

Original Research Article

Prospective randomized comparative study of skin adhesive glue (2-methyl -2- cyanopropionate or cyanoacrylate) versus conventional skin suturing by suture material/skin stapler in clean surgical cases

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ABSTRACT

Background: To compare cosmetic appearance of skin closure wound by three methods -sutures, staples and skin adhesive glue. Traditional skin closure using sutures causes more pain, infection, needs its removal, time consuming and leaves behind bad scar. Nowadays, good cosmetic appearance of operated site is appealing among patients. Surgeons are looking for faster, comfortable and cosmetically best technique for skin closure. Newer techniques need to be evaluated which are better than suture and staples. 2-octylcyanoacrylate is easier to use, flexible, water resistant, pain free sealed skin closure without its need for removal and has better cosmesis.

Methods: This study is conducted from July 2010 to April 2013 in 90 patients at LTMG Hospital. Wounds of clean surgeries closed with suture material, skin staples and skin adhesive glue were studied in 30 patients each. Patients were randomized using standardized methods. Patients followed up over period of 28 days and their scars were assessed according to the modified Hollander cosmesis scale(MHCS) and cosmetic visual analogue scale(VAS). Patient allotment was done using random number table.

Results: Mean MHCS score for skin adhesive group on day 7 was 4.83 which was significantly more than 3.90 for suture and 3.97 for stapler. Mean VAS score for skin adhesive group on day 7 was 67.67 which was significantly more than 61.67 for suture and stapler each. Mean MHCS and VAS score for skin adhesive group on day 7, 14 and 28 were significantly more than suture and stapler groups.

Conclusions: Octylcyanoacrylate can be used for skin closure in clean elective surgeries with better cosmetic outcome as compared to staples and sutures.

Keywords: Cosmetic visual analogue scale, Modified Hollander cosmesis scale, Octylcyanoacrylate, Skin adhesive glue, Skin stapler

INTRODUCTION

The choice of wound closure after surgery, whether major or minor procedure, there always exist lot of questions in many concerns. One of those concerns is how fast and comfortable will be the recovery. Wound

closure techniques have evolved from the earliest development of suturing materials to comprise resources that include synthetic sutures, staples, tapes, and adhesive compounds.^{1,2}

Precise approximation of skin incisions with wound

closure devices is crucial for a favourable cosmetic appearance and functional surgical results. Principles of wound closure focus on relieving tension on the wound and bringing the skin edges together in an everted orientation.^{3,4}

If sutures are tied too tight or left in too long, they may leave permanent suture tracts.⁵ If sutures are removed before adequate healing, the lack of wound tensile strength may result in wound dehiscence or a widened scar.

A closure that penetrates the epidermis and dermis only serves to auto inoculate the wound of the patient, driving surface flora deep into the subcutaneous tissue.⁵ Percutaneous suture closure provides an extra source of contamination via the suture canal and results in a thin peri sutural cuff of dead epidermis, dermis and subcutaneous fat. Suture closure also is a potential source of foreign body reaction within the susceptible subcutaneous tissue.⁶ The type of suture material for skin closure is also reported to influence postoperative wound complications.⁷⁻⁹

However, several other studies have failed to demonstrate significant differences between different types of suture material.¹⁰⁻¹⁵ The surgical scar remains the only visible evidence of the surgeon's skill and not infrequently, all of his efforts are judged on its final appearance.¹⁶

Skin staples give a neat scar with good wound eversion and minimal cross hatching effect. They can be placed faster than sutures and have a lower predisposition to infection because they do not penetrate entirely through the wound and do not produce a complete track from one edge wound to the other.¹⁷ Staplers are non-corrosive and contain inert staple pins. They give uniform tension, minimum tissue compression and trauma. They give superior cosmetic results, allows good blood supply, promote faster scar free healing and are simple to use. Staples are safer because the risk of accidental needle-stick injury is eliminated. In technique of skin closure using skin stapler, surgical staples made of titanium and stainless steel are more often used.

A new technology is surgical adhesives, Cyanoacrylate that could provide patients with the option of suture less skin closure is fast catching up. Nowadays surgeons are looking for faster, comfortable and cosmetically best technique for skin closure, more over 2-octylcyanoacrylate is easier to use and provides a flexible, water resistant, sealed skin closure.¹⁸

2-octylcyanoacrylate 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. For the patient side, it gives less pain during post-operative period, patients can even have a shower, does not needs removal, disappears

naturally as incision heals, leaves no mark.¹⁸

2-Octyl Cyanoacrylate is the latest skin adhesive glue, used for faster skin closure. So, it is essential to do a comparative study of all three techniques of skin closures.

METHODS

In this study conducted at LTMGH, 90 patients were studied from July 2010 to April 2016. Wounds of clean surgeries were closed with suture material, skin staples and with skin adhesive glue in 30 patients each. The patients were randomized using standardised methods and were accordingly assigned into three groups. Patients were followed up over a period of 28 days and their scars were assessed according to the modified Hollander cosmesis scale and cosmetic visual analogue scale. Data collection and statistical analysis was done. Allotment of patients was done using Random number table. Patients with age between 18 to 50 yrs, wound size less than 10 cm, primary clean surgical cases were included in study. Cosmetic appearance of the wound was assessed on postoperative day 7, 14 and 28.

Cases included in study were clean surgical cases of hernias, thyroid, fibroadenoma and lipomas. This was a prospective randomized comparative study in which patients will be studied in three groups. The allocation schedule was created with a computerized random number generation system.

Skin closure was done by suture material, skin stapler and skin adhesive glue. The wound is assessed for cosmetic appearance on 7th, 14th and 28th post-operative day using modified Hollander cosmesis scale, which has 5 clinical parameters which are studied at each follow up.^{19,20} Scars will be assigned 0 or 1 point each for the presence or absence of width greater than 2 mm, elevation or depression, discoloration, suture or staple marks and overall poor appearance each. A total cosmetic score was derived by adding the scores of variables. Score 0 = worst scar, Score 5 = best scar.

Any complications or infections, if present are also observed in all 3 groups. At follow-up on 7th, 14th and 28th day, wound cosmetic appearance is assessed by independent blinded observer and wound scoring is done using visual Analog scale of 0 to 100.²¹⁻²⁷

Cosmetic Visual Analogue scale

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10 20 30 40 50 60 70 80 90 100

0 = worst scar, 100 = best scar.

Statistical analysis done using a nonpaired Student's t-test to assess the statistical significance of correlation of age among the groups and also the differences in the cosmetic results of scar using both MHCS and VAS. The chi-square test was used to compare the result of use of the three techniques of skin closure in various surgeries. A p-value <0.05 was considered statistically significant.

RESULTS

A nonpaired Student's t-test was used to assess the statistical significance of correlation of the cosmetic results of scar using both MHCS and VAS. The chi-square test was used to compare the result of use of the three techniques of skin closure in various surgeries. A p-value of less than .05 was considered statistically significant.

Patients in all the groups were followed up at time of suture and staple removal on 7th days, 14th day, and 28th day and the wound are assessed for cosmesis on above day using Modified Hollander Cosmesis Scale and Visual Analogue scale. The wound cosmesis was assessed by a blinded independent observer and was scored on a Visual Analogue Scale from 0 to 100.

In this study, all the three study groups cases were ranging from 18yrs to 50yrs with average age being 37.90 yrs in suture group, 36.60 yrs in stapler group and 37.57 in skin adhesive group. All the three groups were comparable and the difference between them was statistically not significant. 100% cases were male in the suture where as 90% in staplers and 83.3% in skin adhesive glue.

All the three groups were comparable and the difference between them was statistically not significant. The comparison of MHCS among study group (Table 1 and Figure 1).

Table 1: Comparison of modified Hollander cosmesis score (MHCS) among study groups.

Duration in days	MHCS Score(Mean±SD)		
	Suture	Stapler	Derma bond
7	3.90±0.31	3.97±0.18	4.83±0.46*
14	3.67±0.71	3.73±0.45	4.73±0.52*
28	3.60±0.81	3.53±0.57	4.70±0.47*

* Significant

The mean MHCS score for skin adhesive group on day 7 was 4.83 which were significantly more than the other two groups 3.90 for suture and 3.97 for stapler. Mean MHCS score of suture and stapler are comparable and the difference between them is statistically not significant. The same trend was observed on day 14 and day 28. The comparison of Visual Analogue Scale (vAS) among study groups (Table 2 and Figure 2).

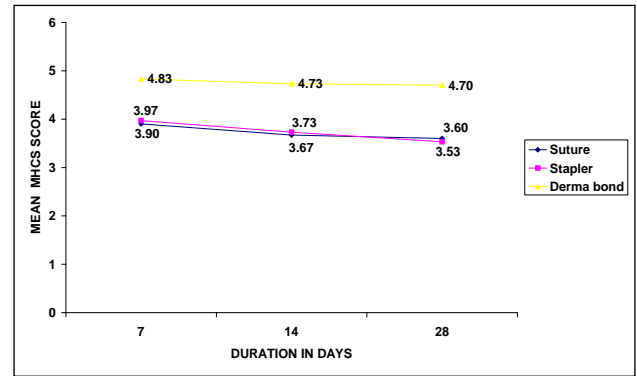


Figure 1: Line diagram of comparison of MHCS between suture, stapler and skin adhesive glue.

Table 2: Comparison of visual analogue scale (Vas) among study groups.

Duration in days	Mean Vas Score (Mean±SD)		
	Suture	Stapler	Derma bond
7	61.67±5.31	61.67±3.79	67.67±6.79*
14	66.33±7.65	69.33±5.21	75.67±7.74*
28	75.00±9.38	76.67±7.11	84.67±6.81*

* Significant

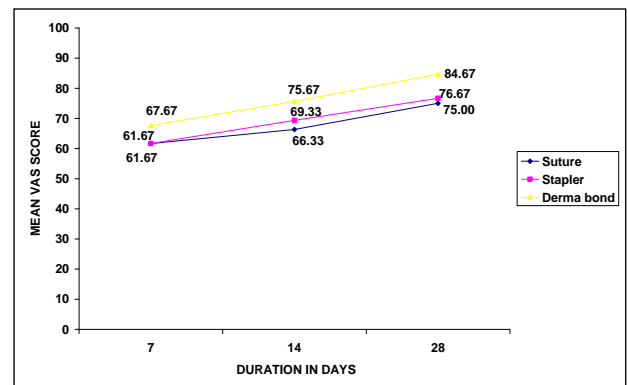


Figure 2: Line diagram of comparison of VAS between suture, stapler and skin adhesive glue.

Mean Visual Analogue Scale score for skin adhesive group on day 7 was 67.67 which were significantly more than 61.67 for suture as well as for stapler. If compared mean Visual Analogue Scale score of suture and stapler are comparable and the difference between them is statistically not significant. The same trend was observed on day 14 and day 28.

DISCUSSION

Traditionally, needle skin suturing with suture material is used as it is cost-effective. Nowadays surgeons are looking for faster, comfortable and cosmetically best technique for wound closure. 2-cyanoacrylate is good alternative for 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 and has got antimicrobial properties, no need for removal, disappears naturally as incision heals, leaves no marks. (Figure 3).



Figure 3: Scar marks on 28th day after surgery using skin adhesive glue.

For the patients, it gives less pain during post-operative period, patients can have shower, disappears naturally as incision heals, leaves no mark.

Use of the eye protective glasses is advisable during the application of skin adhesive glue as it may cause corneal ulceration if accidentally goes into eyes.

In traditional skin closure with suture material, patients experience more pain during post-operative period, they cannot have a shower and have to come for suture removal. Removal of sutures rarely causes pain, but high degree of patient anxiety associated with these procedures remains. Even after healing, there will be track marks of suture. (Figure 4)



Figure 4: Scar mark on 28th day after surgery using suture material.

Similarly, wound closure with stapler also leaves scar mark bilaterally at the entry point of the pin into skin in addition to main scar (Figure 5).



Figure 5: Scar on 28th day after surgery using skin stapler.

Above data states that age of all the three study groups, cases were ranging from 18 yrs to 50 yrs with average age being 37.90 yrs in suture group, 36.60 yrs in stapler group and 37.57 in skin adhesive glue group. All the three groups were comparable and the difference between them was statistically not significant.

100% cases were male in the suture group where as 90% in staplers group and 83.3% in skin adhesive glue group. All the three groups were comparable and the difference between them was statistically not significant.

Wound cosmesis scores

Patients in all the groups were followed up at time of suture and staple removal on 7th days, 14th day, and 28th day and the wound are assessed for cosmesis on above day using Modified Hollander Cosmesis Scale and Visual Analogue scale. The wound cosmesis was assessed by a blinded independent observer and was scored on a Visual Analogue Scale from 0 to 100.

The study conducted by Toriumi DM et al, observed wounds using Modified Hollander Cosmesis Scale and later by Visual Analog Scale and revealed the equivalent result with Modified Hollander Cosmesis Scale. Use of Visual Analog Scale showed superior results with skin adhesive glue.

In a study done by Allali N et al, they compared the wound with Modified Hollander Cosmesis Scale and later by Visual Analog Scale and showed no significant difference in cosmesis with both the scores.²⁰⁻²⁵

In the present study, the results on 7th, 14th and 28th day show that the cosmetic quality of the scar produced by skin adhesive glue was significantly superior to that produced by either sutures or stapler. Mean MHCS score of suture and stapler was comparable and the difference between them was statistically not significant.

Visual analogue scale obtained by analysis of one-

month post-operative photographs, revealed cosmetic results between the three groups- mean Visual analogue scale score for skin adhesive glue group on day 7 was 67.67 which was significantly more than 61.67 for suture as well as for stapler. If compared mean Visual analogue scale score of suture and stapler are comparable and the difference between them is statistically not significant. The same trend was observed on day 14 and 28.

The statistics shows that the cosmetic appearance of wound on 7th, 14th and 28th day for skin adhesive glue was much superior compared with sutures and staples as per visual cosmetic analogue scale and no significant difference was found between sutures and staples.

George TK et al and Macgregor FB et al studied wound closure in the accident and emergency department and found that stapled closure promotes wound edge eversion, formation of an incomplete loop with decreased tissue strangulation, and lack of residual cross marks.^{26, 27}

In a study comparing staples closure with nylon wound closure in head and neck surgeries by Meiring et al showed that the cosmetic result of staples is as good as if not better than that with nylon sutures.²⁸ Lubowski D et al compared stapled and sutured abdominal wound closure which resulted in almost equal cosmetic scores for vertical wounds.²⁹

Similarly, in our study, there is no significant difference in cosmetic appearance of wound between sutures and staples at end of 28th day as per Visual Analogue Scale.

Comparing between sutures and staples, use of skin staples in low tension incision is easy, less time consuming. Skin staples are relatively inert and can be left in situ for a longer period of time without any complications. In addition, patient can take a bath in the early postoperative period and there are no chances of needle prick injury with staples.²⁸

Comparing skin adhesive glue with staples, staples need to be removed after wound healing which is not there with adhesive glue. Patients had more postoperative pain when their wound was closed with staples as compared with glue.

During the study, the wound gaping was observed with two cases of skin adhesive glue, the wounds of which were allowed to heal by secondary intention and cosmetic appearance was studied as per follow up dates and scoring of wound was done.

Cyanoacrylate glue may show allergic reaction in some cases, however in present study, no allergic reaction was noted.

CONCLUSION

The results from the present study show that cosmetic

appearance of the clean surgical wound closure at the end of 28th postoperative day by using skin adhesive glue was better than staples and traditional skin suturing by Sutures.

During the study, overall wound infection rate was observed which was more in suture and stapler group compared to skin adhesive glue.

Skin adhesive glue is costlier than suture and stapler, but is an excellent alternative for getting better cosmetic outcome and with less complication.

Cyanoacrylate glue may show allergic reaction in some cases, but in present study, no allergic reaction was noted in cases.

Therefore, it can be concluded that Octylcyanoacrylate can be used for skin closure in clean elective surgeries with better cosmetic outcome as compared with staples and sutures.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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