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Comparison of cosmetic outcomes of nonabsorbable sutures versus octyl-2-cyanoacrylate tissue adhesive in pediatric traumatic facial lacerations

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ABSTRACT

Aim: To compare the cosmetic results and complications of using monofilament sutures and octylcyanoacrylate tissue adhesives in facial lacerations in the pediatric age group admitted to the emergency department.

Methods: Our study was conducted retrospectively on pediatric patients that were admitted to the emergency department of our hospital. Children between ages of 1 and 18 years old that had lacerations on facial area were evaluated in the surgical yellow zone of our hospital. A total of 120 patients were followed. Standardized photographs were taken at 6 months and, who rated the wounds on a validated cosmesis scale.

Results: A total of 120 patients with lacerations, 60 of whom used suture and 60 used tissue adhesive, were included in the study. In the evaluations after 6 months, no differences were found between the groups in terms of demographic and clinical characteristics. When evaluated in terms of scar healing (according to VAS), which is considered a late-term complication, the use of adhesive was found to be statistically significant (p = 0.0002). In addition, tissue adhesives were found to be statistically significant in comparisons made according to patients' satisfaction with the healing process, application of the procedure (p = 0.025), patients' recommendation for the procedure (p < 0.0001) and the presence of damaged tissue after wound healing (according to ISCD) (p=0, 0082).

Conclusions: The results of our study suggest that the assessment of wounds 6 months after injury and wound repair provides a good measure of long-term cosmetic outcome. Additionally, octylcyanoacrylate tissue adhesive may be a good alternative in the treatment of facial injuries in children when appropriate patient selection is made.

Key words: Pediatric trauma, facial lacerations, monofilament sutures, octylcyanoacrylate, wound healing, treatment outcome.

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1. Introduction

Wound management, which is an important part of emergency medicine practice and education, can present a wide variety of spectrum to clinicians. In wound management, lacerations are repaired with sutures, staples, adhesive tapes and tissue adhesives. Cosmetic results are important, in particular injuries that occur in the

facial area followed by disruption of skin integrity. In wounds with compromised skin integrity (especially on the face) that are admitted to the emergency department, the goal is to restore skin integrity and, by doing so, reduce the rate of infection, scarring and dysfunction [1,2].

There are various suture techniques depending on the characteristics of the laceration. Simple sutures are mostly used in lacerations with low wound tension and no deep tissue extension, as in our patient group [3]. Topical tissue adhesives are one of the alternative techniques used instead of sutures. 2-octyl-cyanoacrylate is a cyanoacrylate derivative used for the adhesion of tissue in the wound area in traumatic lacerations. Cyanoacrylate; it is a long-chain polymer and provides a connection between the lips in scar tissue. They are also used effectively in gastroenterological applications to stop bleeding as well as skin injuries [4]

This study aimed to compare the cosmetic results and complications of the use of non-absorbable suture and tissue adhesive (2-octyl cyanoacrylate) for facial lacerations in the pediatric age group admitted to the emergency department.

2. Materials and metods

Our study was conducted retrospectively on pediatric patients that were admitted to the emergency department of a University Hospital between 1 January 2019 and 31 December 2020. Our study was approved by the Akdeniz University Ethics Committee (Decision no: 6/2 dated 6 June2021). Children between ages of 1 and 18 years old that had lacerations on facial area were evaluated in the surgical yellow zone of our hospital. All patients in our study are of white race. Patients with a previous history of keloid and hypertrophic scars were excluded from the study. Lacerations on the scalp, eyelids, earlobes, curved areas of facial expressions, crush injuries, lacerations longer than 5 cm and wider than 0.5 cm, dirty and deep sublacerationsaneous lacerations were excluded from the study. Additionally, patients whose procedure were at least 6 months old were included. Patients with wounds that were not thought to require deep wound care were divided into two subgroups and skin closure was performed immediately with monofilament sutures or octylcyanoacrylate.

A product containing 2-octyl-cyanoacrylate derivative was used as tissue adhesive. Wounds closed with octylcyanoacrylate were prepared in a standard manner. Wounds were cleansed with an antiseptic solution, and hemostasis was achieved with pressure or topical 1:1,000 epinephrine as appropriate. Wound edges were manually approximated with the use of fingers or forceps. The physician conducting the repair topically painted the octylcyanoacrylate over the manually apposed wound edges using the applicator tip, careful not to apply the adhesive between the wound edges. The wound was held for 30 seconds to allow complete polymerization.

Practitioners in the study were selected among emergency medicine specialists with at least two years of experience. Sutured wounds were anesthetized and cleansed at the treating physician's discretion and the skin closed with a 6-0 monofilament suture under sterile techniques. A dressing was applied for at least 48 hours. Patients were asked to return for early suture removal, wound assessment, or both—3 to 5 days after repair for facial lacerations.

Patients were contacted by phone, invited to the hospital and face-to-face interviews were held. In the patient data form, the type of procedure performed, the location of the laceration, its duration, the development of bleeding and infection afterwards, the number of visits to the hospital including dressing, and satisfaction with the procedure were present.

Informed consent was obtained from the patient's relatives. The patient data form was filled out with the patients and the process was recorded. Standardized photographs were taken at 6 months and, who rated the wounds on a validated cosmesis scale. Patient data were scanned retrospectively. Scar evaluation was interpreted using the cosmetic Visual Analogue Scale (VAS) from the patient data form [5]. The International Scar Classification Definitions (ISCD) published in 2019 were used to evaluate wound healing after 6 months of wounds repaired with simple sutures or tissue adhesive [6]. For the purpose of ensuring standardization in photographs showing the scar, at least 2 pictures were taken within 1 meter, noting that the ambient light was sufficient. Classification of wounds was made by a single physician, an emergency medicine specialist with 10 years of experience. Classification was made using these photographs and physical examination.

2.1. Statistical Analysis

The data were analyzed with the SPSS 23.00 for Windows statistical program, with a 95% confidence interval. Descriptive data were expressed as number (n), percentage (%), mean±standard deviation, median, and minimum-maximum. The distribution of continuous data was examined with the Kolmogorow Smirnow test. Student's T test and Mann Whitney U tests were used as appropriate to evaluate numerical data, and the chi-square test was used to evaluate categorical data. A value of $p<0.05$ was considered statistically significant.

3. Results

A total of 120 patients were included in the study, 60 of whom used suture and 60 used tissue adhesive. There was no significant difference in the analysis between the gender of the patients, the repair method used and the type of trauma they experienced.

While the average age of patients who underwent suture application was 7.32±3.15 years, the average age of patients who underwent adhesive application was 6.72±3.1 (Table 4). 14 of 60 patients (23.3%) who underwent suturing and 25 (41.6%) of 60 patients who received adhesives were female (Table 1).

Table 1. Demographic data.

Parameters	Number of patients	Average
Gender Female	40	7,07±2,9
Male	80	6,79±3,2
Repair method		
Suture	60	7,32±3,15
Female	14	8,28±2,09
Male	46	7,26±3,50
Adhesive	60	6,72±3,1
Female	26	6,4±3,13
Male	34	6,176±3,11

The most common type of injury in patients was observed to be blunt trauma (105). Injuries caused by sharp objects were detected in 15 patients. No significant difference was found in the analysis between the gender of the patients, the repair method used, and the type of trauma they have had experienced (Table 2).

Table 2. Type of injury.

Parameters	Blunt truma	Penetrating	*P* value
Suture	50	10	
Adhesive	55	5	*0,1153*
Male	70	10	
Female	33	7	*0,3424*

In the comparison made on the patients' injury sites; 70.49% of the patients who underwent suturing had injuries in the forehead area, 18.03% had injuries in the chin, 8.2% in the

cheeks and 3.28% in the lip area. Patients who underwent adhesive application; 60% were injured in the forehead area, 23.3% were injured in the chin, 15% in the cheek and 1.67% in the lip area. Tissue adhesives that applied to the injured regions were placed outside the movement areas of the mimic muscles. No significant difference was seen in the comparison between the patients' laceration sites (Table 3).

Tablo 3. Laceration sites.

Laceration sites	**Suture n/%**	**Adhesive n/%**	**Chi-square *P value***
Forehead	43/70,49	36/60,00	*Non-significant*
Cheek	5/8,20	9/15,00	
Chin	10/18,03	14/23,33	
Lips	2/3,28	1/1,67	

Patients reached through the hospital information management system were invited to the hospital for evaluation in the sixth month of the injury. During the meeting, photographs were taken for evaluation purposes. The patients' satisfaction, repair methods, scarring and healing conditions were compared with the Cosmetic Visual Analog (CGA) scale applied to the patients. The results between the distributions of the patient groups and the CGA scale results are given in Table 4.

As the procedure times for the patients were compared, in patients with adhesive application all procedures were completed in less than 30 minutes, in patients with suture application the procedure time was between 30 minutes and 1 hour in 35 patients and more than 1 hour in 9 patients. When the procedure groups were compared as shorter and longer than 30 minutes, it was detected that tissue adhesive application took 4.75 times less time, according to the chi-square test between groups (p <0.0001).

A comparison was made between the results of the patients according to the type of repair. No significant difference was seen in the chi-square test on early complications (bleeding and infection). When evaluated in terms of scar healing (according to VAS), which is considered a late-term complication, the use of adhesive was found to be statistically significant (p = 0.0002). In addition, tissue adhesives were found to be statistically significant in comparisons made according to patients' satisfaction with the healing process, application of the procedure (p = 0.025), patients' recommendation for the procedure (p < 0.0001) and the presence of damaged tissue after wound healing (according to ISCD) (p=0, 0082). (Table 5).

Table 4. Comparison of patient outcome and application types.

Parameters		**Suture (n)**	**Adhesive (n)**	***P value***
Infection	Yes	2	1	*0,5686**
	No	58	59	
Bleeding	Yes	1	2	*0,5491**
	No	59	58	
Scar tissue	Yes	49	29	***0,0002*****
	No	11	31	
Satisfaction with the healing	Yes	46	55	***0,0259*****
	No	14	5	
Satisfaction of procedure	Yes	45	56	***0,0038****
		15	4	
Presence of damaged tissue	Normal	34	47	***0,0082*****
	Damaged	26	13	

**Fischer Exact test, **Chi-Square test*

In patients with suture procedure, 33 patients had normal outcome, immature scars were observed in 9 patients, 15 patients had mature scar and 3 patients had hypertrophic scar tissue. In patients that had been applied tissue adhesives, 47 of them did not develop scar tissue during follow up, immature scars were present in 3 patients,

mature scars were seen in 9 patients and hypertrophic scar was seen in 1 patient. No keloid tissue was observed in any of the patients (Table-5)

Table 5. Presence of damaged tissue after wound healing (according to ISCD).

Parameters	Suture	%	Adhesive	%
Normal	34	56,66	47	78,33
Immature scar	9	15,00	3	5,00
Mature scar	15	25,00	9	15,00
Hypertrophic scar	2	3,33	1	1,67
Keloid Scar	0	0,00	0	0,00

While the number of re-admissions to the hospital was found to be 3.57±0.99 in patients with sutures, this rate was 0.26±0.68 in patients with adhesives. According to the t-test between two, a significantly lower rate of admission was detected in patients who received adhesive (p<0.0001) (Figure 1). The rate of re-application of patients after the repair procedure varies between 0 and 5. The average application amount was found to be 1.93±1.86. In the correlation test between the number of applications and the KGA scale, a negative, weak and significant relationship was detected (r: -0.34, p<0.001).

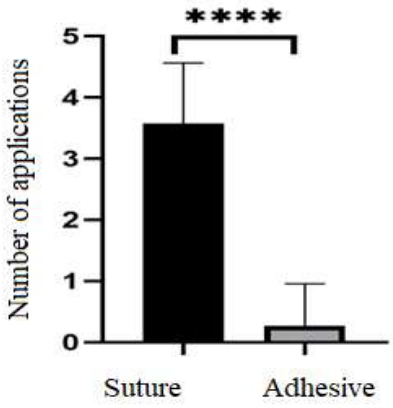

Figure 1. Re-admissions to the hospital (****p<0,0001).

Figure 2 shows photographs of patients using suture technique, taken at the end of 6 months (Figure 2). Figure 3 shows photographs of patients using the tissue adhesive technique, taken at the end of 6 months (Figure 3).

Figure 2. Photographs of patients using suture technique, taken at the end of 6 months.

Figure 3. Photographs of patients using the tissue adhesive technique, taken at the end of 6 months.

4. Discussion

Pediatric traumatic facial lacerations are injuries we frequently encounter in emergency departments. These injuries are repaired using suture and tissue adhesive techniques. Appropriate technique is important due to difficulties such as cosmetic concerns and age group related treatment compliance [1,2].

Findings such as bleeding and Infection that occurred recently after the procedure were considered as early complications. In the literature review regarding early stage complications, no significant difference was observed between sutures and tissue adhesives [7-10]. In our study, it was observed that there was no statistically significant difference in the probability of early complications, consistent with the literature. The main reason no difference in terms of early complications is that the procedures are applied in selected cases; we think that this is due to the procedure being performed on low-tension wounds with no deep tissue extension and low wound lip width.

The late term complication is developing scar. There are studies showing that tissue adhesives provide better cosmetic results when closing low-tension wounds [8-15]. However, there are also studies in the literature showing that cosmetic results are better in patients with suturing [16,17]. In a meta-analysis conducted by Farion et al., no significant difference was found between the two groups. In our study, 56, 66% of the patients who underwent suturing had a normal outcome, while 78.33% of the patients who used adhesive had a normal outcome, which is statistically significant (p<0.0005). In other words, scarring is less visible in cases where tissue adhesive is used. Of the patients who underwent suturing, 25% had a mature scar, 15% had an immature scar, and 3.33% had a hypertrophic scar. Of the patients in whom tissue adhesive was used, 15% had a mature scar, 5% had an immature scar, and 1.67% had a hypertrophic scar. In the 6th month evaluation of patients in whom tissue adhesive was used, it was observed that scar formation developed at a statistically significant lesser rate (p value 0.0002). In our study, we attributed the fact that there is less scarring with tissue adhesives to the fact that there is less invasive procedure and therefore less trauma to the tissue.

In 30 patients who underwent suturing stated that they experienced pain during the procedure and the number of not recommending the procedure was 27, while this number was 6 for patients who received tissue adhesives. It was determined that the patients' pain and analgesia needs were consistent with the literature [18]. In our study, the procedure took less than 30 minutes for 16 of the patients who underwent suturing, while the procedure for 36 patients took between 30 minutes and 1 hour, and the procedure for 9 patients took more than 1 hour. In patients who used tissue adhesive, the procedure time was less than 30 minutes. Tissue adhesive application was applied 4.75 times faster than suture application (p<0.0001). As seen in our study, the use of tissue adhesive shortens the procedure time. Tissue adhesive applied to patients significantly reduced the rate of readmission to the hospital compared to suture patients (p<0.0001). The main reason for these results is that the preliminary preparation phase for the suturing process is longer and the interventional procedure is performed.

The satisfaction rate of the patients in whom tissue adhesive was used was 1.81 times higher than in the suturing group (p = 0.038). Patients who received tissue adhesive stated that they would recommend the procedure 2.12 times more than patients that was applied suture (p<0.0001). We consider that shorter duration, less pain, and better cosmetic results contribute

to this satisfaction. The most important limitation of our study is that it is retrospective. However, the high number of patients due to the high number of emergency department visits, good filing, careful selection of exclusion criteria, and recorded patient follow-up reduce this limitation.

4.1. Limitations

Our study have some limitations. The first limitation is that our study was single-centered, our conclusions might not be generalizable. The second limitation is that our study was retrospective, but there was no bias. To avoid bias, patient subgroups were selected to have equal distribution. The small number of patients in our study is another limitation. As the authors, we accept that double-blind studies with a higher number of patients will increase the level of evidence.

4.2. Conclusions

As a result, in our study, tissue adhesives are found to be superior to sutures in terms of cosmetic reasons, patient satisfaction, duration and readmission in clean wounds that do not have high wound tension, shorter than 5 cm, not extending sublacerationsaneous tissue and are not in special areas (ear, eye, mimic fold areas). As a result of our study, we believe that tissue adhesives can be considered as a suitable alternative to the suture technique when patient selection is made appropriately.

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