Quality of Scar Cosmesis After Surgical Wound Closure With Tissue Adhesive Cyanoacrylate

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ABSTRACT

Objective — *To assess the cosmetic appearance and frequency of optimal surgical wound closure using skin adhesive, the cyanoacrylate.*

Study design — *An experimental study.*

Place & Duration of study — *Department of Plastic and Reconstructive Surgery, Dow University of Health Sciences & Dr. Ruth KM Pfau Civil Hospital Karachi, from May 2018 to May 2019.*

Methodology — *Patients undergoing elective plastic surgery for wound closure with surgical skin incision of 5cm or less as measured by a standard centimeter scale were included in this study. After the completion of procedure, care was taken to achieve adequate hemostasis. Wounds were cleaned and dried thoroughly. Patients were followed up and photographed at 1st, 2nd, 6th and 12th weeks and quality of scar was assessed by modified Hollander Wound Evaluation Score (HWES).*

Results — *A total of 377 patients were included. The average age of the patients was 40.93±8.361 year. There were 150 (39.79%) male and 227 (60.21%) female. Frequency of optimally clean wound with cosmetically optimal wound closure after surgery using skin adhesive at 6thweek postoperative was observed in 91.51% (345/377).*

Conclusion — *Topical tissue adhesives offer a fast and better cosmic skin closure for appropriately selected wounds.*

Key words — *Wound closure, Skin adhesive, Cyanoacrylate*.

INTRODUCTION:

Different materials for wound closure have been tried throughout the history of medicine from woven horse hairs to synthetic polymeric threads to absorbable staples. In any surgical practice closure of wound is one the biggest challenges. Wound closure principles include no tension on the wound and approximating edges of the skin in everted orientation.[1] Sutures are foreign materials that pass through the skin and are allowed to remain in for a period of five to ten days. Sutures tied tightly or not removed for a longer period of time leave a permanent scar. If sutures are removed earlier, they may lead to wound dehiscence.[2] Sutures applied on face, nose, lips and eyelids are often a cause of great discomfort postoperatively.[3] In children removal of sutures often requires sedation as they get distressed if removal is done while awake.[4]

Suture-less skin closure with skin adhesive may just provide the answer to all the difficulties faced with application and removal of sutures. The adhesive is considered ideal if it is safe for local topical application, easy to apply, rapidly polymerize and should support the eversion of the approximated skin edges necessary for wound healing.[2] Cyanoacrylate adhesive is an alternate to wound closure. It is reported as fast and less traumatic mode of wound closure.[5] Other advantages are

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being non-invasive, does not need secondary dressing, easy to shower while applied and does not need removal as in case of suture or staple.[6] Relative disadvantages are being expensive and more technical to get them done right.[7] Wound cosmesis after tissue adhesive closure is an issue on which opinion is divided. Cyanoacrylate and other tissue adhesives have been used in a variety of settings and different surgeries with variable results with regards to cosmetic appearance of postoperative wound.

There lies a gap and equivocal results in the literature with regards to the question that whether tissue adhesives or suture closure of wounds provide better cosmetic results and there is a debate regarding which methods of wound closure is better. In plastic surgery, as patients' demand better cosmetic results, it is of utmost importance to determine which method provides the best outcome. This study was conducted to add evidence based report on the use of cyanoacrylate for wound closure.

METHODOLOGY:

This experimental study was conducted at the Department of Plastic and Reconstructive Surgery, Dow University of Health Sciences & Dr. Ruth KM Pfau Civil Hospital Karachi, from May 2018 to May 2019. Patients undergoing wound closure of a surgical incision 5cm or less were included in the study. Patients with known sensitivity to cyanoacrylate, formaldehyde or acetone products, history of rashes, keloids, use of steroids and blood clotting disorders were excluded. Informed consent was signed by all patients.

All patients requiring skin closure after surgery underwent same preoperative evaluation and received the recommended preoperative and peroperative care as per protocol. Prophylactic antibiotic was given. After the completion of procedure, care was taken to achieve adequate hemostasis. Wound was cleaned and dried thoroughly. Dermal closure was achieved with polyglycolic (Vicryl 4/O. Wound edges were manually approximated with forceps for closure of wound and glue was put in a drop like manner along the entire wound length. Care was taken not to enter the subcutaneous layer. For complete polymerization, wound edges were held for 20-30 seconds. No dressing was applied over the wound. Patients were followed up and photographed at 1st, 2nd, 6th and 12thweeks and quality of scar was evaluated by modified HWES.

SPSS version 21 was used for statistical analysis. Mean and standard deviation was computed for numerical data like age and size of wound. Frequency and percentages were calculated for categorical data like gender, site of wound and wound with optimal score on Hollander Wound Evaluation Score at 6th postoperative week. Stratification was done according to age, gender, site and size of wound to assess the effect of these modifiers on final outcome by employing Chi-square test and taking p-value of =0.05 as statistically significant.

RESULTS:

A total of 377 patients undergoing elective surgery with surgical skin incision of 5cm or less were included. The age of the patients was from 18-60 years. The site of wounds is given in Fig-I. The average age and size of wound was 40.93±8.36 year and 3.17±1.21 cm respectively. There were 150 (39.79%) males and 227 (60.21%) females. Surgical wound closure using skin adhesive at 6thweek postoperative was observed in 91.51% (345/377). Frequency of optimal wound closure was significant among different age groups (p=0.044). This is given in table I. Frequency of optimal wound closure by site of wound was not significant (p=0.769) while the frequency of optimal wound closure was significantly higher in those patients who had =3 cm size of wound. This is given in figure I and table II & III.

DISCUSSION:

Wound closure techniques have evolved from the earliest development of suturing materials to new resources that include synthetic sutures, absorbable sutures, staples, tapes, and adhesive compounds. The engineering of sutures of the synthetic material along with standardization of traditional materials has made for superior aesthetic results. Similarly, the creation of natural glues, surgical staples,

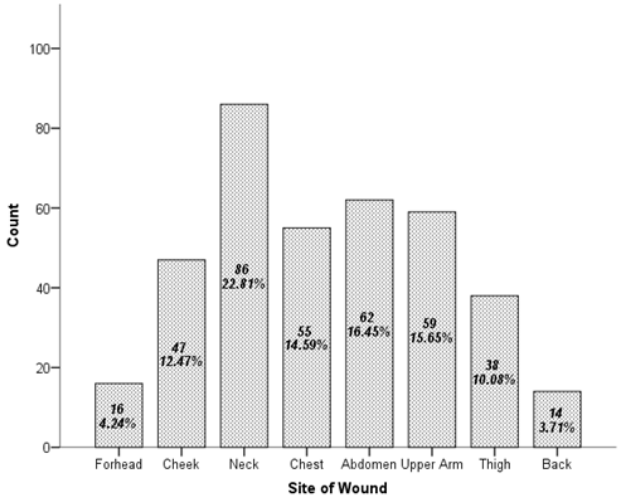

Figure I: Site of wounds

Table I: Optimal Wound Closure At 6 Weeks By Age

Age Groups (Year)	Optimal Wound Clean		Total	P-Value
	Yes	No		
< 30	16 (80%)	4 (20%)	20	0.044
31 to 40	156 (94.5%)	9 (5.5%)	165	
41 to 50	130 (88.4%)	17 (11.6%)	147	
>50	43 (95.6%)	2 (4.4%)	45	

Chi-Square= 8.106

Table II: Optimal Wound Closure At 6 Weeks According To The Site of Wound

Site of Wound	Optimal Wound Clean		Total	P-Value
	Yes	No		
Forehead	15 (93.8%)	1 (6.3%)	16	0.769
Cheek	45 (95.7%)	2 (4.3%)	47	
Neck	79 (91.9%)	7 (8.1%)	86	
Chest	49 (89.1%)	6 (10.9%)	55	
Abdomen	56 (90.3%)	6 (9.7%)	62	
Upper Arm	54 (91.5%)	5 (8.5%)	59	
Thigh	33 (86.8%)	5 (13.2%)	38	
Back	14 (100%)	0 (0%)	14	

Chi-Square= 4.09

Table III: Optimal Wound Closure At 6 Weeks According To The Size of Wound

Size of Wound	Optimal Wound Clean		Total	P-Value
	Yes	No		
< 3 cm	217 (98.2%)	4 (1.8%)	221	0.0005
>3 cm	128 (82.1%)	28 (17.9%)	156	

Chi-Square= 30.66

and tapes to substitute for sutures has supplemented the armamentarium of wound closure techniques.

The aesthetic closure is based on knowledge of healing mechanisms and skin anatomy as well as an appreciation of suture material and closure technique. Choosing the proper materials and wound closure techniques ensures optimal healing. The introduction of tissue adhesives has been received enthusiastically since they may result in equivalent tensile strength, improved cosmetic appearance of the scar and lower infection rate when compared with sutures, staples and adhesive tapes, and they are without many of the risks and disadvantages of alternative methods.[8]

Long term outcome of wound repair that matters most to the patients is the cosmesis.[9,10] Various studies comparing tissue adhesive with sutures reported primarily wound-closing time or early complications and had only analyzed the cosmetic results as a secondary outcome.[9,11,12] No study reported cosmetic outcome to be statistically significant, whereas only two studies analyzed the cosmetic results of the scar after 3 months.[13,14] We considered appearance at 6 weeks to be meaningful. In our study, frequency of optimal wound closure with cosmetically optimal wound closure after surgical wound closure using skin adhesive at 6week postoperative was observed in 91.51% showing adhesive as equivalent to previous old wound closure materials for ideal wound healing and excellent cosmic results after closure of surgical incisions. Many studies validate our results. Maartense et al concluded that the cosmetic results with tissue adhesives were significantly better than with adhesive tape.[13] Toriumi et al had compared tissue adhesives with sutures and showed that long term results were better with tissue adhesives.[15] Dowson et al applied the HWES to measure the cosmetic

results and reported that the use of tissue adhesive to be time saving, had similar rate of complications and outcomes in comparison to non-absorbable sutures.[14]

Remodeling of wounds may take 24 months for completion. Indication of the final scar modeling is expected at 3 months as supported by the results of Quinn et al who reported that the cosmetic outcome after 3 months is strongly predictive of the cosmetic appearance after one year.[16] In our study, we have considered appearance at 6 weeks to be meaningful. Patients were followed and photographed sequentially and quality of scar was evaluated by modified HWES. This provided an objective assessment of wound appearance.

CONCLUSION:

Topical tissue adhesives had a faster healing time and a better cosmetic wound appearance.

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Received for publication: 18-12-2019

Accepted after revision: 10-03-2020

Author's Contributions:
Hyder Ali: Conceived, designed, statistical analysis & editing of manuscript.
Sami Tasleem: Data collection and manuscript writing
Mujtuba Pervez Khan: Final approval of the manuscript.
Waqas Sami: Reviewed and edited manuscript.

Conflict of Interest:
The authors declare that they have no conflict of interest.

Source of Funding: None

How to cite this article:
Ali H, Tasleem S, Khan MP, Sami W. Quality of scar cosmesis after surgical wound closure with tissue adhesive cyanoacrylate. J Surg Pakistan. 2020;25 (1):8-12. Doi:10.21699/jsp.25.1.3.