.

There were no cases develop heamatoma or seroma due to competent subcutaneous sutures closing the dead space.

There were 2 cases develop hypersensitivity reaction to the glue at the third day postoperatively in form of redness at the wound edges aggravated by early and prolonged exposure to the sunlight but responding well to systematic anti-inflammatory drug and local steroid cream.

For all patients Hollander Wound Evaluation Scale (H.W.E.S.) used postoperatively, the results were noted to be affected by the site, shape, nature of the scar and its relation to Langerhan's lines.

As regard the site of the scar, excellent results were obtained in forehead, chin & neck and bad results in left cheek (Table 6).

As regard the shape of the scar, excellent results obtained with linear shape and bad results obtained with other shapes (Table 7).

As regard nature of the scar excellent results obtained with atrophic type and poor results with hypertrophic one (Table 8).

As regard Langerhan's lines, good results obtained with parallel group and poor results with perpendicular one (Table 9).

Also, our patients evaluation by Hollander score, was subjected to evaluation by 2 plastic surgeons blind to the procedure, and also to the patient himself about his or her degree of satisfaction. In most cases we noticed that the surgeon opinion usually consistent with our post-op. H.W.E.S., but the patient's feeling usually not consistent with H.W.E.S. and in most cases, their degree of satisfaction is poor inspite of good result according to Hollander score (Table 10).

Table (1): Distribution of the patients among different sites.

Site of the scar	No. of patients
Forehead	14
Left cheeck	6
Right cheeck	3
Chin	2
Neck	5
Total	30

Table (2): Relation of the site and Langerhan's line.

Site of the scar	No. of patients	Relation to Langerhan's lines	
		Parallel	Perpendicular
Forehead	14	10	4
Left cheeck	6	1	5
Right cheeck	3	2	1
Chin	2	2	0
Neck	5	5	0
Total	30	20	10

Table (3): Relation between nature and different scar sites.

Site of the scar	No. of patients	Nature of the scar		
		Atrophic	Hypertrophic	Wide spread
Forehead	14	7	3	4
Left cheeck	6	1	3	2
Right cheeck	3	1	1	1
Chin	2	2	0	0
Neck	5	5	0	0
Total	30	16	7	7

Table (4): Relation between site and shape of the scar.

Site of the scar	No. of patients	Shape of the scar		
		Linear	Semilunar	Star shaped
Forehead	14	10	1	3
Left cheeck	6	3	1	2
Right cheeck	3	3	0	0
Chin	2	1	0	1
Neck	5	5	0	0
Total	30	22	2	6

Table (5): Preoperative H.W.E.S. in different scar sites.

Site of the scar	No. of patients	Hollander Wound Evaluation Score H.W.E.S.		
		Score of 5	Score of 4	Score of 3 or less
Forehead	14	8	2	4
Left cheeck	6	2	2	2
Right cheeck	3	1	1	1
Chin	2	0	1	1
Neck	5	1	2	2
Total	30			

Table (6): Relation between post-op. H.W.E.S. and scar site.

Site of the scar	No. of patients	Post-op H.W.E.S.	
		Optimal score (6)	Suboptimal score (less than 6)
Forehead	14	10	4
Left cheeck	6	1	5
Right cheeck	3	2	1
Chin	2	2	0
Neck	5	5	0
Total	30	20	10

Table (7): Relation between scar shape and post-op. H.W.E.S.

Shape of the scar	No. of patients	Post-op (H.W.E.S.)	
		Optimal score (6)	Sub optimal score (< 6)
Linear shape	22	14	8
Semi-lunar	2	1	1
Star shaped	6	0	6
Total	30	15	15

Table (8): Relation between nature of the scar and post-op H.W.E.S.

Nature of the scar	No. of patients	Post-op H.W.E.S.	
		Optimal score (6)	Sub-optimal (< 6)
Atrophic	16	12	4
Hypertrophic	7	2	5
Wide spread	7	4	3
Total	30	18	12

Table (9): Relation between H.W.E.S. and Langerhan's lines.

Relation to langerhan's lines	No. of patients	Post-op H.W.E.S.	
		Optimal score (6)	Sub-optimal (< 6)
Parallel	20	18	2
Perpendicular	10	0	10
Total	30	18	12

Table (10): Correlation between H.W.E.S., surgeon's satisfaction and patient's satisfaction.

Site of scar	No. of patients	H.W.E.S. degree	Our post-op H.W.E.S.	Patient satisfaction	Surgeon satisfaction
Forehead	14	Optimal	10	7	9
		Sub-optimal	4	7	5
Left cheek	6	Optimal	1	0	2
		Sub-optimal	5	6	4
Right cheek	3	Optimal	2	0	2
		Sub-optimal	1	3	1
Chin	2	Optimal	2	1	2
		Sub-optimal	0	1	0
Neck	5	Optimal	5	2	4
		Sub-optimal	0	3	1
Total	30	–	–	–	–

CLINICAL CASES

Case (1)

Case (1-A): Pre-operative forehead scar.

Case (1-B): Immediate post-operative.

Case (1-C): Late post-operative.

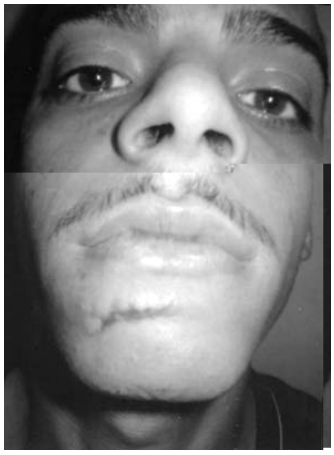
Case (2)

Case (2-A): Intra-operative after excision of the cheek scar.

Case (2-B): Immediate post-operative.

Case (2-C): Late post-operative.

Case (3)



Case (3-A): Pre-operative chin scar.

Case (3-B): Immediate post-operative.

Case (3-C): Late post-operative.

Case (4)

Case (4-A): Pre-operative cheek scar.

Case (4-B): Immediate post-operative.

Case (4-C): Late post-operative.

DISCUSSION

The concept of a surgical tissue adhesive for superficial skin closure is an attractive alternative to the use of sutures to both physicians and patients **[9]**.

Suture placement always requires application of an anesthetic agent and takes significantly more time than application of tissue adhesive (octyl 2 cyanoacrylate), also stitch removal cause pain and leaving high degree of anxiety especially in children.

Additionally tissue adhesive form its own protective barrier eliminating the need for additional bandages and excellent outcome **[10]**.

In this thesis we found that most of our patient's of middle age from 20 years to 25 years (70 of cases). Also, male to female ratio near to be equal with slight higher toward males who are more subjected to trauma. Also analysis of the data revealed that the percentage of general improvement in facial scar using octyl 2 cyanoacrylate after application (H.W.E.S.) was 66%, which considered good percentage and slightly higher than Dean et al. **[10]** who worked upon 50 cases with improvement rate about 55%. Also, the degree of improvement varied according to several factors such as site, shape, nature of the scar and also relation to Langerhan's lines.

Chin and neck records had best results (100%

improvement), followed by forehead (66%) and poor results with cheek areas (16%).

As regard the shape, best results were in linear shape (63%), followed by semilunar (50%) and bad results with star shaped (0%).

As regard the nature excellent results were with the atrophic type (75%) followed by the wide-spread scar (60%) and poor results with the hypertrophic type.

As regard its relation to Langerhan's lines, excellent results obtained with parallel group (90%) and bad one with perpendicular ones.

Also, we compared our results with patient's satisfaction and surgeon's satisfaction, we found that the surgeon opinion was nearly close to the score results in most cases, but the patient's satisfaction was usually low and not related to the score results. This may explained by the fact that the patient desires to remove this scar completely and most of them have some psychological problems related to the original trauma.

In Conclusion:

From this study we conclude that:

1- Revision of facial scar is one of most difficult task among the field of plastic surgery due to the following factors:

   a- Hazard type and shape of the trauma as a causative factor.

   b- Repair of original wound usually done by unexperienced surgeon.

   c- Placement of the wound may be in unfavorable site e.g. perpendicular to Langerhan's lines or in tissue under tension.

   d- Also timing of scar revision depends on several factors as type, site of the scar and psychological readiness of the patient.

2- Proper history, meticulous examination and preoperative evaluation of the scar using (H.W.E.S) should be done to make an accurate assessment for future results.

3- Long interview with the patient should be done, explaining to him his scar status, technique used for revision and suspected postoperative improvement is mandatory.

4- Fine tissue handling, meticulous haemostasis and competent subcutaneous sutures are extremely important to gain good result.

5- Tissue adhesive giving excellent results in atrophic scars, linear shaped and those parallel to Langerhan's lines.

6- Tissue adhesive is also recommended in superficial wounds that don't require application of anesthesia especially in children.

Disadvantages of this technique:

- Tissue adhesive is expensive.
- Application of tissue adhesive needs avoidance of any scrubbing or washing of the face for at least 5 days.

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