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A Comparative Study of Tissue Adhesive And Absorbable Subcuticular Suture In Skin Closure Of Pfannenstiel Incision In Obstetric And Gynecological Surgeries

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Abstract:

Objectives: To compare the difference between tissue adhesive and absorbable subcuticular suture in skin closure of Pfannenstiel incision. **Methods:** It was a prospective, quasi-experimental study in which 70 women were recruited at a tertiary care hospital. The main outcome measures were cosmesis and wound complications. **Results:** Out of the 70 women recruited, the skin incisions of 35 were closed with tissue adhesive and the other 35 with absorbable subcuticular suture. There was no significant difference in outcome in terms of pain and complications although tissue adhesives were associated with a better cosmetic outcome at a six-week follow up visit. **Conclusions:** Skin adhesive and absorbable subcuticular sutures are effective methods of skin closure for cesareans and gynecological surgeries, with low rates of complications and comparable patient satisfaction.

Key words: tissue adhesive, absorbable subcuticular suture, Pfannenstiel incision

Introduction

The rate of cesarean sections has been on the rise in recent times. In an overview on evidence-based surgery for caesarean section by Berghella et al., it was demonstrated that most of the major steps of the operation are supported by good quality recommendations ^[1].

Similarly in the field of gynecology, most conditions requiring surgery in the form of cystectomy or hysterectomy are done with each step being predetermined by principles based on evidence and experience gathered over the years.

However, when it comes to the closure of skin, personal preferences and opinions diverge

between the use of various types of suture materials and suturing techniques. So also, views differ in the use of staples or tissue adhesives which are used, rather commonly, in other operative fields like general surgery or orthopedics.

In a systematic review of the Cochrane Database, a clear lack of data on materials and techniques of skin closure following caesarean section was found ^[2].

Hence, it was the purpose of our quasi-experimental study to determine the role of the material (tissue adhesive versus subcuticular suture) used in skin closure, in cesarean sections and gynecological surgeries done using a Pfannenstiel incision, in the appearance of the scar and the patient's satisfaction.

Materials and Methods

This study was a prospective, quasi-experimental study in which 70 women were recruited. It was

conducted at a tertiary care centre between September 2009 and April 2011.

The study was approved by the Institutional Ethics Committee and a written and informed consent was sought from all the patients enrolling in the study.

From previous studies, with an α error of 0.05 and a β error of 0.05 with a confidence interval of 95%, a sample size of 70 was found to be adequate for this study.

Women undergoing any gynecological or obstetric surgical procedure where approach to the abdomen was through a transverse suprapubic skin incision (Pfannenstiel incision). Women with the following criteria were excluded from the study; previous surgical scar over the lower abdomen (midline vertical scars and/or Pfannenstiel scars), diabetes mellitus, pre-existing chronic illness (e.g. chronic renal failure, cirrhosis, inflammatory bowel disease), poor general condition (e.g. anemia, malignancy), obesity, collagen vascular defects and a history of

keloid formation, immunodeficiency or on corticosteroids.

Before the surgery, a complete history was taken and a physical examination was done as per the proforma. Written informed consent was taken from the patient. Following surgery and closure of the abdomen in layers, skin closure of the surgeon's choice (tissue adhesive or subcuticular absorbable suture) was used (Figs. 1-4).

The suture material used for subcuticular closure was Polyglactin 910 Rapide 2-0 and the tissue adhesive used was isoamyl 2-cyanoacrylate.

The recruited patients were thus divided into 2 groups based on method of skin closure used; 35 patients in whom tissue adhesive was used and the other 35 patients in whom subcuticular absorbable suture was used (Consort statement: Fig.5).

Patients were evaluated on the third day following surgery and at 6 weeks. A primary outcome measure was cosmesis of the scar, measured using visual analogue scale, Vancouver score and a Likert score on the third post op day and at a six weeks follow up visit. Other outcome measures

included pain (measured on the third post-operative day using the visual analogue scale), period of hospitalisation, complications of the wound and the overall satisfaction with the method used for skin closure. Visual analogue score and Likert score were based on the patient's assessment of the scar, and the Vancouver score was assessed by the investigator.

Statistical analysis was done using the SPSS 10 program. Fischer's exact test was used and a value of $P < 0.05$ was considered as significant.

Results

Out of a total of 70 patients, 34 underwent cesarean sections and 36 underwent surgery for gynecological indications.

Patients from the tissue adhesive group who underwent cesareans were compared with patients in the suture group who underwent caesareans, because the process of healing tends to be faster in case of younger women and in the postnatal period. Hence, patients who underwent cesareans were matched. Likewise, patients who underwent gynecological procedures from the tissue adhesive

group were compared with patients from the suture group who underwent gynecological surgeries in order to match off any confounding factors that may arise with respect to the mechanism of healing.

Patient characteristics like age and BMI (body mass index) were noted as these would affect wound healing following surgery (Table 1). The demographic characteristics were comparable in both groups.

As assessed by the visual analogue scale, the Likert score and the Vancouver score, wounds approximated with subcuticular absorbable sutures had a neater appearance as compared to those with tissue adhesive on the third post-operative day. This could be due to the local inflammation caused by the adhesive. At six weeks, there was no difference between the two groups in cosmetic outcome evaluated by the Likert score (Table 2) and the Visual analogue score (Table 3), which would more likely reflect long-term cosmetic outcome. However, patients in whom the incision had been approximated with

subcuticular suture had hyperpigmented scars at the six weeks follow up visit as determined by the Vancouver scoring (Table 4).

Patients belonging to the tissue adhesive group had scores indicating lesser pain on third post-operative day, as compared to the suture group. However, this was not statistically significant.

The most common complications of skin closure are wound infection and dehiscence. In our study, there were no complications except the occurrence of a subcutaneous stitch granuloma in the tissue adhesive group, which was not a direct outcome of tissue adhesive use. The fact that there were no cases of infection, oozing or dehiscence in any patients, suggests that both methods of closure are safe and effective.

There was also no difference found in the number of days of post-operative hospital stay (Bar graph 1). Most patients in both groups were discharged on an average on the 5th post operative day. The reasons for prolonged hospital stay in some cases were due to causes other than those related to the wound.

TABLE 1: COMPARISON OF AGE DISTRIBUTION AND MEAN BMI (BODY MASS INDEX)

Skin closure Characteristics	Cesareans		Gynecologic al operations	
	Tissue adhesive (n=17)	Suture (n=17)	Tissue adhesive (n=18)	Suture (n=18)
Age (years)	27.1	29.9	39.4	42.2
BMI (kg/m ²)	25.7	22.3	26.6	23.8

TABLE 2: LIKERT SCORE AFTER 6 WEEKS

Skin closure Scores*	Cesareans		Gynecological operations	
	Tissue adhesive (n=17)	Suture (n=17)	Tissue adhesive (n=18)	Suture (n=18)
1	0	0	1 (5.6%)	0

2	6 (35.3%)	4 (23.5%)	3 (16.7%)	5 (27.8%)
3	6 (35.3%)	11 (64.7%)	9 (50.0%)	7 (38.9%)
4	5 (29.4%)	2 (11.8%)	5 (27.8%)	6 (33.3%)
	P value=0.238		P value=0.23	

* Likert scale: 1=much better than expected, 2=better than expected, 3=as expected, 4 = worse than expected

TABLE 3: VISUAL ANALOGUE SCORE AFTER 6 WEEKS

Skin closure Scores**	Cesareans		Gynecological operations	
	Tissue adhesive (n=17)	Suture (n=17)	Tissue adhesive (n=18)	Suture (n=18)
80-100	0	0	0	0
40-70	8 (47.1%)	13 (76.5%)	12 (66.7%)	12 (66.7%)
0-30	9 (52.9%)	4 (23.5%)	6 (33.3%)	6 (33.3%)
	Fischer exact test-1		P value= 0.157	

** Patients completed a 100 mm VAS for cosmetic appearance, where 0 indicated the worst outcome and 100 the best, and satisfaction with the scar with 0 indicating extreme dissatisfaction and 100 complete satisfaction

TABLE 4: VANCOUVER SCORE AT 6 WEEKS

Skin closure Scores*	Cesareans		Gynecological operations	
	Tissue adhesive (n=17)	Suture (n=17)	Tissue adhesive (n=18)	Suture (n=18)
0	2 (11.8%)	0	2 (11.1%)	0
1	3 (17.6%)	0	3 (16.7%)	0
2	5 (29.4%)	0	5 (27.8%)	0
3	5 (29.4%)	8 (47.1%)	7 (38.9%)	5 (27.8%)
4	1 (5.9%)	4 (23.5%)	1 (5.6%)	7 (38.9%)
5	1 (5.9%)	5 (29.4%)	0	6 (33.3%)
	P value= 0.753		P value= 0.005	

**The Vancouver scar score has two parameters: pigmentation on a scale from 0 to 3 (0 = normal, 1 = hypopigmented, 2 = mixed, 3 = hyper pigmented) and

vascularity, again on a scale from 0 to 3 (0 = normal, 1 = pink, 2 = red, 3 = purple)

On this scale, *lower scores represent a more normal appearance*

Discussion

Various studies have been done on different methods of skin closure but no studies have been done comparing tissue adhesives with traditional suturing techniques in the field of obstetrics and gynecology. The purpose of this quasi-experimental study design was therefore to determine the difference between tissue adhesive and subcuticular suture for the closure of skin.

The Pfannenstiel incision was chosen as this was the most commonly used incision for operative procedures in obstetrics and gynecology requiring opening of the abdomen. So also, the incision lies along the lines of Langer and when approximated well, provides a more aesthetic scar as compared to other incisions such as, midline vertical, Maylard or Joel-Cohen incisions, which are also used in the field of obstetrics and gynecology. Hence, the Pfannenstiel incision was more appropriate in this case as the primary outcome of our study was the cosmesis of the scar.

The only study comparing sutures and tissue adhesives in closure of skin during cesarean section was done in Mexico ^[3]. Out of 74 patients, cyanoacrylate was used in 44 and nylon and silk in the remaining 30. The outcomes studied were pain, cosmesis, foreign body reaction and complications (wound dehiscence, hematomas). Pain was comparable in both groups. Pruritus predominated in the cyanoacrylate group in about 18.1% versus 13.2% in the control group. Marks on the skin largely predominated on the control group with silk (75%), while there were no marks in the cyanoacrylate group. The foreign body reaction was greater in the cyanoacrylate group, 15.9% versus 6.6% in the control group. Superficial dehiscence in the tissue adhesive group was 6%, while it was 10% in the control group. Hematomas were noted in 2.2% of the cyanoacrylate group, and 6.6% in the control group. Poorly coapted edges were seen in 4.5% in the tissue adhesive group versus 20% in the control group. The average time for skin closure in the cyanoacrylate group was 62.8 s and 283 s in the control group. The investigators were of the

final opinion that the use of cyanoacrylate in cesarean wound closure showed: efficiency, safety and surgical time reduction, the scar aesthetics was improved and costs were reduced.

The largest randomized control trial to date ^[4] included data from three previously reported studies ^[5,6,7] as well as from seven additional clinical sites that included urgent care centres, emergency departments, and a variety of operating room settings (general, orthopedic, dermatologic and gynecological surgery). Enrolled patients had a variety of traumatic lacerations, surgical incisions as well as surgical excision wounds. Wounds ranged in size from 0.1 to 14 cm with more than 100 wounds greater than 4 cm in length. These wounds were located on a wide range of body area including the head and neck, trunk and extremities. This study concluded that wound closure with tissue adhesives was faster than standard wound closure devices with comparable rates of infection, dehiscence and optimal cosmetic appearance.

In a study done by Bernard et.al.^[8] comparing tissue adhesives and suture in closure of traumatic lacerations and incisional surgical wounds, 42 patients had a total of 52 wounds that were evaluated at Children's Hospital, San Diego, California. There were no differences in early complications between the groups. The suture group scored higher on the visual analogue scale (63.3 mm for suture versus 47.8 mm for tissue adhesive), and this difference was statistically significant ($P=0.02$). The suture group also had a higher median score on the Hollander Wound Evaluation Scale, but this difference was not statistically significant. Thus in this study, the cosmetic outcome of cutaneous excision surgery wounds closed with standard suturing was found to be superior to that of wounds closed with octyl-cyanoacrylate.

In another study by Brown et.al.^[9], 134 children undergoing inguinal herniorrhaphy were prospectively randomized to have skin closure with either skin adhesive ($n = 64$) or subcuticular closure ($n = 70$). Digital photographs of healing incisions were taken at the 6-week postoperative

visit. The operating surgeon assessed cosmetic outcome of incisions using a previously validated visual analogue scale at the 6 weeks follow up visit. Mean wound cosmesis scores based on the visual analogue scale were similar between groups (adhesive = 78 ± 21 ; suture= 78 ± 18 ; $P = .50$). Material costs related to herniorrhaphy were higher for skin adhesive (adhesive = \$22.63 versus suture = \$11.70; $P < .001$). Except for a 7% incidence of erythema in both groups, there were no complications encountered. Thus, there was no difference in cosmetic outcome between skin adhesive and suture closure in pediatric inguinal herniorrhaphy. Material costs were increased because of the high cost of adhesive relative to suture^[9]. Both of these studies (Brown et.al. and Bernard et.al.) have been compared with the present study in table 5.

TABLE 5: COMPARISON OF THE CURRENT STUDY WITH THAT OF BERNARD ET AL^[8] AND BROWN ET AL^[9] STUDIES

Study	Bernard et al (2001)	Brown et al (2009)	Present study (2011)

Design	Prospective randomised	Prospective randomised	Quasi-experimental
Sample size	64	21	35
Tissue adhesive Suture	70	21	35
Type of wound	Traumatic lacerations and incisional surgical wounds	Inguinal herniorrhaphy incision	Pfannens tiel incision
Evaluation at Visual Analogue score (100 mm)	6 weeks	8 weeks	6 weeks
Tissue adhesive	47.8 63.7	78 78	42.4 45.1

Suture			
Material with the superior cosmetic outcome	Suture	Equivalent	Equivalent

Wounds closed with skin adhesive would not incur the additional cost of suture removal and may also require fewer dressings, although this was not established in this study as patients in both groups were treated the same post-operatively and suture removal is not required in case of absorbable subcuticular suture which was used in our study. It has also been suggested that adhesive reduces the amount of follow-up required due to the absence of foreign body reaction.

One of the drawbacks of the present study was an inability to randomize patients into the subcuticular suture and tissue adhesive groups as the selection of material to be used for closure was

based on the surgeon's choice. Another drawback was the absence of blinding which would have eliminated the bias encountered during evaluation of the wound site at 6 weeks. However, blinding would not have been possible during the evaluation on the third post-operative day. So also, the true value of using tissue adhesive was not tested as patients with diabetes, anemia and connective tissue disorders were excluded. Although pain was evaluated as an outcome in our study, the value of the same is questionable as no differentiation could be made between the pain arising due to intrabdominal manipulation (incision, excision, cauterization and ligation) and pain at the site of incision.

In the present study, we have found that skin adhesive and absorbable subcuticular sutures are effective methods of skin closure for cesareans and gynecological surgeries and do not show any significant differences as far scar aesthetics were concerned, as per the patient based scores. However, tissues adhesives had significantly better scars at the six-week follow up visit based on the Vancouver score. Pain at the site of the

incision on the third post operative day was also comparable. There were no complications noted in either group. The duration of hospital stay was around 4 days post-operatively in both the tissue adhesive and suture group. Hence, both tissue adhesives and subcuticular sutures are effective methods of skin closure in cesareans and gynecological procedures.

Figures



Fig.1. Wound following subcutaneous approximation



Fig.2.Wound after skin closure with subcuticular sutures



Fig.3.Wound following subcutaneous approximation



Fig.4.Wound following approximation of skin with glue

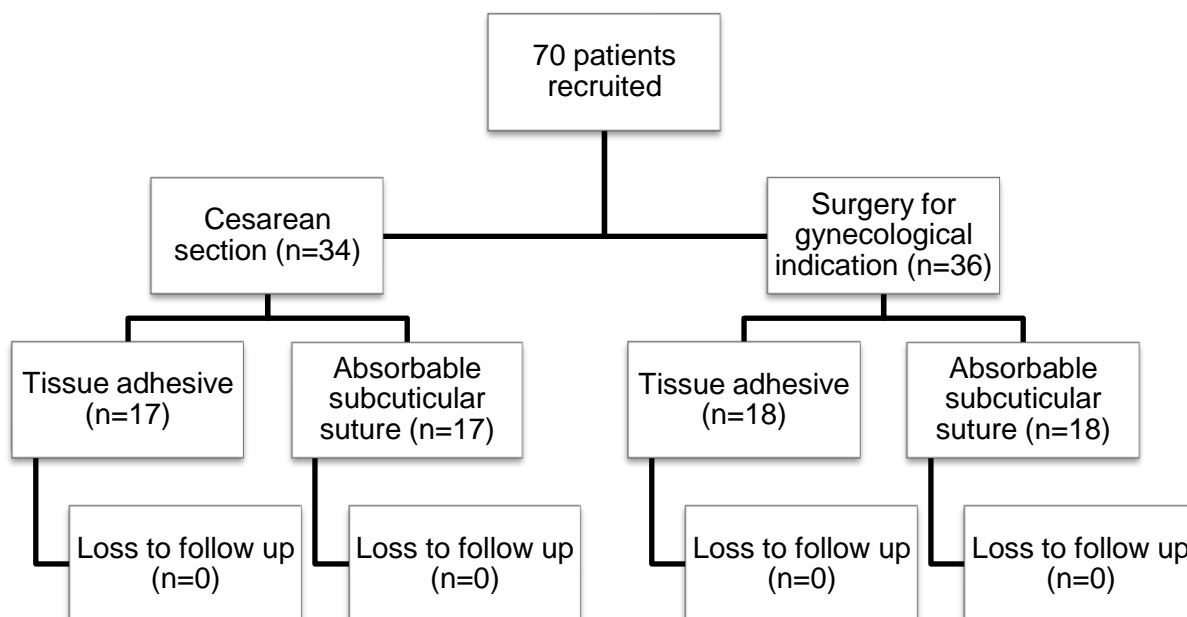
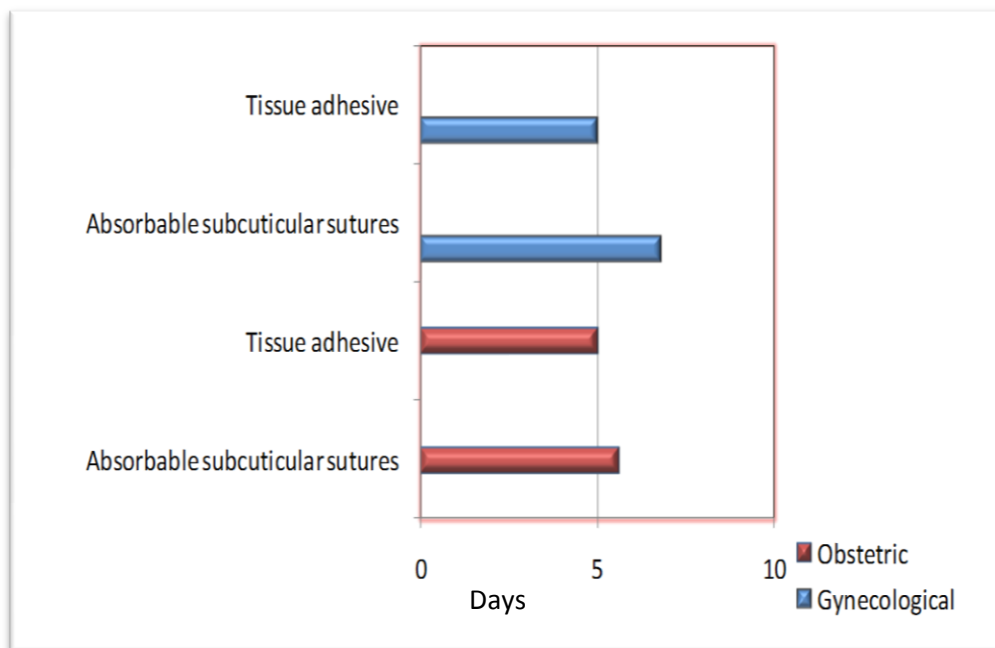


Fig.5.Consort statement



Bar graph 1: Duration of hospital stay following surgery in the two groups

References

- Berghella V, Baxter JK, Chauhan SP. Evidence-based surgery for cesarean delivery. *Am J Obstet Gynecol.* 2005; 193:1607–17.
- Alderdice F, McKenna D, Dornan J. Techniques and materials for skin closure in caesarean section. *Cochrane Database Syst Rev.* 2, 2006.
- Gorozpe JI, González J, Santoyo S, Castañeda J. Closure of the skin with cyanoacrylate in cesarean section. *Ginecol Obstet Mex.* 1999; 67(1):491-6.
- Singer AJ, Quinn JV, Hollander JE, Clark RE. Closure of lacerations and incisions with octylcyanoacrylate: a multi-center randomized clinical trial. *Surgery.* 2002; 131:270–6.
- Bruns TB, Robinson BS, Smith RJ. A new tissue adhesive for laceration repair in children. *J Pediatr* 1998; 132:1067-70.
- Singer AJ, Hollander JE, Valentine SM, et al. Prospective, randomized controlled trial of tissue adhesive (2-octylcyanoacrylate) versus standard wound closure techniques for laceration repair. *Acad Emerg Med* 1998; 5:94–9.

7. Toriumi DM, O'Grady K, Desai D, Bagal A. Use of octyl-2-cyanoacrylate for skin closure in facial plastic surgery. *Plast Reconstr Surg.*1998; 102:2209–19.
8. Bernard L et.al. A prospective comparison of octylcyanoacrylate tissue adhesive (Dermabond) and suture for the closure of excisional wounds in children and adolescents. *Arch Derm.*2001; 137(9):1177-80.
9. Brown KJ et.al. A prospective, randomized comparison of skin adhesive and subcuticular suture for closure of pediatric hernia incisions: cost and cosmetic considerations. *Pedia Surg.*2009; 44(7):1418-22