

Original Research Article

Comparison of tissue adhesive (N-butyl-2-cyanoacrylate) versus conventional suturing in umbilical hernia surgeries

Atul Dua, Nawaz Shariff A.*, K. Krishna Prasad

Department of General Surgery, Sri Devaraj URS Medical College, Kolar, Karnataka, India

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*Correspondence:

Dr. Nawaz Shariff A.,
E-mail: drnawaz08.ns@gmail.com

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ABSTRACT

Background: Umbilical hernia is a common problem encountered mostly in women. Conventional suturing is used as a traditional method for closure of skin in umbilical hernia surgeries. N-butyl-2-cyanoacrylate glue can be used as an alternative where tissue loss is minimal, minimal scarring, no significant bacterial infection and less postoperative pain. The aim of this study was to determine the effectiveness of tissue adhesive in the closure of umbilical skin incisions compared to conventional sutures.

Methods: A prospective study was conducted including 30 patients with umbilical hernia. Patients were allocated into two groups using odd and even method: group A and B. Patients of group A underwent skin closure with topical tissue adhesive and that of group B underwent skin closure with conventional sutures. Skin closure time, postoperative pain, scar assessment using Vancouver scar scale and surgical site infection were recorded. IBS-statistical package for the social sciences (SPSS) 22 version was used to analyse the data.

Results: 57% females and 43% males were included in the study. The age of the patients ranged between 18 and 60 years in both the groups. All patients had chief complaint of swelling in the umbilical area. Group A (tissue adhesive) patients had lesser skin closure time and cosmetically better scar than group B (conventional suturing) patients. Surgical site infection was seen in 2 patients in group B and 1 patient in group A.

Conclusions: Tissue adhesive is superior as compared to conventional suture in terms of skin closure time, cosmesis, postoperative pain and postoperative surgical complications.

Keywords: Umbilical hernia, Cyanoacrylate

INTRODUCTION

Umbilical hernia is a ventral hernia more common in women or seen in increased intra-abdominal pressure conditions such as pregnancy and obesity. Scar after every surgery may have functional, cosmetic and psychological consequences. Tissue adhesives have entered clinical practice more recently and offers advantages like no needle stick injury leading to minimal tissue loss and minimal scarring. Cyanoacrylate is one of the most commonly used tissue adhesive used as an alternative to suture, staples or adhesive strips. Cyanoacrylate molecules exist as monomers and upon exposure to skin, these

monomers polymerize in a exothermic reaction which binds to most superficial epithelium and later form a water tight barrier over approximated wound edges for uninterrupted wound healing.¹ The aim of this study was to determine the effectiveness of tissue adhesive in the closure of umbilical skin incisions compared to conventional sutures.

METHODS

A prospective comparative study was conducted between September 2019 and January 2020 involving 30 patients with umbilical hernia admitted in General Surgery in R. L.

Jalappa hospital and research centre, Kolar, Karnataka, India. Patients were stratified into two groups by odd and even method. Group A was topical tissue adhesive involving odd numbered admitted patients. Group B was conventional suturing (ethilon 3-0) involving even numbered admitted patients. Sample size was calculated based on better cosmesis achieved using vancouver scar scale between conventional suturing and tissue adhesive. The estimated sample size came to be 15 per group.

All patients aged between 18 and 60 years undergoing umbilical hernia surgery were included in this study. Patients with umbilical hernia recurrence, immunocompromised and with underlying skin disease were excluded.

All patients with umbilical hernia who were admitted in R. L. Jalappa hospital and research centre and who fit the inclusion criteria were observed and the data collected are details of participants including disease characteristics, type of intervention, outcomes were reported. Written informed consent was taken from the patients.

In 2 groups, once the procedure is finished, the wound was dried and the time of start and finish of skin closure was noted using a stopwatch timer. The time taken for skin closure was noted. The post-operative pain was assessed at 24 hours, 48 hours and 3rd day using visual analog scale of 0-10. Scar assessment was done using vancouver scar scale at 7th day following surgery. Surgical site infection in both the groups were noted. Data was analysed using IBS-SPSS 22 version. Categorical data were compared using chi-square test or Fisher's exact test and continuous data were compared using independent sample t-test. $P < 0.050$ at 95% confidence interval was statistically significant.

RESULTS

Skin closure time, postoperative pain, cosmesis and surgical site infection were measured between tissue adhesive with cyanoacrylate and conventional suturing using ethilon 3-0 suture. Skin closure time was an average of 2.53 minutes with cyanoacrylate glue and 5.6 minutes with suturing.

Table 1: Comparison of skin closure time between group A and group B in minutes.

| Parameter | Group A | Group B |
|---------------|-------------|-------------|
| N | 15 | 15 |
| Mean | 2.53 | 5.6 |
| S. E. | 0.123 | 0.298 |
| 95 CI | 1.59 - 3.47 | 3.33 - 7.86 |
| Median | 3 | 5 |

N: Number of cases, S.E.: standard error

On post-operative day 1 (POD 1), mean postoperative pain in group A was 3.06 where as in group B was 4.6. On POD 2, mean postoperative pain in group A was 2.94 where as

in group B was 3.5. On POD 3, postoperative pain was same in group A and group B.

Table 2: Comparison of postoperative pain between group A and group B.

| POD | Group A | Group B |
|--------------|---------|---------|
| POD 1 | 3.06 | 4.6 |
| POD 2 | 2.94 | 3.5 |
| POD 3 | 3 | 3 |

Tissue adhesive resulted in a cosmetically better scar than suturing technique. On POD 7, average score using Vancouver scar scale was 2.87 for tissue adhesive and 6.4 for suturing. Cosmesis for tissue adhesive group compared to skin suturing group was statistically significant.

Table 3: Comparison of scar cosmesis of group A and group B using Vancouver scar scale.

| Parameter | Group A | Group B |
|---------------|------------|-------------|
| N | 15 | 15 |
| Mean | 2.87 | 6.4 |
| S. E. | 0.310 | 0.3626 |
| 95 CI | 0.51 - 5.2 | 3.64 - 9.15 |
| Median | 3 | 6 |

N: number of cases, S. E.: standard error

Surgical site infection was seen in 1 patient in group A as compared to 2 patients in group B.

DISCUSSION

A proper closure material allows better tissue approximation with minimal trauma. Wound closure principle is to achieve precise wound approximation, good cosmesis and low infection rates. The clinical usage of cyanoacrylate has been extensively studied for various applications like tissue adhesion, vascular embolization, CSF leak and skin graft application.

Cyanoacrylate glue contains a plasticizer which makes adhesive bond more durable and stronger with skin retaining its elastic properties.² These adhesives slough off within 10 days with wound reepithelialisation and does not require removal.³ Surgical tapes induces least tissue reactivity when used for wound closure but require additional adhesives such as tincture benzoin which increases local induration and skin toxicity.

Elek and Conen demonstrated that sutures considerably lowered the resistance of the skin infection. Sutures act as foreign bodies and reduce minimum Infective dose of staphylococci, established at 2-8 million organisms by a factor of 1000.⁴

This is the first randomized controlled trial conducted for umbilical hernia incision though previous studies have been conducted for inguinal hernia. Brown et al conducted

a randomized controlled trial which reported a significantly shorter time in the skin adhesive group compared to subcuticular suture in the closure of pediatric inguinal hernia incisions.⁵ Skin closure time in present study was 2.53 minutes for cyanoacrylate and 5.6 minutes for suturing.

Carpendale and Sereda in their study of role of percutaneous sutures in surgical wound infections found that infection occurred more commonly in sutured wound and not in glued wounds.⁶ Surgical site infection in present study was seen in one patient with cyanoacrylate and 2 patients with conventional suturing.

Saxena and Willital had extensively used cyanoacrylate tissue adhesive in the extremity wound closures in paediatric emergency. They found that the management of lacerations with sutures involves the use of needles and the injection of local anaesthetic and present a unique challenge in the wound management of an already distressed and frightened child. Pain in present study, on POD 1 mean postoperative pain was 3.06 for tissue adhesive group compared to 4.6 in suturing group. On POD 2, mean postoperative pain was 2.94 for tissue adhesive group compared to 3.5 in suturing group. On POD 3, there was no difference in pain in both groups. Tissue adhesive resulted in cosmetically better scar than conventional suturing in current study. Cyanoacrylate tissue adhesive was found to be an effective alternative replacing skin sutures on virtually all facial lacerations and was also employed in low skin tension wound management. They also reported that cyanoacrylate adhesive applied with optimal immobilization was found to be effective method of skin closure in high skin tension laceration.⁷

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 (SSI).⁸

Limitations

The sample size included in this study, though enough to compare the results in terms of post-operative pain, a larger sample size would have been better for comparing the outcomes and complications. The follow up period was shorter, thus limiting the study of long-term complications. Further studies with larger populations are advocated.

CONCLUSION

Tissue adhesive is superior as compared to conventional suture in terms of skin closure time, cosmesis,

postoperative pain and postoperative surgical complications. Tissue glue is easier to perform, consumes less time shows good cosmetic results than sutures in elective surgeries. In this era of body consciousness, cosmesis is an important aspect of wound management.

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