

Original Research Article

Skin closure with 2-octyl cyanoacrylate glue versus skin stapler: a comparative study

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ABSTRACT

Background: Many advances have been made in the field of skin closure with the latest being sutureless techniques like staplers, glues etc. Most of these techniques have some merits and some demerits as compared to the traditional suture techniques which was both time consuming and cosmetically unacceptable.

Methods: In our study we compare the 2 most common sutureless techniques used on the basis of time consumed, complication of the wound, the cosmetic scar and pain perception post-operative period.

Results: The glue scores over staplers in wounds less than 4cm in terms of cosmetics and complications but staplers score more in terms of time consumed and economical rate.

Conclusions: We recommend the use of glue for small wounds especially in paediatric population if money is not concern. For large wounds staplers are recommended.

Keywords: Staplers, Skin closure, Tissue adhesive glue, 2-Octyl cyanoacrylate

INTRODUCTION

Traditional variety of suture materials have been used for closure of surgical skin incisions. At the termination of most operative procedures the surgeon sutures the cut skin edges. It is his aim to place each stitch in the skin properly, to have it do its work well and to remove it, leaving no mark. Any mark that a suture may form is nothing less than scar tissue (Gillman et al).¹

After the sutures various sutureless techniques came into use that included:

- Metal clips or skin staplers
- Steristrips or adhesive tapes
- More recently surgical adhesive glues which are all cyanoacrylate compounds.

In 1959, Coover et al chemically analyzed and examined the performance of cyanoacrylate adhesives and proposed their application in surgical procedures.² The final appearance of the scar was claimed to be excellent after the use of these tissue adhesives by Watson.³

The first commercial staplers were made of stainless steel with titanium staples loaded into reloadable staple cartridges. Modern surgical staplers are either disposable and made of plastic, or reusable and made of stainless steel. Both types are generally loaded using disposable cartridges. Although most surgical staples are made of titanium, stainless steel is more often used in some skin staples and clips. In our study we compared two sutureless techniques for closure of surgical skin incisions i.e surgical adhesive glue (2-octyl cyanoacrylate) v/s skin staplers.

Aims and objectives

To compare staplers with tissue adhesive glue in surgical incisions less than 10 cm in both adult and pediatric patients undergoing elective surgery in terms of :

- Time taken for closure of surgical incisions
- Post-operative pain perception
- Early and late wound complication including post op wound infection.
- Cosmetic appearance of wound

METHODS

Sample size of 200 cases including both pediatric and adult patients undergoing elective surgery in general surgery department of SGRDIMSR With wound length of less than 10 cm was taken. Follow up period of 6 months post operatively was considered.

Patients were divided into two groups :

Group A: 100 patients undergoing closure of skin incisions by surgical staples.

Group B: 100 patients undergoing closure of skin incisions by tissue adhesive glue.

Inclusion criteria

- Wound length less than 10 cm.
- Written and informed consent.

Exclusion criteria

- Wound length >10 cm.
- No informed and written consent.
- Comorbid conditions like malnourishment and renal failure.
- Metabolic disorders like diabetes, coagulation disorders, immunocompromised etc.
- Local causes like burns, keloids.

Method of usage of skin stapler (Figure 1).

- Each edge is typically picked up with a forceps, everted and precisely lined up.
- Line up the wound edges with the centerline indicator on the head of the stapler.
- Surgeon then places the staples to close the wound while the first assistant advances the forceps, everting the edges of the wound.
- This technique is continued until the entire wound is everted and closed with staples.
- Wound is covered with betadine dressing.

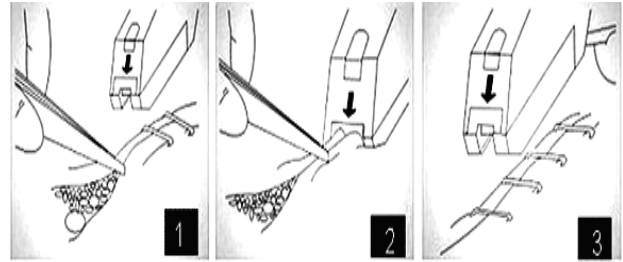


Figure 1: Depicting the method of usage of stapler.

Method of usage of surgical glue

- Wounds thoroughly cleansed and debrided
- Wound edges tightly apposed
- Crack the DERMABOND adhesive vial in the upright position, invert, and apply pressure to saturate the tip
- Release pressure, then reapply pressure to express adhesive

Assesment

- Time taken for closure of skin incisions was measured in both groups intraoperatively.
- Post operative pain perception on 1st two post operative days by following methods:
- FLACC Score for the children below 7 years of age.
- Visual analogue scale for adults and children above 7 years of age.

Pain is graded as follows in both groups:

1-3: Mild discomfort

4-6: Moderate pain

7-10: Severe discomfort or pain or both

Wound in both groups were assessed on 2nd and 5th post operative day for

- Surrounding erythema,
- Tenderness
- Discharge from wound site.

Wound in both groups were again reassessed at time of removal of skin staples (which is between 8 and 14 days) for following

- Any gaping of wound
- Discharge from wound site.
- Cosmetic appearance.

At 1 month patient were assessed for

- Scar hypertrophy of wound.
- Cosmetic appearance of wound site.

At end of 3 months patients were assessed for:

- Scar hypertrophy.

Scar hypertrophy/ cosmetic appearance were categorized as follows

- Excellent: linear flat scar of width less than 2 mm.
- Good: flat, linear scar of width less than 3 mm.
- Fair: minimally raised scar of width less than 5 mm.
- Poor: more than 5mm width and hypertrophied scar.

RESULTS

On the basis of various parameters assessed the results of the study are discussed. On the basis of time of application the patients in group A had mean time around 128.51 sec and that of group B had time around 51.20 seconds. The age difference was not significant between the 2 groups and the age varied from a minimum of 7 months to 81 years in group A and in group B it was from 4 months to 59 years. The mean age in group A was 21.21 years and that in group B was 21.01 years.

Table 1: Various operative procedures in group A and group B.

Operation Performed	Group A	Group B
Hernioplasty or herniotomy	40	40
Orchidopexy	20	20
Open cholecystectomy	20	20
Open appendicectomy	10	10
Pyeloplasty/ nephrectomy	6	6
Fibroadenoma	4	4
Total	100	100

For age less than 7 years, while comparing post-operative pain on day 1, 32 patients of the group A patients felt mild pain while 20 patients in group B felt so (Table 2). Moderate pain was experienced (according to visual analogue) by 14 patients in group A as compared to 28 patients in group B (Table 3).

Table 2: Pain perception on first 2 post-operative day in children below 7 years of age in group a according to FLACC score.

	Mild	Moderate	Severe	No Pain
Ist post operative day	20	28	4	4
2 nd post operative day	32	4	0	20

In adult patients more than 7 years the observations of group A are summarized in the Table 4 and that of group B are summarized in Table 5.

Table 3: Pain perception on first 2 post operative day in children below 7 years of age in group B according to FLACC score

	Mild	Moderate	Severe	No Pain
Ist post operative day	32	14	4	6
2 nd post operative day	20	06	0	30

Table 4: Pain perception on first 2 post operative day in adults and children above 7 years of age in group A according to FLACC score.

	Mild	Moderate	Severe	No Pain
Ist post operative day	18	20	02	04
2 nd post operative day	20	04	-	20

Table 5: Pain perception on first 2 post operative day in adults and children above 7 years of age in group B according to FLACC score.

	Mild	Moderate	Severe	No Pain
Ist post operative day	28	8	-	8
2 nd post operative day	16	2	-	26

48 patients had induration in group B as compared to 68 in group A. This denotes that skin stapling resulted in more induration. 31% cases in group B and 59 % patients in group A had tenderness. 2 (2%) cases in group B showed serous collection/discharge. There was serous collection in 8 (8%) cases in group A.

20 (20%) patients in group B had skin gaping as compared to 12 patients in group A. This lead to conclusion that skin gaping was more common in tissue glue usage.

Scar hypertrophy was noted in 4 patients if group B and 8 patients of group A. The cosmetic outcome was assessed at 4 weeks. The results are summarised below in table 6. P value was 0.038. So overall cosmetic outcome was significantly better in Group B patients as compared to group A.

Tissue adhesive glue (2-octyl cyanoacrylate) scores over skin staplers in terms of closure of smaller sized wounds upto 4 cm which are especially found in paediatric age group because of the following :

- No need to remove the staples.
- Lesser post operative pain.

- Lesser post operative complications like erythema, induration, tenderness, serous collection and discharge and sac hypertrophy.
- No need of daily dressing.

Table 6: Cosmetic results at time of discharge.

Cosmetic results	Group A	Group B
Excellent (width <2 mm)	20(20%)	44 (44%)
Good (width <3 mm)	50(50%)	42 (42%)
Fair (width <5 mm)	26(26%)	14 (14%)
Poor (width >5 mm)	4(4%)	6 (6%)

But there were several areas where staplers scored over tissue adhesive glues which are as follows:

- Easier to apply over larger wounds as no perfect hemostasis is required.
- In case of any collection a staple or 2 can be opened from part of wound to allow collection to drain.
- Staplers are cheaper than glue.
- Time of application is markedly lesser.

DISCUSSION

In the present study two sutureless techniques of skin closure i.e. tissue adhesive glue (2 octylcyanoacrylate) and skin staplers were compared. The aim was to compare these 2 techniques in terms of time taken for skin closure, post-operative pain perception, various post operative complications as erythema, collection/discharge, and wound gaping and finally cosmetic appearance of wound.

As depicted in the study the minimum length of incision in group A was 2.5 cm and maximum length of incision was 8.5 cm. Thus the adhesive was used to close only small or medium sized operative wounds. This again corresponds to the above said limitation of cyanoacrylates (Dermabond), that they cannot be used in the closure of long skin wounds.

Many workers evaluated this material only in a particular type of wound, like Adoni et al used tissue adhesive for the closure of episiotomy wounds.⁴ Samuel PR et al and Maw JL et al evaluated this material in skin wounds resulting from head and neck surgery.^{5,6} In another study conducted by Simon HK et al cyanoacrylate was shown to be a preferred method of cutaneous closure of lacerations oriented against the langer's lines.⁷

So, in none of the studies, adhesive material was tried for the closure of long skin wounds. The wounds most commonly closed were either small to medium sized facial lacerations or oblique to transverse skin incision as in the present study. As depicted in the study the minimum length of incision in group A was 2.5 cm and maximum length of incision was 8.5 cm. Thus the adhesive was used to close only small or medium sized

operative wounds. This again corresponds to the above said limitation of cyanoacrylates (Dermabond), that they cannot be used in the closure of long skin wounds.

In a study conducted by Ridgway et al average time taken for closure of cervicotomy incision in neck surgeries with glue was much more than with skin staplers with a mean difference of 67 sec (Ridgway et al, Khan et al) reported average time for skin closure in the adhesive group to be 100 sec and the average time for the placement of staples 30 sec in patients undergoing arthroplasty i.e TKR or THR (Khan et al).^{8,9} According to Chibbaro et al.¹⁰ There was no significant difference between surgical adhesive glue and skin staples for closure of neurosurgical scalp incisions (Chibbaro et al).¹⁰

Khan et al and Chibbaro et al had no significant difference as regards serous collection in their studies between both groups.^{9,10} (20%) cases in group A developed gaping as compared to 5 (10%) in group B. Upon detailed analysis of incidence of skin gaping in both groups it was observed that most (80%) of incidence of skin gaping in group A occurred in incisions greater than 4 cm while there was no such observed difference among group B patients.

As observed scar hypertrophy/cosmetic results were consistently better among group B patients at time of discharge, 1 month and 3 months. While more patients showed excellent outcome in group B patients at time of discharge as compared to in group A showed excellent outcome. Similar results were observed at 1 and 3 months.

It was observed that most patients in group B who showed fair or poor outcome were the ones who had skin gaping post operatively while most patients who showed poor outcome in group A either had serous collection or skin gaping post operatively. Therefore poor outcomes in either group can be attributed to skin gaping or serous collection.

In most of the other studies cosmetic outcome was measured according to 10 point scale and there was no significant observed difference between both groups in all studies mentioned previously.

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Ethical approval: The study was approved by the institutional ethics committee

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