

COMPARATIVE STUDY OF CONVENTIONAL SUTURES VERSUS CYANOACRYLATE GLUE IN CLEAN OPERATIVE WOUND CLOSURE

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ABSTRACT:

Background: Skin closure technique should be technically easy, acceptable, speedy and economical. However, the use of GLUE is increasing in clinical practice. In this study we compared the conventional suturing and cyanoacrylate glue techniques in terms of time efficacy, post-operative pain, wound complications, cosmesis.

Methods: A prospective observational study was conducted on 100 patients comparing tissue glue and sutures in primary wound closures following elective surgeries in the Department of General Surgery at KIMS KARAD (December 2020 to June 2022).

Results: The patients in the two groups were analyzed using Independent t test, and results were formulated. Glue consumed less time for application with a mean of 2.83 minutes when compared to sutures (4.97 minutes). Glue gave best results in terms of less post-operative pain. Mean VAS score calculated at 0,12,24,48,72 hrs was 3.59,3.80,3.20,2.87,2.10 and at 7 days was 1.13. The wound ASEPSIS score calculated on 3rd, 5th, and 7th day. Cosmesis score on 7th day, 1st month and 5th month was calculated using modified hollander and VAS cosmesis scale. Mean score with glue was 0.82,2.76 and 3.12 respectively. All the above proved statistical significance with p value <0.05.

Conclusions: Skin glue gives the best results in terms of less post-operative pain, wound aseptis, better cosmesis. The concept of tissue glue is a safe, attractive, and effective alternate over other conventional methods of wound closures following elective surgeries.

Keywords: Modified hollander scale, cyanoacrylate, Sutures, Tissue glue, VAS, Wound closure

INTRODUCTION

Various modalities are present for wound closure which includes Sutures, staples, currently tissue adhesive are the widely used technique for wound closure in the routine clinical practice. There is some advantage of sutures for wound closure, that is, it provides proper closure of the wounds. But due to the tissue reactivity or allergic reaction there may be need to remove those sutures. Tissue adhesives offer the advantages of no risk of needle stick injury and no requirement to remove sutures later.

In the clinical practice tissue adhesive are commonly used in the emergency rooms, but some studies observed that the use of tissue adhesive in the operating rooms is on the rise to sutures. Surgeons now prefer adhesives for the surgical skin incisions.

Skin sutures or metal skin clips are other modalities which are used for the closure of the surgical incisions routines. They are also safe and effective, but the disadvantage of these is, they need certain instruments during application, takes too much time compared to tissue adhesives and most important factor is the requirement of extra staff and the cost of removal of sutures/staples.

According to the definition, ideal incision closure should be simple, effective, safe, rapid, inexpensive, painless, cosmetic and bactericidal. Recent studies suggest that the use of tissue adhesive for closure of both traumatic lacerations and incisional surgical wounds leads to cosmetic outcome comparable to conventional sutures.

Surgical site infection are a significant for surgeon, despite major improvements in antibiotics, better anesthesia, superior instruments, early diagnosis of problem and improved techniques of

postoperative vigilance. when a surgeon sutures a clean incision, healing takes place with minimal loss of and tissue and without significant bacterial infection with minimal scarring and with glue the results are better in comparison with suture material. Tissue adhesives offer barrier to microorganism to the site of healing and therefore have a success towards reducing wound infection. time taken for skin closure is 3 minutes with adhesive glue but with suture material it takes about 7-10 minutes. best cosmesis is achieved

with glue when compared with sutures. The skin suture patients needed postoperative dressing but there was minimal cost in postoperative management of wound closure with glue. Certainly there is no risk of needle stick injury to the surgeon whilst using adhesive rather than suture.

In case of sutured wound, multiple puncture sites are the source of infection which is avoided in adhesive glue thereby reducing wound infection. while applying adhesive glue for skin closure, dead space is obliterated and complete hemostasis should be achieved for better results.

It was very clearly demonstrated by Ordman and Gillman ¹ in their studies that tape closed wound was in no way inferior to suture closed wound. The absolute values obtained from the tensile strength of tape closed incisions after 5 th day was found very high and found sufficient enough to make spontaneous rupture unlikely in the normal postoperative period. The greater tensile strength of the suture over glued wound has been ascribed to some extent to the greater fibrosis provoked only internally along the incision by the perisutural reaction.⁴ Kamer and Joseph found that cyanoacrylate is safe, reliable and cost effective alternative to conventional wound closure techniques if properly used, cyanoacrylate prevents suture marks and milia formation. Patients have minimal complaints and are certainly pleased with the manner in which their wounds heal in comparison to their counterparts from the suture control group. There is no need to remove suture, which was very inconvenient to the patients.

Advances in surgery and anaesthesia have not been paralleled by advances in the treatment of wound problems and skin closure is one of the many factors that are involved. The conventional and universally used methods of skin closure with stitching the edges together have been subjected to the scrutiny of laboratory research and clinical trials. Nevertheless, the results of suturing are not always completely acceptable. The end result of natural healing process is of paramount importance and much effort is given to the production of an invisible scar. The shortcomings of sutures are well documented in literature and we continued to be worried about minor inflammatory reactions with sutures and by skin marks either temporary or permanent. Hence present study has been undertaken to study the efficacy of cyanoacrylate glue in operative wound closure

Aim:

To study the comparison of conventional sutures versus cyanoacrylate glue in clean operative wound closure

Objective

1. Healing of wound
2. To access the complications
3. The cosmetic appearance of skin closure by application of adhesive skin glue and sutures

MATERIALS AND METHODS

STUDY DESIGN: PROSPECTIVE OBSERVATIONAL STUDY

SOURCE OF DATA

Patients admitted to surgery department in Krishna Hospital with clean operative wounds in the period of DECEMBER 2020 To JUNE 2022 will be taken for study, considering the inclusion and exclusion criteria.

METHOD OF COLLECTION OF DATA:

Operated clean wound patients will be recruited into the study based on the inclusion and exclusion criteria mentioned below.

A detailed history of the patient shall be taken.

The above data shall be tabulated in accordance with parameters including age, sex, post operative pain,time consumption,cosmetic appearance,complications of skin closure.

INCLUSION CRITERIA

Cases undergoing clean elective surgical procedure with incision length around 3 to 10cm

EXCLUSION CRITERIA

1. Cases not undergoing primary closure.
2. Surgeries where stomas are necessary.
3. Patients not giving consent for cyanoacrylate skin closure.
4. Surgeries involving excision of malignant tumours.
5. Surgeries across mucocutaneous junctions like lips,oral cavity,eyes etc where adhesive glue is contraindicated.

SAMPLE SIZE

100 patients with inclusion criteria will be studied from DECEMER 2020 to JUNE 2022 (18Months)

$$n = \frac{Z^2 \cdot \frac{1-\alpha/2 \cdot SD^2}{(M \times E)^2}}$$

SD- STANDERD DEVIATION

M – MEAN

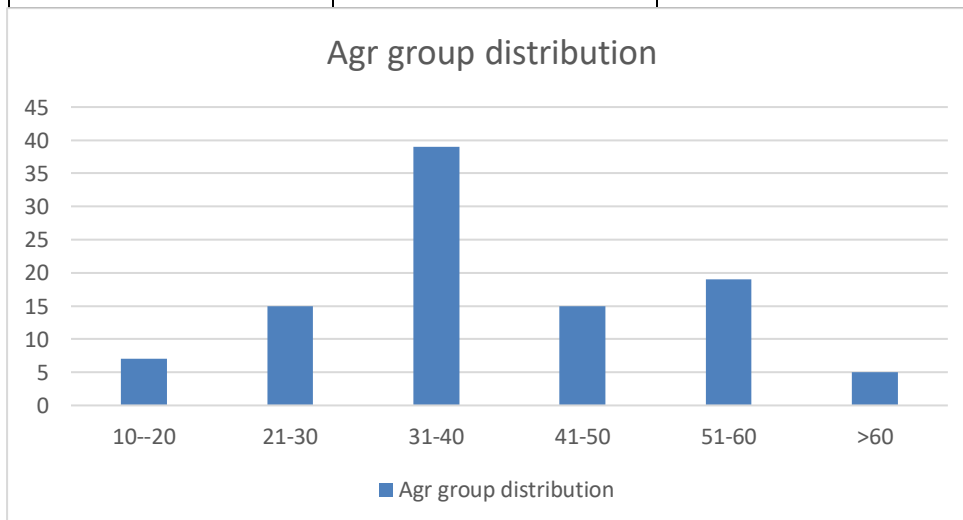
E – PRECISION (10%)

Sample size(n)= 100

Observation and analysis

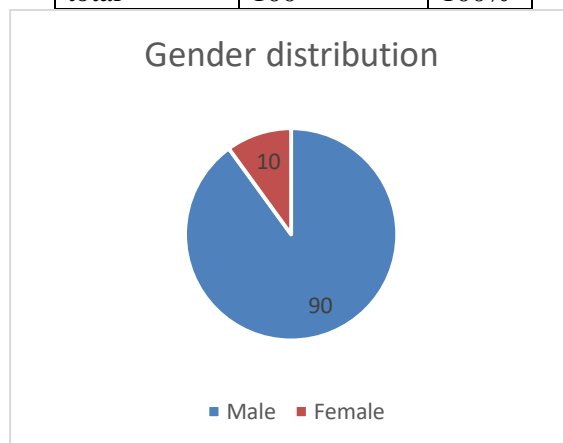
Age distribution

Age group	No of patients	% age
10-20 years	7	7%
21-30 years	15	15%
31-40 years	39	39%
41-50 years	15	15%
51-60 years	19	19%
>60 years	5	5%
Total	100	100



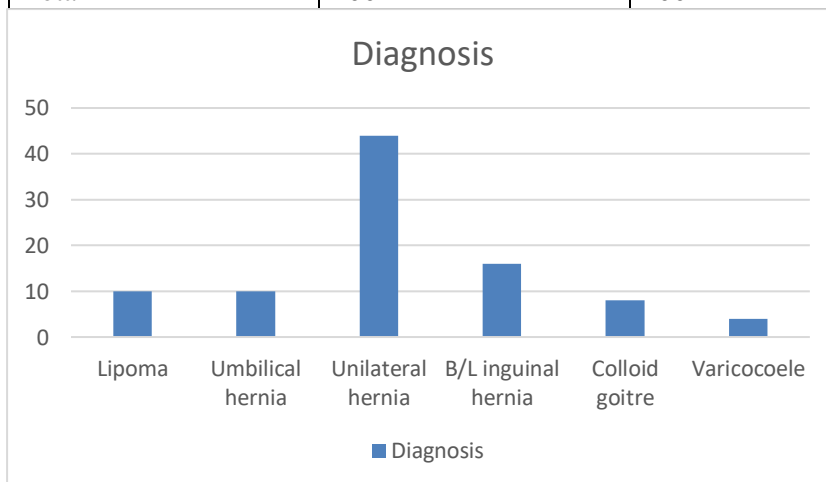
Gender distribution:

Gender	No of patients	%age
Male	90	90%
Female	10	10%
total	100	100%



Diagnosis in the study population:

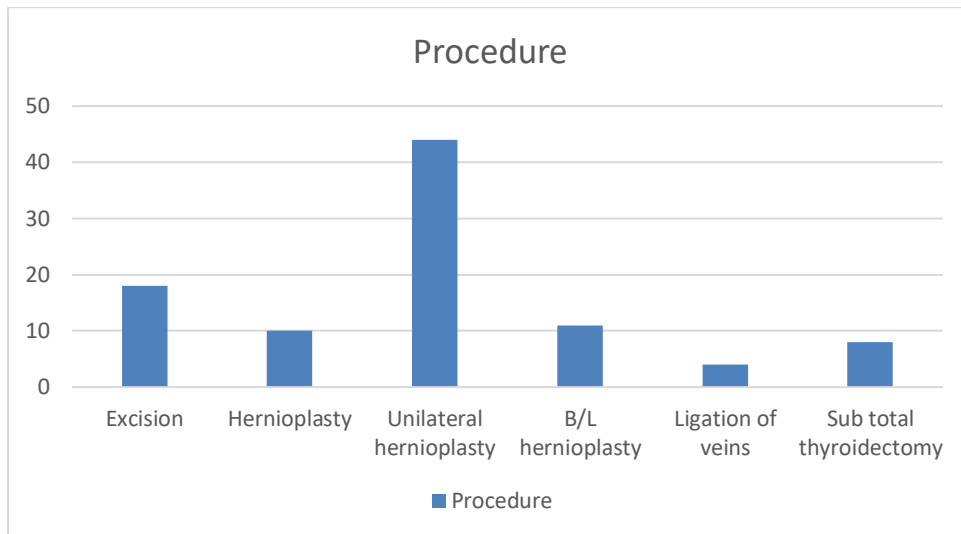
Diagnosis	No of patients	%age
Lipoma	18	18%
Umbilical hernia	10	10%
Bilateral inguinal hernia	16	16%
Unilateral hernia	44	44%
Varicocoele	4	17%
Colloid goitre	8	8%
Total	100	100



Procedures used for the disease:

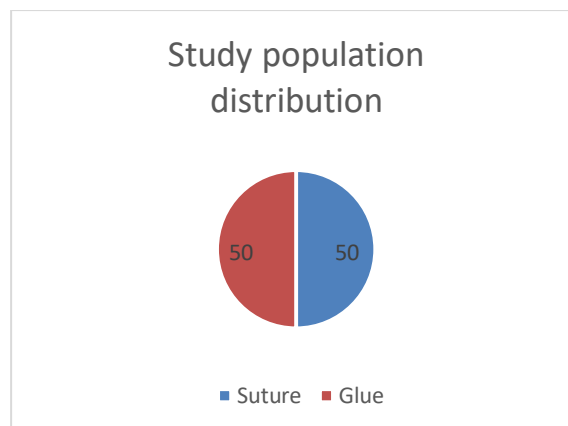
Surgery done	No of patients	%age
Excision	18	18%
Hernioplasty/Myo's Repair	10	10%
Bilateral hernioplasty	16	16%
Unilateral hernioplasty	44	44%
Ligation of veins	4	4%
Sub total thyroidectomy	8	8%

	100	100
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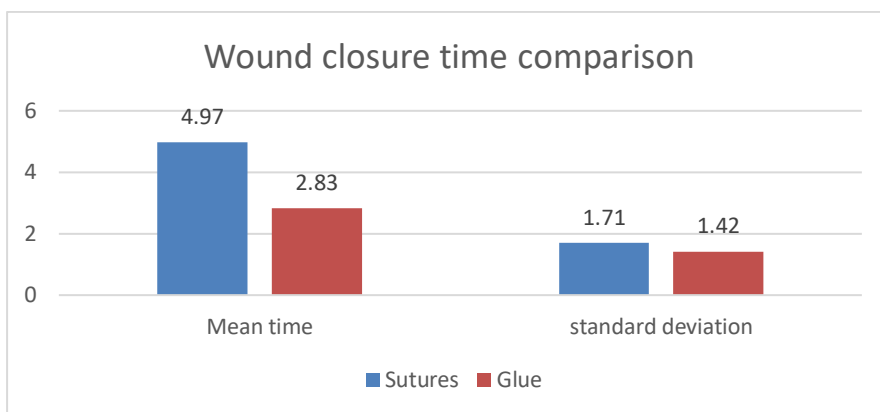
Comparison suture and glue material used in the study:

Material	Frequency	%age
Suture	50	50%
Glue	50	50%
Total	100	100%



Comparison of time taken for the wound closure: Independent t test was applied for this.

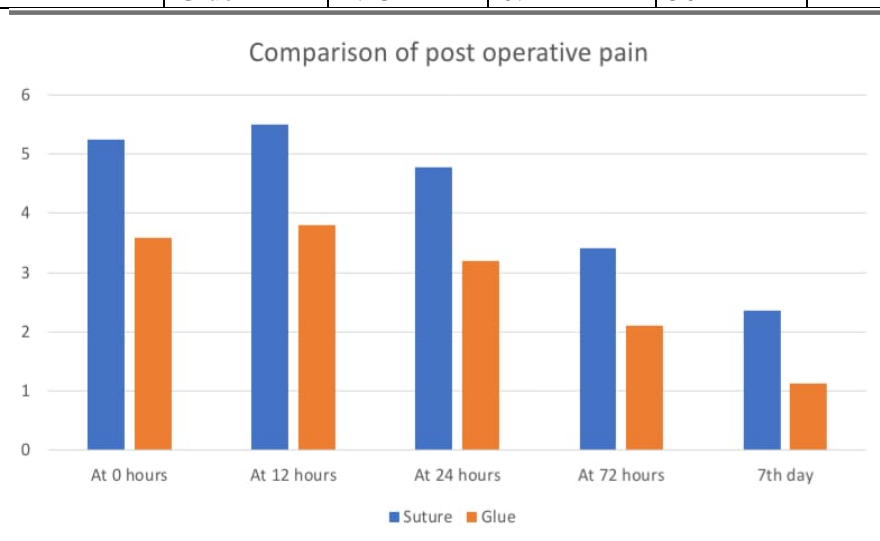
Time taken for wound closure (in minutes)	Method	N	Time taken (mean)	Standard deviation	t value	P value
	Suture	50	4.97	1.71	7.354	<0.05
	Glue	50	2.83	1.42		



Comparison of post-operative pain among the patients:

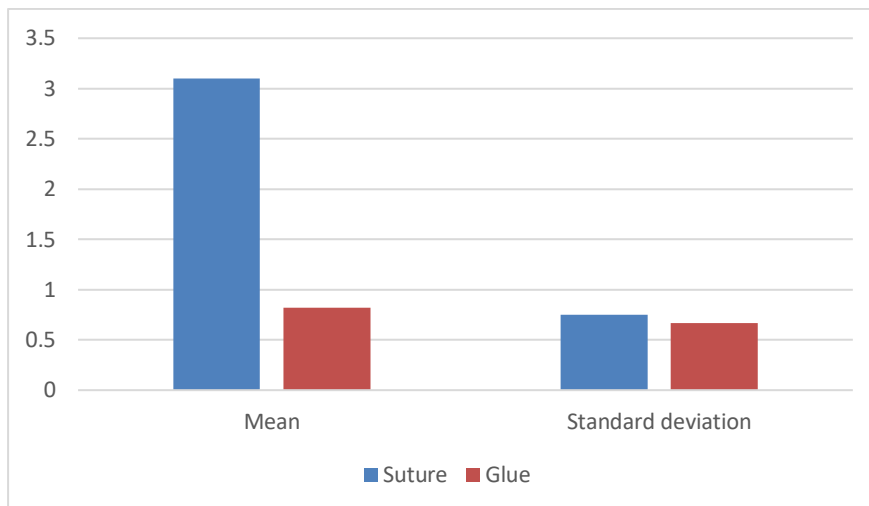
The postoperative pain in both groups were studied using Visual analogue scale. visual analogue scale is a numerical scale which ranges from 0-10 with scale 0- no pain and scale 10- worst pain. The postoperative pain being monitored at 0 hrs, 12hrs, 24hrs, 48hrs, 72hrs and 7th postoperative day.

Postoperative pain score	Method	Mean	Standard deviation	N	P value
At 0 hours	Suture	5.25	0.70	50	<0.05
	Glue	3.59	0.63	50	
At 12 hours	Suture	5.50	0.79	50	
	Glue	3.80	0.71	50	
At 24 hours	Suture	4.78	0.72	50	
	Glue	3.20	0.60	50	
At 48 hours	Suture	4.00	0.62	50	
	Glue	2.87	0.51	50	
At 72 hours	Suture	3.41	0.52	50	
	Glue	2.10	0.41	50	
On 7 th days	Suture	2.35	0.45	50	
	Glue	1.13	0.42	50	



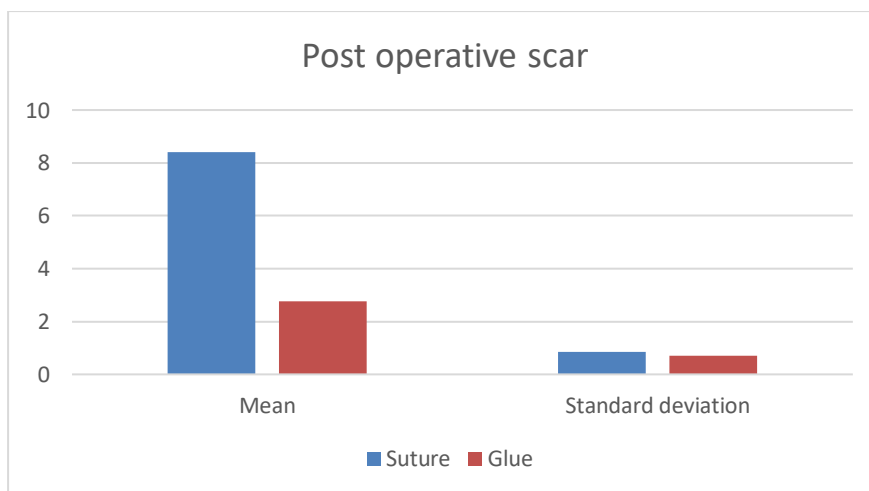
Comparison of asepsis score between both the methods:

Asepsis score	Method	Mean	Standard deviation	N	t score	P value
	Suture	3.10	0.75	50	14.96	<0.05
	Glue	0.82	0.67	50		



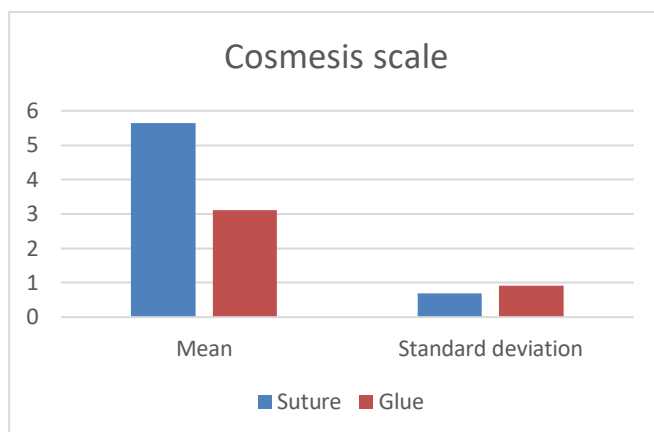
Comparison of post-operative scar among the study group:

Vancouver scar score	Method	N	Mean	Standard deviation	t score	P value
	Suture	50	8.40	0.84	32.15	<0.05
	Glue	50	2.76	0.71		



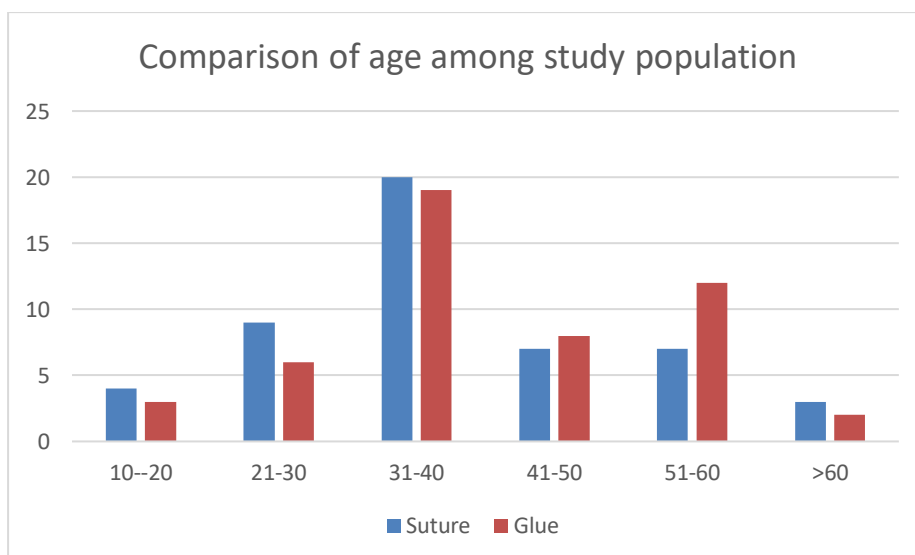
Comparison of cosmesis among the study population:

Modified Hollander scale	Method	N	Mean	Standard deviation	t score	P value
	Suture	50	5.65	0.70	15.90	<0.05
	Glue	50	3.12	0.91		



Comparison of age and gender among the study population

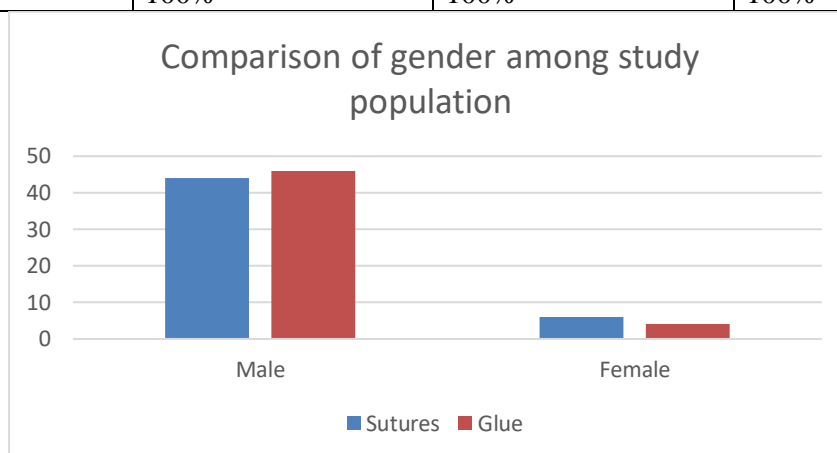
Age group	Total Count	Suture	Glue
	% age	%	%
10-20	7	4	3
	7%	4%	3%
21-30	15	9	6
	15%	9%	6%
31-40	39	20	19
	39%	20%	19%
41-50	15	7	8
	15%	7%	8%
51-60	19	7	12
	19%	7%	12%
>60	5	3	2
	5%	3%	2%
Total	100	50	50



Comparison of gender among skin glue and sutures

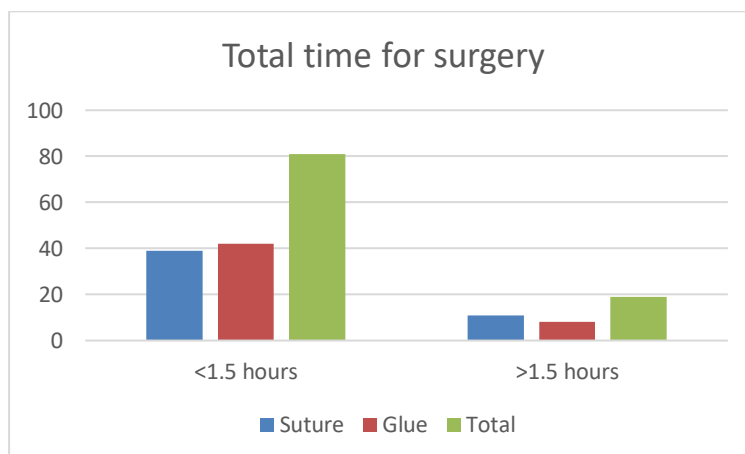
Gender	Suture	Glue	Total
Male	44	46	95
	96%	94%	95%

Female	6	4	10
	12%	8%	10%
N	50	50	100
Total	100%	100%	100%



Time for surgery :

Time for surgery	Suture	Glue	Total
<2 hours	39	42	81
	78%	84%	
>2 hours	11	8	19
	22%	16%	
Total	50	50	100
	100%	100%	100%



Discussion

Approximation of skin incision in wound closure technique is essential for a good cosmetic and functional result. The main goal of all wound closure technique is to approximate the wound edges without disturbing the natural process of healing. Traditionally, skin closure technique was performed with suture material because of cost effectiveness and availability. But current trend runs towards a faster, comfortable and cosmetically better technique. Suture material remains standard material for skin closure, but however use of suture material is associated with postoperative pain and one have to come for suture removal which in turn causes anxiety or pain. Since suture material is associated with puncture site near the wound edge, there is high chance of microbial invasion which in turn leads on to surgical site infection.

Needle stick injury is highly associated with suture material and hence there is high chance of transmission of HIV and other diseases.

Despite all shortcomings of suture material technique, it still retains the maximum tensile strength.

Again coming onto stapler device, application is faster, associated with lowest rate of tissue reaction and infection. However these stapler device do not produce meticulous closure and removal of staples produces pain.

Surgical tapes which is used for wound closure technique is least inducers of tissue reactivity but however it requires the use of adhesive adjuncts like tincture of benzoin which increases the local induration and skin toxicity.

An ever ending research for a material to overcome the shortcomings of various closure technique led to discovery of skin adhesive glue (octylcyanoacrylate).

Tissue adhesive were discovered in 1949 but clinically it came into surgeons practice in 1959. In earlier generation short carbon atoms were used which results in faster degradation and producing toxic products.

Cyanoacrylate are topical adhesive glues that forms bond over outer surface of skin. It contains long chain plasticizer and forms strong flexible bond.

In the present study total 100 patients were included for the study period which were having clean wound.

Majority of the patients were present in the age group of 31 -40 years with 39% followed by 51-60 year age group with 19% and 21-30 years and 41-50 years with 15% each. There was no statistical significance in the age group distribution.

There was male preponderance among the study population with 90% of the patients being male while 10% of the patients were females.

In Ananda B B et al study⁴⁶ total 90 patients were included which were distributed randomly in sutures, stapling and skin glue group. The mean age of the group of 41.11 with almost 20% of the patients were in the age group of 31-50 years. This was similar to our study in which majority of the patients were in the age group of 31-40 years.

Also in the study there was male predominance with 65 patients being male (72.2%) and rest of the patients were female.

All the patients were admitted in the hospital for surgery and who were having clean wound post operatively. There were many diagnoses according to which the participants were involved in the study for the study duration.

Most common cases which were found in the study population were inguinal hernia cases, either bilateral inguinal hernia, or unilateral hernia with total 16% and 44% cases respectively. Followed by 18% lipoma cases, 10% umbilical hernia, 8% colloid goitre and 4 cases of varicocoele cases went present.

All the different diagnoses require different type of surgeries such as for bilateral inguinal hernia, unilateral hernia and umbilical hernia, hernioplasty was done in same number of patients, 16%, 44% and 10% cases. Excision was done for the lipoma cases (18%). Ligation of veins was done in 4% of varicocoele cases and sub total thyroidectomy (8%) was done for colloid goitre.

Ananda B B et al (1) study also included four types of surgeries – open appendectomy, lipoma excision, open cholecystectomy and hernioplasty.

In All the above mentioned surgeries either adhesive glue or sutures were used for the skin closure after the surgery. And the outcomes were assessed during the usage of the same group. For which total 100 patients were taken of which 50 each were allotted to either group for the study duration. Thereby 50 cases were distributed in the adhesive glue group and 50 cases were allotted to sutures group.

In the present study the time taken for wound closure was calculated for both the groups and t test was applied as the test of significance. It was found in the study that mean time taken by the sutures group was 4.97 minutes (SD 1.71) whereas the mean time taken in the adhesive glue was

almost half of the sutures group which was 2.83 minutes (SD 1.42). this finding was statistically significant with p value <0.05.

In Ananda B B et al calculated the number of seconds in which wound was closed in all three groups using a stop watch. It was found in the study that 22 number of patients (73.3%) among the staple population took less than 60 seconds whereas 29 patients (96.7%) of the patients among adhesive glue population took less than 60-200 seconds but among the three groups suture population took highest amount of time which is more than 200 second. The result of this study matches with the present study that the time taken for wound closure was significantly less in adhesive glue compared to sutures.

Visual analogue score was compared among the suture and adhesive glue group on the visual analogue scale on 0 to 10. This was calculated at 0, 12, 24, 48 and 72 hours and on 7th day. The mean was calculated for the VAS score. It was found in the study that there was a statistically significant difference between the pain score in adhesive glue and sutures group. At 0 hours the mean score was found to 5.25 in the sutures group compared to 3.59 in the glue group. Similarly it was found that the mean score of VAS was higher in the suture group compared to the adhesive glue group. Though it was observed that there was slight increase in the pain score at 12 hours after which the VAS score gradually decreased from 24 hours to 7th day. On 7th day as well there was slight pain observed in the study population with mean of 1.1 in the glue group compared to 2.23 in the suture group.

Similar to our present study, in the study by Ananda B B et al it was stated that the pain score at 12, 24, 48 and 72 hours and at the end of the 7th day showed that the 12 hours pain score was least in glue population, 24 hours post operative pain was also least in the glue group. It was observed in their study that the least score was found in the adhesive glue groups in all the time duration taken into account.

Asepsis score was also found to be less in the present study with mean value of 3.10 in the suture group whereas it significantly less in 0.82. the statistical significance was calculated after applying the t test. The p value was <0.05.

Similar to our present study the asepsis score found less in the Ananda B B et al study. it was taken that the lesser the score better was the outcome. In their study the asepsis score was calculated on day 3, 5 and 7 post operatively. Overall lesser asepsis score was observed among the glue population with statistical significance for post operative day 4 and 5. This remains one of the limitation of our study where asepsis score was not calculated chronologically.

In the present study Vancouver scar score was used to evaluate the scar in post operative phase. Lesser scar was taken as the better outcome. It was found in the study that mean scar score was higher in the suture group with mean value of 8.40 compared to glue group where the mean value of the scar was found to 2.76. the scar was compared in the study population using t test and it was found that the difference was statistically significant with p value<0.05.

Cosmesis score was calculated using modified Hollander score and it was taken that lesser the mean value better was the outcome. For which it was found that the mean value of suture group was 5.65 compared to 3.12 mean in the glue group. This was found to be statistically significant in the study population.

In Ananda B B et al study cosmetic outcome of the wound was assessed on the 7th post operative day, 1st month and 3rd month using modified Hollander score and VAS cosmesis scale. It was found in the study that the score was numerically in favor of glue and this difference was not proved as statistically significant but by the end of the one month there was widening of the cosmesis score and it was statistically significant which strongly signified that glue group had better cosmesis compared with the suture or staple group,

SUMMARY

The main goal of all wound closure technique is to approximate the wound edges without disturbing the natural process of healing. Traditionally, skin closure technique was performed with suture material because of cost effectiveness and availability. But current trend runs towards

a faster, comfortable and cosmetically better technique. cyanoacrylate are topical adhesive glues that forms bond over outer surface of skin. It contains long chain plasticizer and forms strong flexible bond. Tissue adhesive were discovered in 1949 but clinically it came into practice in 1959. Most common cases which were found in the study population were inguinal hernia cases. Open appendectomy, lipoma excision, open cholecystectomy and hernioplasty were also done. And the outcomes were assessed during the usage of the same group. The time taken for wound closure was significantly less in adhesive glue compared to sutures. Ananda B B et al calculated the number of seconds in which wound was closed in all three groups using a stop watch. It was found that 22 patients (73.3%) among the staple population took less than 60 seconds and 29 patients (96.7%) of the adhesive glue population took between 60-200 seconds. Asepsis score was also found to be less in the present study with mean value of 3.10 in the suture group whereas it significantly less in 0.82 in the glue group. The study by Ananda B B et al had pain scores at 12, 24, 48 and 72 hours and at the end of the 7th day. In Ananda B B et al study cosmetic outcome of the wound was assessed on the 7th post operative day, 1st month and 3rd month using modified Hollander score and VAS cosmesis scale. It was found that mean scar score was higher in the suture group with mean value of 8.40 compared to glue group. The use of cyanoacrylate glue better than conventional sutures in the clean operated wound closure. There was significant difference in the post operative pain in the glue group versus suturing group. The glue group had better asepsis and cosmesis score as well as less time for the closure of the wound.

Conclusion

- It was found in the study the glue group had better results compared to sutures group
- It took lesser time compared to sutures for the closure of the wound
- Glue group had better asepsis and cosmesis score
- There was significant difference in the post operative pain in the glue group versus sutures group with better results shown by glue group.
- Therefore from the study it can be concluded that the use of cyanoacrylate glue better than conventional sutures in the clean operated wound closure.

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