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Effect of tissue adhesive Octyl-2-Cyanoacrylate in traumatic facial wounds

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ABSTRACT

Introduction: Tissue adhesives have been taken into consideration because they do not need to be removed after wound healing. This study was conducted to compare scars remained by Octyl-2-Cyanoacrylate and sutures in traumatic facial wounds in adults.

Materials and Methods: This randomized clinical trial study was performed on 50 patients aged 15-50 years referred to Babol Shahid Beheshti Hospital due to traumatic facial wounds. Written informed consent was obtained for each patient. The patients were divided into two groups. In the first group, patients were treated with 5-0 nylon suture and Octyl-2-Cyanoacrylate was used for wound repairment in second group. The patients were followed up on 1, 7, 60 and 120 days after wound healing and assessed by Patient and Observer Scar Assessment Scale (POSAS) and Vancouver criteria to evaluate remaining scar. Also amount of pain intensity was determined by the Visual Analogue Scale (VAS) criteria, 7 days after wound healing. Data was analyzed by SPSS V16, t-test, Friedman, Chi-square and Man-Whitney-U tests.

Results: Twenty-eight (56%) were male and 22(44%) female. There was a significant decreasing trend in Vancouver and POSAS indices during 120 days of study ($p<0.001$). Based on POSAS and Vancouver criteria there was no significant difference between two groups on the days 1, 60 and 120. However, on day 7, there was significantly better healing result in the adhesive group compared to the suture group. Based on the VAS criteria; the average pain intensity was 4.14±1.16 in sutured group, on 7th day ($p=0.00$). There was no significant difference in wound closure time between the two groups ($p=0.07$).

Conclusion: Generally, there was no significant difference between the scar left by sutures and tissue adhesives after 120 days.

Keywords: Facial wound, Octyl-2-Cyanoacrylate, Suture, Tissue adhesive.

Introduction

Cutaneous wounds are as old as mankind. The earliest record of wound closure dates back to 1100 BC [1]. Nowadays surgeons have several choices for wound closure with less pain and no need for removal sutures after healing. These non-invasive materials include; Butyl-Cyanoacrylate (Histoacryl), Actyl-Cyanoacrylate (Dermabond) and surgical bands like Steri strip [1]. Basic bond monomer is a liquid with low viscosity. Cyanoacrylates polymerize into some long chains that create a strong membrane by contact with anionic materials like blood to keep wound margins closer. Because the adhesive membrane generally will be removed by epidermal layer regeneration after 5 to 10 days, there is no need to remove this adhesive layer [2].

Cyanoacrylate adhesives were discovered in 1949 and used 10 years later by Coover et al in surgical procedures. While these materials have been used during the past decades, their use has been restricted by the inferior mechanical properties of the butyl-cyanoacrylates (due to poor tensile strength

and brittle nature) limiting their use to small low-tension lacerations and incisions [3]. The development and introduction of the stronger and more flexible 8 carbon 2-octylcyanoacrylate (Dermabond), in the summer of 1998 has been a major advancement in the wound closure field. This derivative has a longer side chain and forms a stronger and more flexible bond, with a three-dimensional breaking strength four times that of butyl-2-cyanoacrylate. In 1998 Octyl-2-Cyanoacrilate was approved by FDA for traumatic and surgical wound closure [4]. Unlike suturing, using cyanoacrylate has no need to have any special tools, anesthetic injection and removing after surgery. Moreover, less time is spent by using this material and it is less sensitive to developing infections. When Cyanoacrylate tissue adhesives were compared with absorbable and non-absorbable suture threads on facial wounds of children, the results revealed that Cyanoacrylates are advantageous [1]. Based on various studies, the suture threads by their properties and the instruction for their usage can cause infection. Also suture threads as a foreign body may have the potential to cause infection in wound area [5,6].

Maghareh Abed (2007) compared two ways of using tissue adhesive in closure of periodontal flaps in patients with moderate periodontitis and reported better efficacy of tissue adhesives in increment of post-surgical wound healing and related decrease of bleeding, less time for surgery, preventing perforation, torn and bleeding from gingival tissue and higher patient satisfaction [7].

Singer (2002) compared cosmetic outcomes of wound healing by tissue adhesives and suturing and showed that during the 3 months period there were no significant difference between the two methods [8].

Jennifer (1997) compared cyanoacrylates tissue adhesives and subcuticular sutures in head and neck incisions and the results showed no significant difference in cosmetic outcomes [9].

According to low attention for using tissue adhesives for wound closure in our country and also no registered study in this field, this study was conducted to evaluate the effect of Octyl-2-Cyanoacrylate in traumatic facial wounds repairment.

Materials and Methods

This randomized clinical trial study was performed on 50 patients aged 15-50 years with traumatic facial wounds and following inclusion criteria: no systemic disease; no consumption of drug affecting on blood factors and liver function; wound diameter less than 4 centimeters; linear wounds; wound depth less than 0.5 centimeter; no contusion in wound margins; no dirty wound; no history of unusual scars in wound area and no history of colloid. After obtaining written informed consent, patients were randomly divided into two groups. First group was treated with 5/0 nylon 3/8 circle round suture thread (Supa medical devices: Iran) and second group by Octyl-2-Cyanoacrylate tissue adhesive (B–Braun; Germany). Tissue adhesive (blue) produced from butyl cyanoacrylate or enbucrilate. For application to the edge of the wound as well as for sclerotherapy. In this step the time spent for each procedure was recorded. Patients were followed up 1, 7, 60 days and 120 days after wound repair. Clinical criteria were measured and appropriate images were obtained from the wound area with a Sony cyber-shot (12 megapixels) at a distance of 30 centimeters, with equal magnification and perpendicular to wound surface so that comparison would be possible at the end of the study. To evaluate remaining scars, POSAS was used. This scale includes pain and itching measures and consists of two numerical criteria including evaluation of the scar by patient and by the observer. These criteria consist of the evaluation of vessels, pigmentations, thickness, flexibility of surface and also evaluation of patients' symptoms including pain, itching, color and thickness. Moreover, Vancouver scale was performed to evaluate four variables including vascularity, height/thickness, flexibility and pigmentation. Sensation of patient about his or her scar was not included. To measure the pain, Visual Analogue Scale (VAS) was used. The VAS comprises of a 10cm usually horizontal line with two extreme scores of 0 to 10, in which 0 means no pain and 10 a pain which cannot be tolerated. Using VAS, the intensity of pain was measured in sutured group, in the day of 7 and during suture removal. Data was recorded and imported to the SPSS v.16 and analyzed using Chi-square, Friedman, t-test and Mann-Whitney-U tests. $P<0.05$ was considered significant.

Results

This randomized clinical trial study was performed on 50 patients with an age range of 15-50 years referred to Shahid Beheshti Hospital due to traumatic facial wounds. The mean age of participants was 30.6±10.74 years (15-50 years); 28(56%) were male and 22 (44%) female, distributed as 14 (56%) males and 11(44%) females in each group. The mean age in sutured group was 32.48±10.68 (17-49 years) and 28.72±10.68 (15-50 years) in tissue adhesive group and there was no significant difference between the two groups (p=0.21). Based on Vancouver criteria, there was no significant difference between the two groups on the first day (p=0.32). Same results were obtained on the days 60 and 120. On day 7, there was significantly less scar tissue in the adhesive group compared to the sutured group according to the Vancouver criteria (p<0.001) (Table 1).

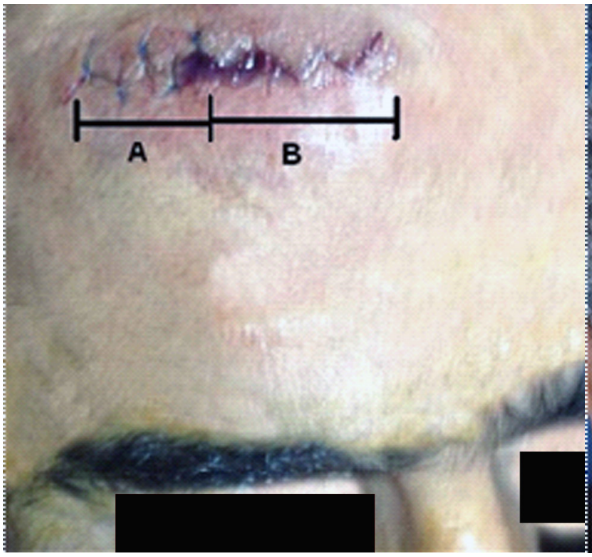


Figure 1. The day of wound closure.
A: suture thread was used
B: tissue adhesive was used

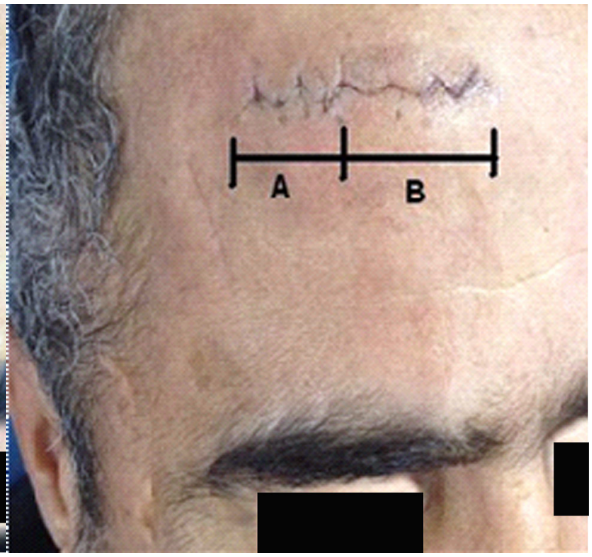


Figure 2. Seven days after wound closure.
A: suture thread was used
B: tissue adhesive was used

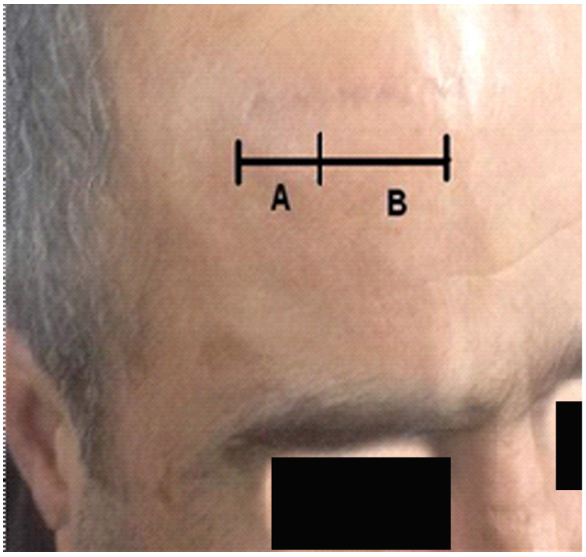


Figure 3. Two months after wound closure.
A: suture thread was used
B: tissue adhesive was used

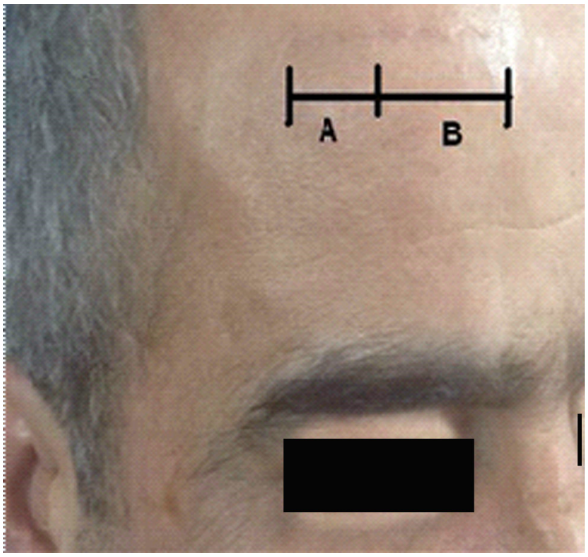


Figure 4. Four months after wound closure.
A: suture thread was used
B: tissue adhesive was used

Table 1. Comparison of Vancouver index in sutured group and tissue adhesive group.

Day of study	Repair method	Mean ± Standard deviation	95% Confidence interval	p
1st day	Suture	7.4±0.91	0.62-1.69	0.32
	Tissue adhesive	7.24±0.97		
7th day	Suture	6.44±1.04	0.63-1.92	0.001
	Tissue adhesive	5.16±1.21		
60th day	Suture	3.42±0.88	0.32-1.27	0.34
	Tissue adhesive	3.32±0.80		
120th day	Suture	1.72±0.76	0.19-1.08	0.21
	Tissue adhesive	1.92±0.81		

Table 2. Comparison of POSAS index in sutured group and tissue adhesive group.

Day of study	Repair method	Mean ± Standard deviation	95% Confidence interval	p
1st day	Suture	36.72±2.15	1.04-3.76	0.7
	Tissue adhesive	37.32±2.61		
7th day	Suture	29.32±2.42	2.01-4.78	0.001
	Tissue adhesive	25.92±2.44		
60th day	Suture	22.24±2.69	1.38-4.21	0.43
	Tissue adhesive	21.44±2.27		
120th day	Suture	13.6±1.75	1.25-2.98	0.07
	Tissue adhesive	14.48±1.22		

There was a decreasing trend in Vancouver index in both groups, on the days 1, 7, 60 and 120, that was statistically significant (p<0.001) (Diagram 1).

Average POSAS index showed no significant difference between the two groups on the first day (p=0.7).

The results obtained on 60th and 120th days of study showed no statistically significant difference (p=0.07) and (p=0.43). On 7th day and in tissue adhesive group; this index was significantly less than sutured group (p<0.001) (Table 2).

There was a decreasing trend in POSAS index in both groups, on the days 1, 7, 60 and 120, that was statistically significant (p<0.001) (Diagram 2).

On 7th day and based on VAS criteria, average pain intensity during removing sutures in patients was 4.88±1.16 (3-7). Also it was 4.14±0.66 in males and 5.82±0.98 in females that showed significant difference between two genders (p=0.0001). Moreover, time spent for wound repairment by using tissue adhesive was 3.68±1.65 minutes and 4.56±1.75 minutes using sutures and there was no significant difference between the two groups (p=0.07).

Discussion

This study was conducted to compare effect of Octyl-2-Cyanoacrylate and sutures in traumatic facial wounds. Similar to previous studies, results of current study showed no difference in cosmetic outcomes in traumatic

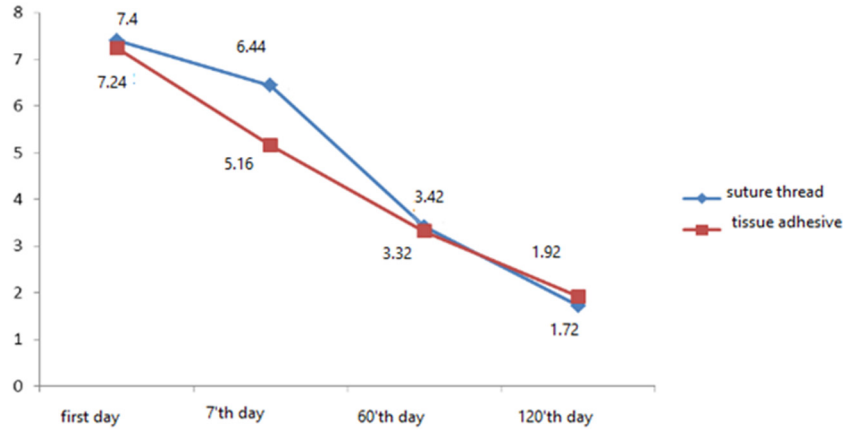


Diagram 1. Wound healing process based on Vancouver index in sutured group and tissue adhesive group.

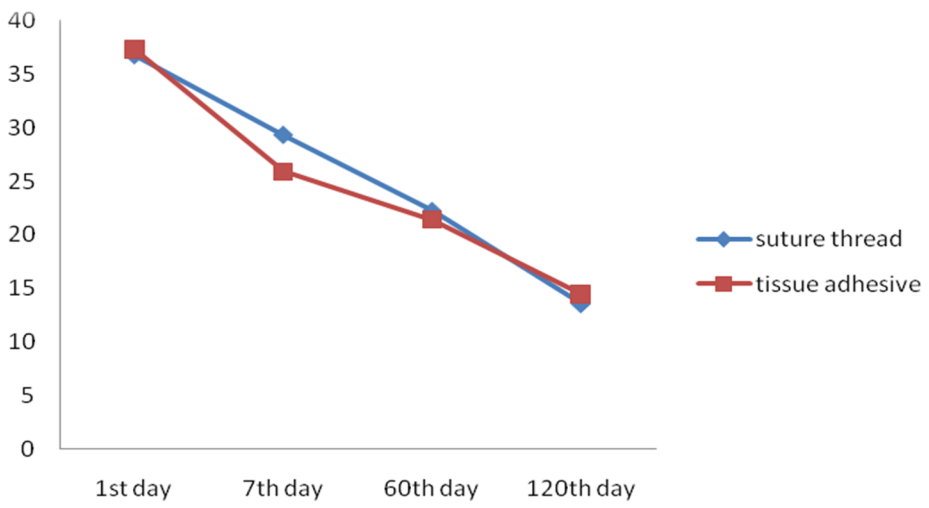


Diagram 2. Wound healing process based on POSAS index in sutured group and tissue adhesive group.

facial wounds repaired by Octyl-2-Cyanoacrylate tissue adhesive and suture threads [8,9]. The obtained results on first day of the study showed that depth of repaired wound was similar in two performed methods. However, in evaluation of the proximity of wound margins, the results in sutured group were better than tissue adhesive group but it was not significantly different. These results were similar to results reported by Handschel et al.; Bernard et al. and Man et al. in their studies [3,10].

On 7th day of the study, patients were evaluated in terms of depth of the scar, amount of tissue epithelialization, erythema around the wound area and wound infection. The results obtained in tissue adhesive group were significantly better than that of sutured group in all cases. Also patients were evaluated in terms of opening the sutures or detachment of tissue adhesive; and only in one patient tissue adhesive had been detached from the wound sites. The same example of the detachment of tissue adhesives from the wound sites has been reported two days after wound closure in one patient in the study performed by Namjoonik et al. (2002), conducted to compare the use of Cyanoacrylates instead of suture threads in wounds of the buccal mucosa [11]. Further trauma to wound area can be mentioned as the reason of this issue.

Two months after wound closure there was no difference between two groups in terms of remaining scar, infection and proximity of wound margins that was similar to William's results in USA, but different with Bernard's study (2001) results [10,12]. He showed that using suture threads along two months had better outcomes in comparison with tissue adhesives.

The obtained results at the last day of the study were a little different from previous results. In patients younger than 25, remained scar tissue in adhesive group was significantly more dominant than sutured group. Moreover, in sutured group, the adjustment of the wound margins with surrounding tissue was better than the tissue adhesive group. Wound margins in tissue adhesive group seemed to be bulged in younger patients and amount of vascularization was a little more than surrounding tissue, but this was not observed in sutured group which is similar to Handschel's and Switzer's results but unassociated with the results of Man's study [3,13]. Bernard et al in a study in 2001 evaluated the difference between Octyl-Cyanoacrylate tissue adhesive and sutures in excisional wound closure in children and adults and mentioned that suture has better results than tissue adhesive in children. Toriumi et al reported better results in adults in a study of comparison of Octyl-Cyanoacrylate tissue adhesive in facial plastic surgeries [14]. Generally, in recent study there was no correlation between remained scar and the age of patients. This result was also obtained for the gender of the patients and generally there was no difference between male and female in healing process.

In this study, sutured group patients were evaluated for pain intensity during suture removal based on pain scores on 7th day and their results were organized based on gender. Therefore, the scores of the females were higher than the males.

Also In this study the time spent for wound closure by tissue adhesives was less than suturing method which was similar to the results of previous studies. Contrary to previous studies, the differences were not significant, and the reason probably was that the residents of studied hospital were more experienced in suturing than tissue adhesive method.

Conclusion

This study was conducted to compare scars remained by Octyl-2-Cyanoacrylate and sutures in traumatic facial wounds. The results showed that generally using of Cyanoacrylate tissue adhesive and suture threads in traumatic facial wounds have no difference in cosmetic outcomes and tissue adhesives could be used instead of sutures in wound repair.

***Conflict of interest**: The authors declared no conflict of interest.*

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