

# **Original Research Article**

# A COMPARATIVE STUDY OF LAPAROSCOPIC PORT SITE SKIN CLOSURE WITH SUTURE VERSUS WITHOUT SUTURE: WOUND APPLICATION WITH CYANOACRYLATE FOR WOUND EDGES ADHESION

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#### ABSTRACT

**Background:** The aim of present study was to compare laparoscopic port site skin closure versus skin adhesives.

**Materials and Methods:** The present study was a prospective study. The present study was carried out in the Department of general surgery in Mahatma Gandhi Memorial hospital. The study was carried out for a period of 24 months, i.e., from August 2022 to September 2024. Patients undergoing laparoscopic surgeries irrespective of age group both in the emergency and elective setup were included.

**Results:** In the present study, most subjects in both the groups were belonging to the age group of 41 to 50 years (34.28 % and 37.14% in group A and B respectively). There was a female preponderance (51.42 % and 54.28 % in group A and B respectively). Study subjects were diagnosed with appendicectomy (28.57 %, 25.71 %); cholecystectomy (22.85 %, 20 %); hernioplasty (17.14 %, 20%); laparoscopy (17.14%, 22.85%) and ovarian cystectomy (14.28%, 11.42 %). Majority subjects had no complications (94.28 %, 91.42 % in group A and B respectively). There was no significant difference between the groups in terms of age, gender, mean height, mean weight and diagnosis, complications of subjects (p: 0.46, 0.127, 0.0914, 0.00872, 0.46, 0.35). There was no significant difference between the groups in terms of mean wound length of subjects postoperatively and on day 14 (p: 0.114, 0.71 respectively) but a statistically significant difference was observed on Day 5 (p: 0.01). Wound length was lesser in group A subjects comparatively on Day 5. There was a significant difference between the groups in terms of mean time taken for wound closure (p: 0.04). Wound closure was faster in group A subjects comparatively. There was a highly significant statistical difference in the distribution of subjects basing on outcome on Day 5 (p: 0.001). Majority subjects in group A had healthy outcome comparatively.

**Conclusion:** The present study concluded that Laparoscopic port sites closed using 2-octyl cyanoacrylate have better short term cosmetic appearance.

**Keywords:** 2-octyl cyanoacrylate, appendicectomy, Wound closure, Skin closure, Adhensives.

# **INTRODUCTION**

Minimally invasive techniques have grown leaps and bounds over the past decade. This occurred as a result of patient demands for less painful operations quicker postoperative recovery and technological development. Any general surgical procedure can be done using laparoscopic procedures. Surgeries in the chest, upper abdomen, and pelvis, especially those not requiring tissue removal, are ideally suited for laparoscopic techniques. Conversely, other procedures may have lesser known benefits when minimally invasive techniques are performed, especially when the specimen excised is large.<sup>[1,2]</sup>

Traditionally, laparoscopic trocar sites were closed either by subcuticular sutures or a simple skin suture depending on the surgeon. The other methods in which the port closure is being carried out are skin staples, surgical tape, full thickness cuticular sutures and skin adhesives. Cyano acrylates were actually used as tissue adhesives in operative set up. Easy application, cost-effectiveness, cosmesis all make it a valuable asset in wound closure. Skin adhesives are being used extensively in the closure of extremity, head, and neck lacerations. Use of cyanoacrylates in otologic and ophthalmologic surgery are also being described.<sup>[3,4]</sup>

Octylcyanoacrylate is a long- chain cyanoacrylate tissue adhesive. It is a combination of monomer and plasticizers which form a flexible bond with a breaking strength comparable to 5-0 monofilament suture. Multiple clinical applications for which it is commonly being used exist. However, no studies exist to compare its use in closing laparoscopic port sites.

#### **Aims and Objectives**

AIM: The aim of present study was to compare laparoscopic port site skin closure versus skin adhesives.

Objectives: The following were the objectives of present study:

- То establish the applicability of octylcyanoacrylate in laparoscopic surgery for closure of trocar sites by comparing it with conventional suturing.
- To reduce the operating time and to reduce the economic strain with reference to repeated change of dressings and to produce cosmetically better wounds.

# **MATERIALS AND METHODS**

Place of Study: The present study was carried out in the Department of general surgery in Mahatma Gandhi Memorial hospital.

Type of Study: The present study was a prospective study.

Duration of Study: The study was carried out for a period of 24 months, i.e., from August 2022 to September 2024.

Sample Size: The study was conducted on 70 patients.

## **Inclusion Criteria**

Patients meeting the following criteria were enrolled into the study.

- Patients undergoing laparoscopic surgeries irrespective of age group both in the emergency and elective setup
- Patients willing to give consent.
- Patients willing to participate.

#### **Exclusion Criteria**

Patients meeting the following criteria were excluded from the study.

- Cases in which the laparoscopic procedure is • converted to open technique.
- Patients who are terminally ill
- Patients who were not willing to give consent.
- Patients not willing to participate.

#### **Informed Consent**

All the patients fulfilling selection criteria were explained about the details of the disease process, options of treatment, ultimate outcome, possible effects, complications and chances of recurrence in both procedure and a written informed consent was obtained before enrolment. They were informed of their right to withdraw from the study at any stage.

# **Data Collection**

- A detailed clinical history and physical examination was carried out on patients followed by a thorough review of their hospital records.
- All the patients meeting inclusion criteria were included in the study.
- Patients were divided into two groups based on • the type of suturing. o Group A: Port site closure with suture.
  - Group B: Port site closure with non-suture.
- The necessary data was recorded and noted down in the master charts.
- All the data was documented and analyzed by subjecting it to statistical analysis.

Statistical Analysis: The collected data was entered into Microsoft Excel Worksheet-2010 and data was taken into IBM SPSS Statistic for windows, version 24 (IBM Corp., Armonk, N.Y., USA) software for calculation of frequency, percentage, mean, standard deviation and probability value.

# RESULTS

The present prospective study was conducted on 70 patients in the Department of general surgery, at Mahatma Gandhi Memorial Hospital, Warangal for a period of 24 months. The patients were divided into two groups, each consisting of 35 patients.

**GROUP A** (N = 35): 35 subjects underwent port site closure with suture.

**GROUP B** (N = 35): 35 subjects underwent port site closure non-suture.

Table 1: Age wise distribution of subjects.				
Age group (years)	Group A N (%)	Group B N (%)	P-Value	
31 to 40	6 (17.14 %)	5 (14.28 %)		
41 to 50	12 (34.28 %)	13 (37.14 %)	0.46	
51 to 60	10 (28.57 %)	9 (25.71 %)		
61 to 70	7 (20 %)	8 (22.85 %)		
Total	35 (100 %)	35 (100 %)		

In the present study, the subjects were categorized into four age groups. The above table gives data on distribution of study subjects based on their age. Majority subjects in group A were found in the age group of 41 to 50 years, i.e., 12 (34.28 %); followed by 10 subjects (28.57 %) in the age group of 51 to 60 years; 7 subjects (20 %) in the age group of 61 to 70 years and finally 6 (17.14 %) in the age group of 31 to 40 years.

Fable 2: Distribution of subjects basing on their gender.				
Gender	Group A N (%)	Group B N (%)	P-Value	
Male	17 (48.57 %)	16 (45.71 %)		
Female	18 (51.42 %)	19 (54.28 %)	0.127	
Total	35 (100 %)	35 (100 %)		

The above table gives data on distribution of study subjects based on their gender

Table 3: Comparison of anthropometric parameters of subjects in both groups.				
Anthropometric parameters         Group A Mean ±Sd         Group B Mean ±Sd         P-Value				
Height	161.33±5.17	155.67±3.29	0.0914	
Weight	69.53±5.37	55.73±6.14	0.0872	
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The above table gives data on comparison of anthropometric parameters of study subjects.

Fable 4: Distribution of study subjects basing on diagnosis.					
Diagnosis	Group A N (%)	Group B N (%)	P-Value		
Appendicectomy	10 (28.57%)	9 (25.71 %)			
Cholecystectomy	8 (22.85 %)	7 (20 %)			
Hernioplasty	6 (17.14 %)	7 (20 %)			
Ovarian cystectomy	5 (14.28 %)	4 (11.42 %)			
Laparoscopy	6 (17.14 %)	8 (22.85 %)	0.46		
Total	35 (100 %)	35 (100 %)			

The above table gives data on distribution of subjects basing on diagnosis.

Table 5: Comparison of wound length between groups postoperatively.					
Parameter Group A Mean ±Sd Group B Mean ±Sd P-Value					
Wound length (cm)	6.24±0.47	6.67±0.37	0.114		

The above table gives data on comparison of wound length of study subjects. The mean wound length of subjects in group A was 6.24±0.47 cm and that in group B was 6.67±0.37 cm. The calculated p value was 0.114 which indicated that there was no significant difference between the groups in terms of mean wound length of subjects postoperatively

Table 6: Distribution of study subjects basing on complications				
Complications	Group A N (%)	Group B N (%)	P-Value	
No	33 (94.28 %)	32 (91.42 %)	0.35	
Yes	2 (5.71 %)	3 (8.57 %)		
Total	35	35		

The above table gives data on distribution of study subjects based on the complications developed. Majority subjects in group A had no complications, i.e., 33 subjects (94.28 %); followed by 2 subjects (5.71 %) who developed complications. Majority subjects in group B had no complications, i.e., 32 subjects (91.42 %); followed by 3 subjects (8.57 %) who developed complications. The p-value calculated was 0.35 indicating no statistical difference in the distribution of subjects based on the complications developed.

Table 7: Comparison of time taken for wound closure between groups.					
Parameter	Group A Mean ±Sd	Group B Mean ±Sd	P-Value		
Time taken for wound closure (Days)         8.84±1.62         9.77±1.69         0.04					
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The above table gives data on comparison of time taken for wound closure between groups. The mean time taken for wound closure in group A subjects was 8.84±1.62 days and that in group B was 9.77±1.69 days. The calculated p value was 0.04 which indicated that there was a significant

difference between the groups in terms of mean time taken for wound closure. Wound closure was faster in group A subjects comparatively.

Table 8: Distribution of study subjects basing on outcome (Day 5).				
Outcome	Group A N (%)	Group B N (%)	P-Value	
Healthy	14 (40 %)	7 (20 %)	0.001	
Unhealthy	21 (60 %)	28 (80 %)		
Total	35 (100 %)	35 (100 %)		

The above table gives data on distribution of study subjects based on the outcome (Day 5). Majority subjects in group A had unhealthy outcome, i.e., 21 subjects (60 %); followed by 14 subjects (40 %) with healthy outcome. Majority subjects in group B had unhealthy outcome, i.e., 28 subjects (80 %); followed

by 7 subjects (20 %) with healthy outcome. The pvalue calculated was 0.001 indicating a highly significant statistical difference in the distribution of subjects based on outcome on Day 5. Majority subjects in group A had a healthy outcome comparatively.

Table 9: Comparison of wound length between groups on day 5.					
Parameter Group A Mean ±Sd Group B Mean ±Sd P-Value					
Wound length (cm)	4.15±0.92	6.09±0.71	0.01		

The above table gives data on comparison of wound length of study subjects on day 5. The mean wound length of subjects in group A on day 5 was  $4.15\pm0.92$  cm and that in group B was  $6.09\pm0.71$  cm. The calculated p value was 0.01 which indicated that there

was a significant difference between the groups in terms of mean wound length of subjects on day 5. Wound length was lesser in group A subjects comparatively.

Table 10: Distribution of study subjects basing on outcome (Day 14).					
Outcome	Group A N (%)	Group B N (%)	P-Value		
Healthy	31 (88.57 %)	33 (94.28 %)	0.001		
Unhealthy	4 (11.42 %)	2 (5.71 %)			
Total	35 (100 %)	35 (100 %)			

The above table gives data on distribution of study subjects based on the outcome (Day 14). Majority subjects in group A had a healthy outcome, i.e., 31 subjects (88.57 %); followed by 4 subjects (11.42 %) with unhealthy outcome. Majority subjects in group B had healthy outcome, i.e., 33 subjects (94.28 %); followed by 2 subjects (5.71 %) with unhealthy outcome. The p-value calculated was 0.001 indicating a highly significant statistical difference in the distribution of subjects basing on outcome on Day 14. Majority subjects in group A had a healthy outcome comparatively.

Table 11: Comparison of wound length between groups on day 14.					
Parameter Group A Mean ±Sd Group B Mean ±Sd P-Value					
Woundlength(cm)	0.71±0.14	0.72±0.10	0.71		

The above table gives data on comparision of wound length of study subjects on day 14. The mean wound length of subjects in group A on day 14 was  $0.71\pm0.14$  cm and that in group B was  $0.72\pm0.10$  cm. The calculated p value was 0.71 which indicated that there was no statistical difference between the groups in terms of mean wound length of subjects on day 14.

#### DISCUSSION

Scar formation is an unavoidable result of wound healing after a traumatic or surgical intervention. The aesthetic look of a scar is the most crucial factor in evaluating the surgical outcome. The most common technique for wound closure continues to be sutures, which have been used for generations. Other new techniques such as the use of tapes, staples, and adhesive tapes have been developed over time.<sup>[1]</sup> To know which method will produce the best results, it is helpful to research and contrast new techniques, such as cyanoacrylate glue with conventional suture materials. The best technique for closing an incision must be simple, risk-free, fast, quick, inexpensive, painless, and bactericidal. It should also result in the best cosmetic appearance of the scar, less postoperative pain, less wound infection, and a shorter stay in the hospital. Although cyanoacrylates, a liquid monomer that forms a strong bond between

two wound edges when it comes into contact with it, were discovered in 1949, their practical use in the closure of surgical wounds was not documented until the next 10 years. Cyanoacrylate glue can be used as tissue adhesive as they are easy to apply and takes less time to close, offering a hurdle to microorganisms at the healing location so it has less rate of wound infections, and the best cosmesis is achieved as compared to sutures.<sup>[2]</sup> As we can see in a conventional suturing technique, the source of infection is the puncture wounds created by the needle.<sup>[3]</sup> This is avoided in adhesive glue, decreasing the rate of surgical site infection using cyanoacrylate glue for skin closer, but in the use of cyanoacrylate glue, the dead space should be eliminated, and complete hemostasis is required to achieve a better result. The most common way to show it is as a 100mm horizontal line with a point in the middle that represents the patient's pain threshold between "no pain at all" and "worst pain imaginable."<sup>[4]</sup> The VAS's validity, reliability, and simplicity make it the best instrument for describing the degree or intensity of pain. One of the most often used wound rating systems is the Southampton wound grading system. It allows surgical wound healing to be assessed based on particular criteria and assigned a numerical value, providing a more objective assessment of wounds.<sup>[5]</sup> minimally invasive surgeries have grown over the past decades this is due to less painful operations, quicker postoperative recovery, and fewer hospital stays. Traditionally laparoscopic port site skin was closed by Ethilon 2.0 RC. This study's main goal was to assess the effectiveness of cyanoacrylate glue vs Ethilon 2.0 RC in terms of the average amount of time needed to close a wound, postoperative pain at the wound site, and surgical site infection. The results obtained from this study were compared with other similar studies and discussed below:

**Age group:** In the present study, the subjects were categorized into four age groups. Majority in group A were found in the age group of 41 to 50 years, i.e., 34.28 % subjects; followed by 28.57 % subjects in the age group of 51 to 60 years; 20 % subjects in the age group of 61 to 70 years and finally 17.14 % subjects in the age group of 31 to 40 years. The results of our study were in correlation with the past studies conducted by Galil KA et al,<sup>[6]</sup> Applebaum JS,<sup>[7]</sup> Morton RJ et al.<sup>[8]</sup>

**Gender:** Majority subjects in group A were females, i.e., 51.42%; followed by 48.57 % males. Majority subjects in group B were females, i.e., 54.28 %; followed by 45.71 % males. The p-value calculated was 0.127 indicating no statistical difference in the gender wise distribution of subjects. The results of our study were in correlation with the past studies conducted by Galil KA et al,<sup>[6]</sup> Applebaum JS,<sup>[7]</sup> Morton RJ et al.<sup>[8]</sup>

Anthropometric Parameters: The mean height of subjects in group A was  $161.33\pm5.17$  cm and that in group B was  $155.67\pm3.29$  cm. The calculated p value was 0.0914 which indicated that there was no significant difference between the groups in terms of mean height of subjects.

The mean weight of subjects in group A was  $69.53\pm5.37$  kg and that in group B was  $55.73\pm6.14$  kg. The calculated p value was 0.0872 which indicated that there was no significant difference between the groups in terms of mean weight of subjects. The results of our study were in correlation with the past studies conducted by Galil KA et al, Applebaum JS, Morton RJ et al.<sup>[6-8]</sup>

**Diagnosis:** Majority subjects in group A underwent appendicectomy, i.e., 28.57 %; followed by 22.85 % with cholecystectomy; 17.14 % each with hernioplasty and laparoscopy and finally 14.28 % with ovarian cystectomy. Majority subjects in group B underwent appendicectomy, i.e., 25.71 %; followed by 22.85 % with laparoscopy; 20 % each with hernioplasty and cholecystectomy and finally 11.42 % with ovarian cystectomy. The P value calculated was 0.46 which indicated that there was no statistical difference between the two groups in terms of diagnosis. The results of our study were in correlation with the past studies conducted by Quinn J et al,<sup>[9]</sup> Noordzij JP et al.<sup>[10]</sup>

**Postoperative Wound Length:** The mean wound length of subjects in group A was  $6.24\pm0.47$  cm and that in group B was  $6.67\pm0.37$  cm. The calculated p value was 0.114 which indicated that there was no significant difference between the groups in terms of

mean wound length of subjects postoperatively. The results of our study were in correlation with the past studies conducted by Ellis DAF et al, DeolekarS et al, Dowson et al.<sup>[11-13]</sup>

**Complications:** Majority subjects in group A had no complications, i.e., 94.28 %; followed by 5.71% who developed complications. Majority subjects in group B had no complications, i.e., 91.42 %; followed by 8.57% who developed complications. The p-value calculated was 0.35 indicating no statistical difference in the distribution of subjects based on the complications developed. The results of our study were in correlation with the past studies conducted by HalopuroS et al,<sup>[14]</sup> Kung H et al,<sup>[15]</sup> Quinn JV et al.<sup>[16]</sup> Time Taken for Wound Closure: The mean time taken for wound closure in group A subjects was 8.84±1.62 days and that in group B was 9.77±1.69 days. The calculated p value was 0.04 which indicated that there was a significant difference between the groups in terms of mean time taken for wound closure. Wound closure was faster in group A subjects comparatively. The results of our study were in correlation with the past studies conducted by Dowson et al,<sup>[13]</sup> Singh, P.K et al,<sup>[17]</sup> Deshpande MN et al.[18]

#### **Outcome** (Day 5)

Majority subjects in group A had unhealthy outcome, i.e., 60 %; followed by 40 % with healthy outcome. Majority subjects in group B had unhealthy outcome, i.e., 80 %; followed by 20 % with healthy outcome. The p-value calculated was 0.001 indicating a highly significant statistical difference in the distribution of subjects based on outcome on Day 5. Majority subjects in group A had a healthy outcome comparatively. The results of our study were in correlation with the past studies conducted by Dowson et al,<sup>[13]</sup> Garg S et al,<sup>[19]</sup> Campwala I et al,<sup>[5]</sup>

The mean wound length of subjects in group A on day 5 was  $4.15\pm0.92$  cm and that in group B was  $6.09\pm0.71$  cm. The calculated p value was 0.01 which indicated that there was a significant difference between the groups in terms of mean wound length of subjects on day 5. Wound length was lesser in group A subjects comparatively. The results of our study were in correlation with the past studies conducted by Ellis DAF et al, DeolekarS et al, Dowson et al.<sup>[11-13]</sup>

#### **Outcome (Day 14)**

Majority subjects in group A had a healthy outcome, i.e., 31 subjects (88.57 %); followed by 4 subjects (11.42 %) with unhealthy outcome. Majority subjects in group B had healthy outcome, i.e., 33 subjects (94.28 %); followed by 2 subjects (5.71 %) with unhealthy outcome. The p-value calculated was 0.001 indicating a highly significant statistical difference in the distribution of subjects based on outcome on Day 14. Majority subjects in group A had a healthy outcome comparatively. The results of our study were in correlation with the past studies conducted by Dowson et al,<sup>[13]</sup> Garg S et al,<sup>[19]</sup>

#### Wound Length (on day 14)

The mean wound length of subjects in group A on day 14 was  $0.71\pm0.14$  cm and that in group B was  $0.72\pm0.10$  cm. The calculated p value was 0.71 which indicated thatthere was no statistical difference between the groups in terms of mean wound length of subjects on day 14. The results of our study were in correlation with the past studies conducted by Ellis DAF et al, DeolekarS et al, Dowson et al.<sup>[11-13]</sup>

### **CONCLUSION**

2-octyl cyanoacrylate is a safe and effective method for closure of skin incisions without any toxicity. There is no difference in early complications such as breaking of film, wound dehiscence and wound infection when compared with conventional suturing. Laparoscopic port sites closed using 2-octyl cyanoacrylate have better short term cosmetic appearance.

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