

Comparative Study Between Skin Closures with Adhesive Skin Glue 2-Octyl Cyanoacrylate and Suture Material in Clean Elective Surgeries

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Abstract

Background: The choice of wound closure after surgery, whether major or minor procedure, has always raised many concerns. One of those concerns is how fast and comfortable will be the recovery. Usage of surgical adhesives, 2-Octyl Cyanoacrylate provides a flexible, water resistant, sealed skin closure. It provides a needle-free method of wound closure, an important consideration because of blood-borne viruses (e.g., HIV). **Objectives:** To discover the advantages and disadvantages of using 2-Octyl Cyanoacrylate glue for skin closure in comparison with that of suturing. **Methodology:** A comparative study was done in two groups of patients (with 35 patients each). In both the groups, detailed history was taken preoperatively and routine investigations like haemoglobin, total count, ESR, RBS were done to rule out any acute or chronic infection. Shaving of the parts was done at the same time on previous evening. Injection Cefazolin 1 gm single dose was given intravenously at the time of anaesthesia. In one group, 2-Octyl Cyanoacrylate was used as a method of skin closure. In the 2nd group, skin incision was closed using sutures. **Results:** The present study proves that the Time taken for skin closure, the Post-operative pain and Cosmetic appearance are significantly better with adhesive glue 2-Octyl Cyanoacrylate than the traditional skin closure by suturing. **Conclusion:** Skin closure with adhesive glue Octyl Cyanoacrylate is better than the traditional skin suturing. As it forms a flexible, water resistant sealed skin closure and allows

patient to shower any time after surgery. It is faster, comfortable and cosmetically better technique for skin closure. It significantly reduces post-operative pain.

To conclude, adhesive glue Octyl Cyanoacrylate skin closure is a significantly better technique than traditional skin closure by suturing in clean elective surgeries.

Keywords: Adhesive glue; 2 Octyl Cyanoacrylate; Skin suturing; clean elective surgeries.

Introduction

The choice of wound closure after surgery, whether major or minor, has always raised many concerns. One of those concerns is how fast and comfortable the recovery will be. Wound closure techniques have evolved from the earliest development of suturing materials to comprise resources that include synthetic sutures, absorbable and non-absorbable, staples, tapes and adhesive compounds.

Although suture materials and aspects of the technique have changed, the goals remain the same: closing dead space, supporting and strengthening wounds until healing increases their tensile strength, approximating skin edges for an aesthetically pleasing and functional result, and minimizing the risks of bleeding and infection.

A New technology of surgical adhesives i.e Cyanoacrylate, is fast catching up. As an 8-carbon alkyl derivative, the polymer 2 Octyl Cyanoacrylate is less reactive than the shorter-chain derivatives. The slower degradation of the Octyl derivatives may result in lower concentrations of the Cyanoacrylate polymer by-products in surrounding tissues,

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resulting in less inflammation. Additionally, plasticizers are added to produce a more pliable and tissue-compatible product that flexes with the skin and remains inherent for longer periods of time.

Traditionally, needle skin suturing with suture material is used because of cost-effectiveness. Now a days surgeons are looking for faster, comfortable and cosmetically better techniques for skin closure, moreover 2-Octyl cyanoacrylate is easier to use and provides a flexible, water resistant, sealed skin closure. It provides a needle-free method of wound closure, an important consideration because of blood-borne viruses (e.g., HIV). It requires no bandaging due to its antimicrobial properties. From the patient's perspective, it gives less pain during the post-operative period, patients can even have a shower, needs no suture or staple removal, disappears naturally as incision heals and leaves no mark. Cyanoacrylates typically fix within a minute and achieve full bond strength in 24 hours [1].



Fig. 1: Adhesive Glue

Objectives

1. To compare the time efficacy between the two methods of skin closure.
2. To compare the postoperative pain in the two methods of skin closure.
3. To compare the cosmetic appearance of skin closure by the two methods.
4. To observe for any complications in the two methods of skin closure.

Materials and Methods

Study design: This was a comparative study conducted on 70 patients divided into two groups of 35 each.

Settings: Department of General Surgery in H.K.E's Basaveshwar Teaching and General Hospital.

Source data: 70 Patients (35 in each Group) who underwent clean elective surgery with no focus of infection on the body, admitted in the Department of General Surgery in H.K.E's Basaveshwar Teaching and General Hospital during the period of Dec 2010 to Nov 2011.

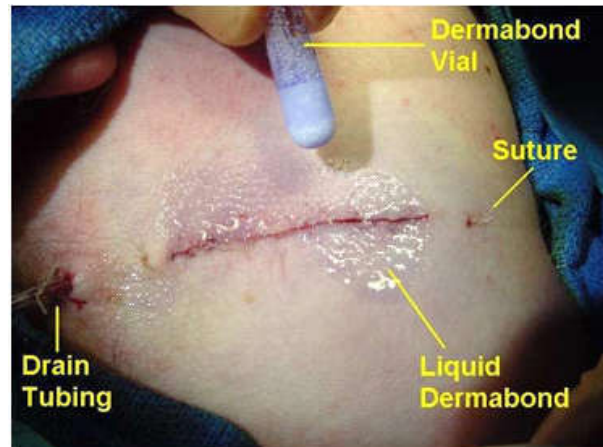


Fig. 2: Application of Adhesive Glue

Procedure:

A comparative study was conducted on patients who were divided into two groups of 35 each. In patients of both the groups, detailed history was taken preoperatively and routine investigations like haemoglobin, total count, differential count, ESR, RBS were done to rule out any acute or chronic infection. Preoperative shaving of the parts was done at the same time on previous evening and same antibiotic protocol was followed. Injection Cefazolin 1 gm single dose was given intravenously at the time of anaesthesia and in minor surgeries, which were done under local anaesthesia, antibiotic was administered immediately before surgery.

In both the groups, after completion of the procedure, the wound was dried. The time at the start of skin closure and the time of finishing skin closure were noted using stop watch timer [2,3].

In both the groups, the post-operative pain was assessed at 0 hours, 12 hours, 24 hours, 48 hours, 72 hours, and 7th day using visual analogue scale of 0 to 100. 0 being no pain and 100 is worst pain possible as rated by patient themselves [4,5,6].

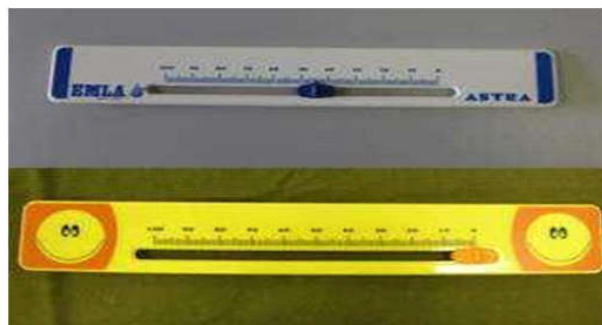


Fig. 3: Visual Analog Scale Marking

The outcome of wound was assessed at 3rd, 5th, 7th post-operative days using ASEPSIS SCORE. Wound was scored from 0 to 10, according to the proportion of wound involved and presence of serous collection, erythematous changes, purulent exudate, and separation of deep tissues [7,8,9].

Table 1: Wound Asepsis score

Wound characteristic	Proportion of wound affected					
	<20	20-39	40-59	60-79	>80	
Serous exudate	0	1	2	3	4	5
Erythema	0	1	2	3	4	5
Purulent exudates	0	2	4	6	8	10
Separation of deep tissue	0	2	4	6	8	10

The wound was assessed for cosmesis on 7th post-operative day using modified Hollander cosmesis scale [7]. A total cosmetic score was derived by adding the score of variables. A score of 1 was given to each variable if not present in the wound, so a score of 6 was considered as optimal while 5 or less as sub-optimal.

Table 2: Modified Hollander Cosmesis Scale

Categories	Absent	Present
Step off borders: Edges not on same plane	1	0
Contour irregularities: Wrinkled skin near wound	1	0
Wound margin separation: Gap between the sides	1	0
Edge inversion: Wound not properly inverted	1	0
Excessive distortion	1	0
Good overall appearance	1	0

On the follow up on 1st month and 3rd month, the wound cosmesis was assessed by independent blinded observer and wound scoring was done using Visual Analog scale of 0 to 100 [7,8,10].

Inclusion Criteria

Cases undergoing clean elective surgical

procedure and skin closure with suturing or with 2-octyl cyanoacrylate adhesive glue under same antibiotic coverage for same duration from Dec 2010 to Nov 2011.

Exclusion Criteria

1. Cases not undergoing primary closure.
2. Surgeries where stomas were necessary.
3. Patients not agreeing for 2-octyl cyanoacrylate skin closure.
4. Patients who did not come for follow-up on 7th or 15th post-operative day.

Method of Statistical Analysis

1. Chi - Square test with Yates correction, if required.
2. Student 't' test.

Results

All were clean elective surgery cases. The patients were randomly included in either Skin Suturing group or Adhesive Glue group. Same antibiotic for same duration was administered in patients of both the groups.

There was no irritation of skin, hypersensitivity reaction or toxicity in any group.

There were 40 (57.14%) males and 30 (42.85%) females in the present study.

Out of 35 total cases in adhesive glue group, 18 (51.45%) were males and 17 (48.57%) were females. In suturing group, there were 22 (62.85%) males and 13 (37.1 4%) female cases out of 35 total cases.

The mean age for Adhesive Glue group was 19.71±10.10 years and that for Skin Suturing group was 23.71±12.88 years. Nevertheless, the difference in the age between the two categories was statistically not significant (p>0.609).

The elective surgeries included in this study were open appendectomy, herniorrhaphy, excisions of Fibroadenoma, lipoma, dermoid and sebaceous cysts.

The Mean time taken for skin closure in adhesive glue is 76.57 seconds ±14.12 and that of skin suturing is 401.86 seconds ± 84.96. This difference is of great significance with p value of <.0001 confidence.

Table 3: Post operative pain score

	0 hrs	12 hrs	24 hrs	36 hrs	48 hrs	72 hrs	7 th day
Adhesive glue group	84.57 ± 2.62	69.43 ± 2.55	54.00 ± 2.50	36.54 ± 2.55	24.86 ± 2.53	12.54 ± 2.55	3.80 ± 1.14
Skin suturing group	97.11 ± 1.007	84.69 ± 2.36	68.54 ± 2.46	53.69 ± 2.18	34.69 ± 2.10	19.43 ± 1.94	7.94 ± 1.62
P value	<0.0001	<0.0001	<0.0001	<0.0017	0.0017	0.0009	0.0027

Visual Analog Scale (VAS) is calibrated from 0 to 100, 0 is marked for being no pain and 100 being sense of worst pain. This difference was statistically significant at all times. (Table 3)

Table 4: Distribution of ASEPSIS Score at different intervals (Days)

Interval (Days)	Type of material	Seroma	Erythema	Purulent	Wound separations	Total
3 rd day	Adhesive glue	2 (5.71%)	0	1 (2.86%)	0	35
	Skin suturing	3 (8.57%)	1 (2.86%)	2 (5.71%)	0	35
	Total	5	1	3		70
5 th day	Adhesive glue	0	0	2 (5.71%)	0	35
	Skin suturing	2 (5.71%)	0	2 (5.71%)	0	35
	Total	2	0	4		70
7 th day	Adhesive glue	0	0	0	2 (5.71%)	35
	Skin suturing	0	0	0	2 (5.71%)	35
	Total	0	0	0	4	70

This difference is of great significance and outcome is good with adhesive Glue although on 7th day the difference was not significant. (Table 4).

Table 5: Total Complications observed in each group

Complications	Type of Material used		Total
	Adhesive Glue (N=35)	Skin suturing (N=35)	
Seroma	2(5.71%)	5(14.28%)	7
Purulent exudates	3(8.57%)	4(11.42%)	7
Erythema	0	1 (2.9%)	1
Wound Separation	2(5.71%)	2 (5.71%)	4
Total	7 (19.99%)	12 (34.31%)	19

Wound Cosmesis Score on 7th post-operative day using Modified Hollander Cosmesis Scale showed that Skin Suturing group had a maximum score of 6 and a minimum of 4 in 2 patients. In Adhesive Glue group, maximum score was 6 and minimum was 5 in 2 patients. These early results were more in favour of Adhesive Glue.

Further, in the follow-up at 1st month & 3rd month, the Wound cosmesis was assessed by a blinded independent observer and was scored in a Visual Analogue Scale from 0 to 100. (Table 5).

Wound Cosmesis Score at 1st month: Skin Suturing group had a minimum score of 82 and a maximum of 91 with a mean of 86.54±2.92. In Adhesive Glue group, maximum score was 99 and minimum was 97 with a mean of 98±0.76. This difference is significant with a p value of <.0001 confidences.

Wound Cosmesis Score at 3 months: Skin Suturing group has a minimum score of 85 and maximum of 93 with a mean of 88.29±2.13. In Adhesive Glue group, maximum score was 100 and minimum of 98 with a mean of 98.94±0.84. This difference was also significant with a p value of <.0001 confidences.

Table 6: Comparison of Post Operative Wound Cosmesis score

Interval (days)	Type of material used	No	Mean	Std Dev	Min.	Max.	t value	p value
7 th day	Adhesive glue	35	5.94	0.50	5.00	6.00	0.86	0.3931
	Skin suturing	35	5.74	0.56	4.00	6.00		
1 month	Adhesive Glue	35	98.00	0.76	97	99	4.31	<0.0001
	Skin suturing	35	86.54	2.92	82	91		
3 month	Adhesive Glue	35	98.94	0.76	98	100.00	4.28	<.0001
	Skin suturing	35	88.29	2.13	85	93		

Discussion

Age

In a study conducted by Matin.S.F, in 50 patients, incisions were closed with Octyl Cyanoacrylate, and in 42 patients, with Skin suturing [11]. In the patients of Octyl Cyanoacrylate skin closure, mean age was 52.5 years and that of Skin Suturing was 51.24 years. In the present study, the age for Skin Suturing group was 23.71±13.06 years and that for Adhesive Glue group was 19.71±10.25 years. Nevertheless, this difference in the age between the two categories was not statistically significant (p>0.610) as patients were randomly selected.

Sex ratio

Also, it was observed from this study that the sex ratio (Male: Female ratio) of Adhesive Glue Group was 1:0.94 and that of Skin Suturing Group was 1:0.54 where as the respective values of Matin.S.F study was 1:0.85 and 1:0.7824.

Time Taken for Skin Closure

In Matin.S.F. Study in the Octyl Cyanoacrylate Group, the mean time taken for skin closure in Adhesive Glue Group was faster than Skin Suturing Group (150 seconds versus 360 seconds) [11]. In the Present Study, the mean time taken for skin closure in Adhesive Glue was much faster than Skin Suturing Group (76.57 Seconds Versus 401.86 seconds) which is of great significance with p<0.0001.

Post-Operative Pain

The present study shows significantly less postoperative pain during early and 7 days post-operatively. The earlier studies by Arunachalam P et al and Ong C.C.P et al., have compared the post-operative pain using Visual Analog Scale of 0 to 100 and have shown less post-operative pain in Adhesive Glue Group but of no significance [10,12].

In the present study, there was significantly less pain in Adhesive Glue Group up to first 72 hours following surgeries but the difference in pain on 7th post-operative day was not statistically significant.

Wound asepsis score

The wound Asepsis Score on 3rd & 7th day, was a maximum of 4 in Skin suturing group and 2 in Adhesive glue group. The wound Asepsis Score on 7th day was 4 in both groups.

The complications in adhesive glue were observed in 7 cases (2 seromas, 3 purulent and 2 wound separations) and 12 cases (5 seromas, 4 purulent, 1 erythema and 2 wound separation) were observed in skin suturing group in the present study. Earlier published studies by Singer A.J., et al., shows that the infection rates at the end of 1 week after surgery were similar and fewer cases of Adhesive Glue were erythematous. But Wound Dehiscence rate is 1.6% in Adhesive Glue group and 0.9% in Suturing Group [13]. In the Present Study, Wound separation was noted in 2 cases (5.71%) in Adhesive Glue Group and 2 cases (5.71%) in Skin Suturing Group which is equivalent in significance. Toriumi D.M., et al., in their study evaluated the Wound at 1st week and observed no complications [14].

Wound cosmesis score

The study conducted by Toriumi. D.M., et al., observed wounds using Modified Hollander Cosmesis Scale and later by Visual Analog Scale showed superior results with Adhesive Glue Skin Closure [14]. In the present study, the early results on 7th day are in favour of Adhesive Glue Group and the later follow up at 1st month and 3rd month show significant difference and Adhesive Glue group had better Cosmesis as compared with Skin Suturing.

In summary, comparing Time Taken for Skin Closure, the Post Operative Pain, the Cosmetic Appearance between Adhesive Glue group and

Skin Suturing Group of the present study with earlier studies, proves that Adhesive Glue Octyl Cyanoacrylate in skin closure was significantly better than the traditional Skin Suturing Closure.

Conclusion

The present study shows that the Adhesive Glue Octyl Cyanoacrylate Skin Closure is better than Traditional Suturing Skin Closure. The concept of a surgical tissue adhesive for superficial skin closure is an attractive alternative to the use of sutures for both Surgeons and Patients due to following characters;

1. The reduced time taken for skin closure resulted in a shorter operative time.
2. Forms a flexible, water resistant, sealed skin closure.
3. Faster, comfortable and cosmetically better technique for skin closure, and is easier to use.
4. Practically, the watertight barrier formed by Octyl Cyanoacrylate allows patient to shower any time after surgery.
5. No stitches to be removed.
6. No need to apply bandages.
7. Reduced postoperative pain.
8. Disappears naturally as incision heals, leaves no mark.
9. Octyl Cyanoacrylate is non-irritating to skin and side effects are extremely less.

Therefore it can be safely concluded that Octyl Cyanoacrylate can be used in surgical Skin Closure in clean elective surgeries

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