# **Original Research Article**

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# Comparative study between cyanoacrylate tissue adhesive versus skin sutures in closure of wound in 60 operated cases of open inguinal hernia

Jawansing T. Manza<sup>1</sup>, Rushabh S. Maisuria<sup>1</sup>, Devendra R. Chaudhari<sup>1</sup>, Divyang N. Dave<sup>1</sup>, Yatin B. Gajra<sup>2</sup>, Daxesh P. Patel<sup>1</sup>\*

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\*Correspondence: Dr. Daxesh P. Patel,

E-mail: dax.12345@gmail.com

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# **ABSTRACT**

Background: Today there are numerous methods available for closure of wounds like tissue adhesives, staplers, adhesive tapes and obviously the age old conventional suturing, all of which have their own pros and cons. The aim was to study the complications and results of use of 2-octyl cyanoacrylate on wound healing and compare them without those of conventional suturing.

Methods: Study included 60 operated cases of open inguinal hernia. And comparison was made between cyanoacrylate tissue adhesive and conventional skin suturing in open inguinal hernia.

Results: 1 out of 30 (3.3%) from tissue adhesive group and 2 out of 30(6.7%) develop fever ( P value=1.000). 4 (13.3%) of tissue adhesive and 4 (13.3%) from suturing developed redness (P value=1.000). 4 (13.3%) tissue adhesive and 5 (16.7%) from suturing had discharge (P value=0.718). 2 (6.7%) and 1 (3.3%) developed wound dehiscence from tissue adhesive and suturing respectively (P value=0.554). 1 (3.3%) from tissue adhesive developed edge eversion (P value=0.313). 24 (80%) wounds are cosmetically good in which tissue adhesive was applied and 2(6.7%) in which suturing was done (P value=0.001) which is statistically significant.

Conclusions: Time required for the intraoperative application of cyanoacrylate glue is less than suturing of incision. Incidence of wound infection was found to be less when wound closure done by cyanoacrylate glue in comparison to suturing. A single linear scar was obtained using cyanoacrylate glue which is cosmetically better than suture scar. Incidence of wound dehiscence is more in cases of application of cyanoacrylate glue than suturing.

Keywords: 2-octyl cyanoacrylate, Inguinal hernia, Skin closure

# **INTRODUCTION**

Today there are numerous methods available for closure of wounds like tissue adhesives, staplers, adhesive tapes and obviously the age old conventional suturing, all of which have their own pros and cons. Every patient would want a method that would heal a wound with minimal scar. However the final decision to use a particular method rests on the surgeon. The surgeon must evaluate each case individually and choose closure material which will maximize the opportunity of healing and minimize the likelihood of infection. The proper closure material will allow the surgeon to approximate the tissue with little trauma. Every surgery leaves behind a scar that may have functional, cosmetic or psychological consequences. Principle of wound should be to achieve precise wound closure approximation, have easy handling and working properties and have low infection rates. 1, 2 Sutures are the classical and conventional technique for the purpose of

<sup>&</sup>lt;sup>1</sup>Department of General Surgery, Government Medical College, Surat, Gujarat, India

<sup>&</sup>lt;sup>2</sup>Medical officer, Indus hospital Ahmedabad, Gujarat, India

wound closure. They require passage of a foreign material through tissues, if tied tightly or left for too long it may leave permanent suture marks and if removed early will result in dehiscence. Added to these setbacks, is an additional requirement of a dressing to protect the wound and suture as well. The ever-striving search for an alternative procedure and material lead to the discovery and development of tissue adhesives.

Cyanoacrylate is the generic name of the family of strong fast acting adhesives with industrial, medical and household uses.<sup>3,4</sup> Tissue adhesive were invented in 1949 and tried clinically for the first time in 1959. This procedure allows for normal wound healing and is accomplished without the need of local anesthesia or entry of foreign material. The tissue adhesives, have been used in general surgery in the procedures related to abdomen, eyes, kidney, liver and vascular surgeries.

In present study of cyanoacrylate was used in skin closure of wound of operated cases of open inguinal hernia.

# **METHODS**

Cases selected were subjected to a detailed history and thorough physical examination.

Study included 60 operated cases of open inguinal hernia. And comparison was made between cyanoacrylate tissue adhesive and conventional skin suturing in open inguinal hernia.

#### Inclusion criteria

- Age 18 to 60 years.
- Sex Male and Female both.
- Hernia Direct and Indirect.

### Exclusion criteria

- Hernia with TVH.
- Diabetes mellitus, Hypertension, Tuberculosis and HIV patients.
- Congenital hernia.

Patients were selected as per consecutive admissions of patients. Cyanoacrylate glue was applied in patients operated in our unit and sutured cases were taken from other units.

The amount of glue required for closure of incision is about 0.25-0.35 ml.<sup>5</sup>

Duration of the treatment with antibiotics was for 7 days. After stay of 2<sup>nd</sup> postoperative day, patient was discharged and called for follow up after 8 days and then on 4 weeks and 8 weeks.

Brief methodology

Cyanoacrylate glue was applied after achieving complete haemostasis. The ends of skin incision was held with skin hooks and approximation of wound edges was achieved manually by fingers or forceps.<sup>5-7</sup>

- The glue was applied directly over the edges in droplet forms taking care not to apply adhesive between wound edges.
- The applied film extended to at least 5 mm on either side of the healthy skin around the wound area.
- The wound was held till it will dry to allow complete polymerization as indicated by opacification of the glue.
- Time will measured from start of skin closure till its completion. Clear and dry dressing was applied and maintained in position for 4 days after closure.
- Resultant scar for assessment of cosmetic outcome was seen in both the groups when the patients came for follow up after 8 days and then on 4 weeks and 8 weeks.
- Skin suturing was done using monofilament non absorbable mattress or simple suturing (2-0) and sterile dressing is done. Sutures were removed after 8th postoperative days.
- For cosmesis comparison between suturing method and cyanoacrylate was done on the basis of scar width.

#### Scar width

- Good up to 2mm
- Fair >2mm to 4 mm
- Poor >4 mm

#### **RESULTS**

Study includes 60 operated cases of open inguinal hernia.<sup>8-10</sup>

Table 1: Age group.

A co croun		Wound closure		Total	
Age group	Age group		Suture	Total	
	Count	5	9	14	
< 30 y	% within wound	16.7	30.0	23.3	
	closure	10.7	30.0		
	Count	8	2	10	
31-40 y	% within wound	26.7	6.7	16.7	
	closure	20.7			
	Count	9	11	20	
41-50 y	% within wound	30.0	36.7	33.3	
	closure	30.0	30.7	33.3	
	Count	8	8	16	
51-60y	% within wound	26.7	26.7	26.7	
	closure	20.7	20.7	20.7	
Total	Count	30	30	60	
	% within wound closure	100.0	100.0	100.0	

Table 2: Method of wound closure.

C:4a		Wound Closure		
Site		Glue	Suture	
	Count	21	17	
Right	% within wound closure	70.0%	56.7%	
	Count	9	13	
Left	% within wound closure	30.0%	43.3%	
Total	Count	30	30	
	% within wound closure	100.0%	100.0%	

In 30 patients cyanoacrylate tissue adhesive and in other 30 patients conventional suturing used for wound closer.

Table 3: Distribution of patient presenting with fever.

Fever		Wound	Total	
rever		Glue		Total
	Count	1	2	3
Yes	% within wound closure	3.3%	6.7%	5.0%
No	Count	29	28	57
	% within wound closure	96.7%	93.3%	95.0%
	Count	30	30	60
Total	% within wound closure	100.0%	100.0%	100.0%

Statistical analysis done with the help of software statistical packages for social sciences (SPSS).

Majority patients in this study are between 41-50 years of age group (Table 1).

Out of 60 patients around 38 patients have right side and 22 patients are of left inguinal hernia (Table 2).

Table 4: Distribution of patient presenting with redness.

Redness		Wound	Total	
		Glue	Suture	1 Otai
	Count	4	4	8
Yes	% within wound closure	13.3%	13.3%	13.3%
No	Count	26	26	52
	% within wound closure	86.7%	86.7%	86.7%
	Count	30	30	60
Total	% within wound closure	100.0%	100.0%	100.0%

1 (3.3%) patients having fever in which cyanoacrylate tissue adhesive applied and 2 (6.7%) patients having fever in which suturing is done (Table 3).

- 4 (13.3%) patients each in cyanoacrylate tissue adhesive group and suturing group having redness (Table 4).
- 4 (13.3%) patients having discharge in cyanoacrylate group and 5 (16.7%) patients in which suturing is done (Table 5).

Table 5: Distribution of patient presenting with discharge.

Discharge		Wound	Wound closure		
		Glue	Suture	Total	
	Count	4	5	9	
Yes	% within wound closure	13.3%	16.7%	15.0%	
	Count	26	25	51	
No	% within wound closure	86.7%	83.3%	85.0%	
	Count	30	30	60	
Total	% within wound closure	100.0%	100.0%	100.0%	

2 (6.7%) patients having wound dehiscence in which cyanoacrylate tissue adhesive is applied and 1 (3.3%) in which suturing is done (Table 6).

Table 6: Distribution of patient presenting with wound dehiscence.

Wound dehiscence		Wound	Total	
		Glue	Suture	Total
	Count	2	1	3
Yes	% within wound closure	6.7%	3.3%	5.0%
	Count	28	29	57
No	% within wound closure	93.3%	96.7%	95.0%
	Count	30	30	60
Total	% within wound closure	100.0%	100.0%	100.0%

Table 7: Distribution of patient presenting with edge eversion.

Edge eversion		Wound cl	Total	
		Glue	Suture	10tai
	Count	1	0	1
Yes	% within wound closure	3.3%	0.0%	1.7%
	Count	29	30	59
No	% within wound closure	96.7%	100.0%	98.3%
Total	Count	30	30	60
	% within wound closure	100.0%	100.0%	100.0%

Table 8: Distribution of patient presenting with wound cosmesis.

Cosmesis		Wound o	Total	
		Glue Suture		10tai
	Count	1	5	6
Poor	% within wound closure	3.3%	16.7%	10.0%
Good	Count	24	2	26
	% within wound closure	80.0%	6.7%	43.3%
	Count	5	23	28
Fair	% within wound closure	16.7%	76.7%	46.7%
	Count	30	30	60
Total	% within wound closure	100.0%	100.0%	100.0%

1 (3.3%) have edge eversion in which cyanoacrylate tissue adhesive is applied (Table 7).

24 (80%) patients are cosmetically good in which cyanoacrylate tissue adhesive applied and 2 (6.7%) in which suturing is done (Table 8).

#### **DISCUSSION**

The wound adhesive n-octyl cyanoacrylate is approved by the US food and drug administration for closure of incised wound, apart from using it for skin closure various studies have been conducted showing versatile use of n-octyl cyanoacrylate. This study consists of comparative study of closure of wound of open inguinal hernia with the help of cyanoacrylate tissue adhesive and conventional suturing.

Out of 60 patients in 30 patients wound is closed with cyanoacrylate tissue adhesive and in other 30 cases conventional suturing is done.

In the present study age of the patient varied from 18 to 60 years with the highest prevalence noted in the age group of 41-50 years (Table 1).

Table 9: Descriptive statistics of time required for wound closure and scar width.

	Wound closure	N	Mean	Std. Deviation	Independent sample to value
Time requires(min)	Glue	30	3.00	0.983	0.0001
	Suture	30	7.27	1.461	
C	Glue	30	1.87	0.819	0.0001
Scar width(mm)	Suture	30	3.20	0.847	

Table 10: Comparisons with other studies.

Studies	Glue	Suture
Mean age		
Present study	41.9 yr	42.5 yr
SDM college Karnataka	52.5 yr	51.24 yr
Infection		
Present study	0 %	3.3%
SDM college Karnataka	13.30%	13%
Cochrane study (London)	2.70%	6.60%
Dehiscence		
Present study	6.70%	2%
SDM college Karnataka	3.30%	4.00%
Cochrane study (London)	2.70%	4.90%
Time		
Present study	3 min	8.9 min
SDM college Karnataka	1.6 min	6.5 min
IMS Varanasi	1.3 min	4.5 min

In the present study of 60 operated cases of closure of wound of open inguinal hernia all patients included were male.

Time required for application of cyanoacrylate tissue adhesive is shorter than suturing by conventional method (Table 9).

Average time required for application of cyanoacrylate glue is 3 min. and average time required for suturing is 7 min.

Comparing with SDM College Karnataka time required for application of glue is 1.6 min and for suturing 6.5 min.

Comparing with IMS Varanasi time required for application of glue is 1.3 min and for suturing is 4.5 min (Table 10). 11-13

1(3.3%) case having wound dehiscence in which suturing is done whereas 2(6.7%) cases having wound dehiscence in which cyanoacrylate is applied. statistically no significant relation seen between both groups of wound closure (p value=0.554, Df=1) (Table 6).

Comparing with SDM College Karnataka found wound dehiscence in 3.3% in which cyanoacrylate is applied and 4.00% in which suturing is done.

Comparing with Cochrane study London found wound dehiscence in 2.70% cases in which cyanoacrylate is applied and 4.90 % cases in which suturing was done

Out of 30 patients in cyanoacrylate group 1 (3.3%) case having fever and 2 (6.7%) have fever in which suturing is done. Chi square test is applied to check statistical association for history of fever in wound closure by cyanoacrylate tissue adhesive and suturing.

There was statistically no significance between wound closure by cyanoacrylate tissue adhesive or suturing having fever (p > 0.05). (p value = 1.000, Df = 1) (Table 3).

4(13.3%) cases in suturing group whereas 4 (13.3%) cases in cyanoacrylate group was having redness. There was statistically no significant relation seen between both groups of wound closure (p value=1.000, Df=1) (Table 4).

5 (16.7%) cases in suturing group and 4(13.3%) cases in cyanoacrylate group having discharge. Statistically no significant relation seen between both groups of wound closure (p value=0.718, Df=1) (Table 5).

Only one case (3.3%) in which cyanoacrylate is applied having edge eversion. statistically no significant relation seen between both groups of wound closure (p value=0.313, Df=1) (Table 7).

suturing and cyanoacrylate are compared for cosmesis on the basis of scar width

- Good-if scar width is less than 2 mm
- Fair-if > 2 mm to 4 mm
- Poor- if scar width is more than 4 mm

2 (6.7%) cases in suturing method and 24 (80%) cases in cyanoacrylate group are cosmetically good.

23 (76.7%) in suturing and 5 (16.7%) in cyanoacrylate group are cosmetically fair.

5 (16.7%) cases in suturing method and 1 (3.3%) cases in cyanoacrylate are cosmetically poor.

There was statistically significant relation seen between both groups of wound closure regarding Cosmesis. (p value=0.0001, Df=2) (Table 8). Scar width is small and linier in application of cyanoacrylate glue and it is thicker in case of suturing. Average scar width after application of cyanoacrylate glue is 1.87 mm and after suturing is 3.20 mm. Statistically significant relation seen between both groups of wound closure regarding time required and scar width. (p value=0.001) (Table 9).

#### **CONCLUSION**

Time required for the intraoperative application of cyanoacrylate glue is less than suturing of incision. Incidence of wound infection was found to be less when wound closure done by cyanoacrylate glue in comparison to suturing. A single linear scar was obtained using cyanoacrylate glue which is cosmetically better than suture scar. Incidence of wound dehiscence is more in cases of application of cyanoacrylate glue than suturing

All above observed results are on small number of case group, hence for definitive result large number of case group is required.

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# **REFERENCES**

- 1. Vercelli SG, Ferriero F, Sartorio V, Stissi F. How to assess postsurgical scars: a review of outcome measures. Disabil Rehabil. 2009;31(25):2055-63.
- Singer AJ, Arora B, Dagum D, Valentine S, Hollander JE. Development and validation of a novel scar evaluation scale. Plastic Reconstrn Surg. 2007;120(7):1892.
- 3. Beam JW. Tissue adhesives for simple traumatic lacerations. J Athl Train. 2008;43(2):222-4.
- 4. Wu Z, Vakalopoulos ZA, Kroese LF, Boersema GSA, Kleinrensink GJ, Jeekel J et al. Reducing anastomotic leakage by reinforcement of colorectal anastomosis with cyanoacrylate glue. Eur Surg Res. 2013;50(3):255-61.
- 5. Bruns TB, Worthington JM. University of Tennessee College of Medicine, Chattanooga, Tennessee. Am Fam Physician. 2000 Mar 1;61(5):1383-8.
- Shivamurthy DM, Singh S, Reddy S. Comparison of octyl-2-cyanoacrylate and conventional sutures in facial skin closure. Natl J Maxillofac Surg. 2010 Jan-Jun;1(1):15-9.
- Bernard L, Doyle J, Friedlander SF, Eichenfield LF, Gibbs NF, Cunningham BB. A prospective comparison of octyl cyanoacrylate tissue adhesive (dermabond) and suture for the closure of excisional wounds in children and adolescents. Arch Dermatol. 2001;137(9):1177-1180.
- 8. Zempsky WT, Zehrer CL, Lyle CT, Hedbloom EC. Economic comparison of methods of wound

- closure: wound closure strips vs. sutures and wound adhesives. Int Wound J. 2005 Sep;2(3):272-81.
- 9. Lloyd NM, Codon RE. The pre-peritoneal approach and illiopubic tract repair of inguinal hernia. Hernia. Philadelphia: JB Lippincott Co;1995:154-180.
- Fitzgibbons RJ Jr. Inguinal hernia, Chap 36, Schwartz Principles of surgery, In: Brunicardi C, Anderson DK (Ed.), London: McGraw Hill; 2005:1353-93.
- 11. Naik SA. Comparative Study of Primary Skin Closure with Adhesive Skin Glue and Conventional Suture Material in Clean Elective Surgery. Int J Intg Med Sci. 2016;3(8):384-90.
- 12. Hasan Z, Gangopadhyay AN, Gupta DK, Srivastava P, Sharma SP. Sutureless skin closure with isoamyl 2-cyanoacrylate in pediatric day-care surgery. Pediatr Surg Int. 2009 Dec;25(12):1123-5.
- 13. Coulthard P, Worthington H, Esposito M, Elst M, Waes OJ. Tissue adhesives for closure of surgical incisions. Cochrane Database Syst Rev. 2002;3(6).

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