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COMPARATIVE STUDY OF CYANOACRYLATE TISSUE ADHESIVE AND SUBCUTICULAR SUTURE FOR WOUND CLOSURE FOLLOWING BREAST SURGERY

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ABSTRACT

BACKGROUND: This study aims to compare subcuticular sutures and cyanoacrylate tissue adhesive for skin closure. There have been several studies on the benefits of cyanoacrylate tissue adhesive. This tissue adhesive is said to provide superior cosmetic results compared to traditional sutures. This study analyses the results when cyanoacrylate adhesive is used as a substitute for subcuticular sutures.

METHODOLOGY: The prospective interventional study was conducted from August 2022 to May 2024. The study included 68 patients, all of whom met the required inclusion criteria. The outcome of the procedure was detected at day 0, 3, 7, 10, and 30. post-procedural wound complications and cosmetic results were measured at various evaluations.

RESULTS: A total of 68 patients participated in the study, 34 patients in the control group and 34 patients in the study group. Using an adhesive reduced the amount of wound site infection but increased wound gaping. However, no difference in cosmetic outcome after 1 month was observed between cyanoacrylate and subcuticular sutures.

CONCLUSION: Cyanoacrylate tissue adhesive is a good alternative to traditional subcuticular sutures. Patients experience less discomfort when the wound is closed using cyanoacrylate, and a better solvent result can be obtained. Thus, tissue adhesive can be considered for routine treatment procedures in the hospital.

KEYWORDS: Cyanoacrylates, Breast, Tissue Adhesives, Sutures.

INTRODUCTION:

In India, thousands of individuals undergo breast surgery annually for malignant & benign conditions. Sutures and staples are typical wound closure procedures, although tissue adhesives have come into clinical practice recently [1]. Of the 1.6 million breast biopsies conducted annually

in the US, 80% are related to benign breast disease. [2] Fibroadenomas are the most prevalent benign breast tumour, accounting for 67-94% of all biopsies performed on women under the age of 20 and 10% of all women in their lifetime. [2] Surgical excision is the definitive procedure performed for symptomatic benign breast tumours to alleviate anxiety about the potential for growth or malignancy as well as physical discomfort. Given the non-malignant nature of fibroadenomas and other benign breast lesions, an important goal in treatment should be cosmesis. [3]

Several studies have shown that cyanoacrylate (CA) tissue adhesive gives a similar cosmetic outcome to wound suturing in the repair of lacerations, [3,4] head and neck surgery, [5] plastic surgery, and [6] breast surgery [7,8]. Primary closure of the wound with sutures is still the most used method for surgical wound closure. These sutures need removal in the postoperative period, and the persistence of these sutures may favour the development of surgical site infections and unacceptable scars. Tissue adhesives were developed in the 1950s as an alternative way of wound closure [9]. Cyanoacrylate glue has many advantages including ease of application, less time for application, avoidance of dressings and suture removal. Small puncture marks seen commonly in any scars are also avoided. Cyanoacrylate, while liquid, consists of cyanoacrylate ester monomers. They polymerise when they come into contact with tissue anions, creating a strong bond that keeps the opposing edges of the skin together [10]. The adhesive strength of Cyanoacrylate glue usually wanes off around 8 to 10 days. Epithelisation of the wound happens in 5 to 10 days and hence requires no removal.

The United States Food and Drug Administration has authorised it as a topical skin adhesive that protects the wound from bacteria. Studies have showcased that cyanoacrylate adhesives give an efficient barrier against microbes for the initial 72 hours after application [11]. Postoperative care is simplified as patients can shower immediately, and no suture removal or dressing is needed. It is also cosmetically more acceptable.

This study set out to evaluate adequate wound closure, the incidence of wound infection and gaping, postoperative pain, and cosmetic outcomes after benign breast surgeries. The study compared the effectiveness of applying cyanoacrylate tissue adhesive with standard subcuticular suturing.

MATERIAL & METHODS

This prospective interventional study was conducted from July 2022 to May 2024. The inclusion criteria included all patients with benign breast lesions undergoing excision having incisions ≤3 cm, while exclusion criteria are malignancy, connective tissue disorder, acute inflammatory conditions of the breast, immune-compromised patients, lactating women, and incisions >3 cm. 68 patients who underwent elective surgical procedures, were included in the study - in 34 patients CA was used for wound closure and in 34 the wound was closed with subcuticular sutures.

Material: 1) n-butyl-cyanoacrylate glue (Endocryl)
2) Polyglycaprone (Monocryl 2-0)

The procedure of closing wounds:

The fundamental requirement for achieving suture-less skin closure is a clean, dry wound with skin margins that may be drawn together without excessive strain. The study group used n-butyl-2-cyanoacrylate to seal the wounds. If there was a tiny ooze, absolute hemostasis was obtained by applying pressure; if there was a big bleeder, cautery was used. Polyglactin (Vicryl) in sizes 2-0 or 3-0 was used in all cases to apply subcutaneous interrupted sutures. When the subcutaneous sutures were being applied, all knots were buried.

Following the above-mentioned step, the operating field was cleaned and dried. When needed, using a finger or forceps to hold the skin margins together, the assistant could approximate the wound edges manually. Taking care not to get glue between the wound edges, the glue was poured into the syringe and applied immediately over the margins in droplets. The glue layer was extended to at least 5 mm on both sides.

The wound was held together until it was completely dry to allow the adhesive to fully polymerize and form an opaque coating. clean, dry dressing was done, which was taken off the next day. On the third day, the patient was instructed to take a bath and dab gently to dry the adhesive. On POD 3, 7, and 10 the wound was checked for infection, discharge, wound gaping, erythema & pain. On POD 30 of the follow-up, the cosmetic outcome of the scar was assessed based on margin separation, wrinkling, swelling/oedema, edge inversion & excessive skin distortion.

RESULTS:

A total of 68 patients, 34 being in each group were alternately allocated the respective group. The table compares the characteristics of patients in two groups.

Table 1 : Demographic features of study participants

features	cyanoacrylate tissue adhesive, N = 34	standard subcuticular suturing, N = 34	p-value
AGE	27 (22, 35)	27 (19, 35)	
DIAGNOSIS			0.028
RT AXILLARY TOS HYPERTROPHY	0 (0%)	1 (2.9%)	
LT BREAST FIBRODENOMA	11 (32%)	20 (59%)	
RT BREAST FIBROADENOMA	23 (68%)	13 (38%)	

TOS- TAIL OF SPENCE

Wound condition in the postoperative period

The occurrence of surgical site infection and discharge was nil/reduced in the CA group. Although the CA group experienced a greater incidence of wound gaping, statistically, there was no difference in the incidence of wound gapping between the conventional suturing group and the CA group. Post-operative erythema and pain were less in the CA group.

Table 2: Comparison of wound complications:

Wound condition	Day 0	Day 3	Day 7	Day 10
Infection at the suture site				
CA	0	0	0	0
Suture	0	0	1 (2.9%)	1 (2.9%)
P value			**>0.9**	**>0.9**
Discharge				
CA	0	0	0	O
Suture	0	0	3 (8.8%)	1 (2.9%)
P value			**0.2**	**>0.9**
Wound Gaping				
CA	0	0	2 (5.9%)	2 (5.9%)
Suture	0	0	2 (5.9%)	0
P value			**>0.9**	**0.5**
Erythema				
CA	7 (21%)	0	0	0
Suture	11 (32%)	0	1 (2.9%)	0
P value			**>0.9**	
Pain				
CA	10 (29%)	0	5 (15%)	0
Suture	13 (38%)	3 (8.8%)	1 (2.9%)	1 (2.9%)
P value	**0.4**	**0.2**	**0.2**	**>0.9**

Wound condition	Day 0	Day 3	Day 7	Day 10	P value
Infection at the suture site					
CA	0	0	0	0	
Suture	0	0	1 (2.9%)	1 (2.9%)	>0.9
Discharge					
CA	0	0	0	0	
Suture	0	0	3 (8.8%)	1 (2.9%)	0.2, >0.9
Wound gaping					
CA	0	0	2 (5.9%)	2 (5.9%)	
Suture	0	0	2 (5.9%)	0	>0.9, 0.5
Erythema					
CA	7 (21%)	0	0	0	
Suture	11 (32%)	0	1 (2.9%)	0	>0.9
Pain					
CA	10 (29%)	0	5 (15%)	0	0.4, 0.2, 0.2, >0.9
Suture	13 (38%)	3 (8.8%)	1 (2.9%)	1 (2.9%)	

In the analysis of the cosmetic condition, margin separation, swelling/oedema, and edge inversion were not observed in either group at day 30. Regarding wrinkling, the p-value was 0.6, which was greater than 0.05, indicating that there was no significant difference at day 30 between cyanoacrylate and standard subcuticular suturing. In these analyses, there seems to be no significant difference in cosmetic effects in both groups.

Table 3: cosmetic outcome

Cosmetic condition	Day 1	Day 30	P value
Margin separation			Not testable
CA	0	0	
Suture	0	0	
Wrinkling			0.6
CA	0	8	
Suture	0	10	
Swelling/oedema			Not testable
CA	0	0	
Suture	0	0	
Edge inversion			Not testable
CA	0	0	
Suture	0	0	
Skin distortion			Not testable
CA	0	0	
Suture	0	0	

DISCUSSION:

For a long time, tissue adhesives, such as cyanoacrylate glue, have been used in wound closure. These materials have the advantages of rapid closure, reduced postoperative wound care requirements, and increased patient satisfaction [12]. After the wound heals, patients and doctors hope that there will not be any noticeable scars.

The study findings indicate that there was no significant alteration in the aesthetic aspect of the wound that was closed with CA and sutures. When wounds closed with cyanoacrylate glue were compared to subcuticular sutures, the wound looked better and showed fewer indications of inflammation. The scar appearance was marginally better in patients who received CA during the initial post-op days. M. Alicandri-ciufelli, A. Piccinini, et al., in their study found that subcuticular

sutures perform better in early aesthetic results following thyroidectomy or parathyroidectomy incision than synthetic glue & after three months, aesthetic results showed no variation [15].
Aditya Musham et al. conducted this research titled "Comparison of Tissue Adhesive Glue with Subcuticular Absorbable Suture for Skin Closure Following Thyroid Surgery" revealed no statistically significant variance in the two groups' scar outcomes in the first or Third month. Concerns about wounds did not exist in either group. [14]
Our limitations of the above study include a small sampling size, and short-term follow up i.e. 1 month & further research is needed to determine how effectively N-Butyl-2-cyanoacrylate works in various surgical procedures in comparison to traditional suturing. As with suturing, tissue adhesive application for wound closure is a manual skill that needs to be applied carefully and with practice. Therefore, larger-scale, multi-institution research along with an extended follow-up is advised.

CONCLUSION:

N-butyl-2-cyanoacrylate tissue glue causes less discomfort during skin closure and fewer surgical site infections because of its bacteriostatic qualities. These qualities contribute to better wound healing, minimizing complications, and resulting in aesthetically pleasing scars.
Given that the cost of CA is comparable to Monocryl, the use of CA does not negatively impact the cost-effectiveness of the procedure. By undertaking this study, we can conclude that N-Butyl-2-cyanoacrylate is equally effective in skin closure.

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