COMPARATIVE STUDY BETWEEN 2 BUTYL CYANOACRYLATE VERSUS CONVENTIONAL SUTURES IN SKIN CLOSURE OF INGUINAL HERNIA PATIENTS

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ABSTRACT

BACKGROUND
Skin sutures are known as the signature of a surgeon. However, in recent times conventional suturing is being replaced by newer methods of skin closure. The commonest of them being skin staples. There are numerous other methods available like adhesives tapes and adhesive glues. Skin staples gained popularity due to the less time needed to apply the staples and the cost was comparative to the sutures used. Use of adhesive glue was restricted due to the cost. This study was designed to compare the outcomes between conventional suture closure and 2-butyl cyanoacrylate glue closure of skin after inguinal hernia surgery.

MATERIALS AND METHODS
This was a prospective case-controlled study with a sample size of 50 done in Pondicherry Institute of medical sciences over a period of 18 months. Patients between the ages of 25 to 70 undergoing elective inguinal hernia surgery were included in this surgery. Patients with recurrent inguinal hernia and who had features of strangulation were excluded.

RESULTS
The mean age in suture group was 48.24 and in skin glue group it was 47.92. 2 out of 25 (8%) in glue group and 7 out of 25 (18%) in the sutures group had erythema and induration 48 hours after surgery. 1 (4%) patient had serous discharge with partial wound dehiscence in glue group while there was none in suture group. 2 butyl cyanoacrylate was costlier by Rs. 120 than sutures per wound.

CONCLUSION
The use of tissue adhesive was associated with shorter closure time. Pain was much less in patients for whom skin closure was performed using skin glue and as such comparatively less analgesics were required post operatively. Glue was marginally costly than conventional sutures.

KEYWORDS
2-Butyl Cyanoacrylate, Skin Closure, Inguinal Hernia

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BACKGROUND
Hernias are among the oldest recorded afflictions of mankind and are most commonly seen in the groin.1,2 Although many new inventions are being made in hernia repair, skin closure remains limited to the use of skin sutures or metal staples. Traditionally incisions have been closed with sutures, staples or surgical tapes, and more recently tissue adhesives. The method of skin closure in patients undergoing surgery has become increasingly important with the development of accelerated rehabilitation and the pressure placed on surgeon to reduce length of stay in the hospital. After any surgical procedures, wound complications are one of the major sources of morbidity and can prolong the inpatient stay or lead to re-admission.3

Ideally a wound closure device should be easy to use, rapid, and painless, result in excellent cosmesis, not require device removal and be cost effective.4 Although none of the currently available closure device meet all of these needs, the topical cyanoacrylate tissue adhesive offers many of the characteristics of this ideal wound closure device. Though cyanoacrylates were initially synthesized by a German chemist in 1949,5 Wound closure with a cyanoacrylate was reported 10 years later.6

The first, short-chain cyanoacrylates were crudely manufactured and found to be toxic to animals in pharmacological doses.7 Longer – chain derivatives lacking the associated toxicity of the short – chain derivatives and more sophisticated manufacturing techniques have led to the development of pure nontoxic monomers and the
acceptance of adhesives into clinical practice. Multiple studies have now been demonstrated that when properly used, the rates of wound infection and dehiscence as well as the cosmetic outcome with adhesives are similar to sutures.²⁵,²⁶,¹⁰ The food and drug administration (FDA) approval of several new cyanoacrylates tissue adhesives over the last decade has led to their increased use and popularity. The cyanoacrylate is a sterile, inert, non-toxic, biocompatible and bacteriostatic liquid topical skin adhesive. The tissue adhesives have many advantages over standard wound closure devices in addition to their rapid application. The strength and other physical properties of the cyanoacrylate adhesives are directly related to the length and complexity of their alkyl side chain. Short, straight-chain derivatives (ethyl or butyl cyanoacrylate) form tight and stronger bonds compared with complex or long-chain derivatives (propoxypropyl cyanoacrylate and octocrylocyanoate).¹¹ They are relatively painless to apply and may not require the use of painful local anaesthetics. They also slough off spontaneously within 5 to 10 days eliminating the need for suture removal allowing a wider time range for wound follow-up if required.

MATERIALS AND METHODS
This was a prospective case control study between 2016 and 2018 for a period of 18 months. A total number of 50 patients were evaluated under this study.

Inclusion Criteria
1. Patients undergoing elective surgery.
2. Age group between 25 to 70.
3. Inguinal hernia (unilateral or bilateral).
4. American society of anaesthesiology grade I or II.
5. Male and female patients.

Exclusion Criteria
1. Recurrent inguinal hernia
2. Obstructed or strangulated inguinal hernia.

Patients fulfilling the inclusion criteria in the department of general surgery Pondicherry institute of medical sciences were taken up for the study. Consent was taken prior to the surgery. Before commencing the surgery, a stopwatch was handed over to the floor sister in charge who recorded the time taken for skin closure. Just before the skin closure procedure the surgeon intimated the floor sister in charge. For the study group a single vial of tissue glue (2-butylcyanoacrylate) was required for every patient undergoing the surgery.

Surgical site infection was evaluated based on the presence of hyperemia of the skin at or adjacent to the suture site. Also, presence of discharge (either serous or pus) at the suture site was taken into consideration and recorded based on the post op day. While the patient was in the ward presence of surgical site infection was monitored on a daily basis starting from post op day 3 till the day of discharge. Presence of skin necrosis was evaluated for while the patient was in the ward and recorded for based on post op day. Postoperative pain also was measured using visual analogue score at 24 and 48 hours and recorded. A standard analgesic was provided for all patients. If in case an analgesic was added to the standard analgesic for pain management then the maximum as per visual analogue scale was taken into consideration.

RESULTS
Age Distribution
The difference among age and sex were not significant and did not affect the results of other variables. The mean age in suture group was 48.24 and in skin glue group it was 47.92. The Overall Mean Age was 48.08±14.77. (Table 1).

Side of Hernia and Method of Skin Closure
Total number of patients in the study were 50. Of these 18 (36%) had direct hernia while 31 (62%) had indirect hernia. Only 1 patient (2%) had a pantoon hernia. The suture group had 6 direct hernia and 19 indirect hernia patients. Whereas the Glue group had 12 each of direct and indirect hernia and one pantaloon hernia. (Table 2).

Analgesic Requirement
24 (96%) of the 25 patients were given analgesic injection within 2 hours of the surgery in the sutures group whereas only 1(4%) patient required analgesic in glue group. p value <0.001. The remaining one patient in sutures group was given analgesic in the next hour while 19 (76%) patients of glue group were given in the second hour. The remaining 5 patients in the glue group were given analgesic in the 4th hour or later. (Table 3).
Wound Erythema and Exudate
7 (28%) of the suture group had erythema within 48 hours whereas only 2 (8%) in the glue group were affected. Exudate in 48 hours from the wound was seen in 1 (4%) of the patients in the glue group while none of the patients in the suture group had any discharge. (Table 4).

Wound Dehiscence with Skin Necrosis
Partial wound gaping was seen in one patient of the glue group who did not require subsequent secondary suturing. The dehiscence was managed with daily dressing. (Table 5)

Skin Closure Time
The skin closure time was mean of 5.476 minutes while in glue group was 4.584 p value <0.001. The time in glue was taken up by opening and mixing of the glue components and also time for the glue to dry up. (Figure 1)

DISCUSSION
Each year there are over 7 million traumatic lacerations\(^\text{12}\) and between 26 and 90 million surgical incisions requiring closure by surgeons, emergency physicians and primary care practitioners.\(^\text{13}\) The method of skin closure in patients undergoing surgery has become increasingly important with the development of accelerated rehabilitation and the pressure placed on surgeons to reduce length of stay in the hospital. After any surgical procedures, wound complications are one of the major sources of morbidity and can prolong the inpatient stay or lead to re-admission.\(^\text{3}\)

With regards to patient characteristics, the difference among age and sex were not significant and did not affect the results of other variables. The mean age in suture group was 48.24 and in skin glue group it was 47.92. This is comparable with the randomized controlled study by Malekpour F\(^\text{14}\) et al wherein the mean age was 45 ± 18 years.
Among the various parameters used to assess and compare between skin sutures and tissue adhesives; time taken for closing skin was analysed and it was found that the use of tissue adhesive was associated with shorter closure time (p < 0.001). This is comparable to studies done by Naik SA and Hasan Z et al. Naik SA study revealed that skin closure took 6.5 min while glue application took 1.6 min. on an average. Hasan Z study has skin suture time of 4.5 min. and glue application time of 1.3min. Jawasing Manza et al reported suture time of 7 minutes and glue application time of 3 minutes.

It has been reported that skin staples are more painful than conventional sutures. A relevant finding in our study showed that pain was much less in patients for whom skin closure was performed using skin glue and as such comparatively less analgesics were required post operatively. This was similar to studies by Toriumi DM et al and Ananda BB et al where randomized clinical trial comparing sutures to butyl-cyanoacrylate for the closure of skin was performed and, it was noted that wound closure with the use of adhesive was less painful and faster than conventional sutures.

As the cost of adhesive glue is coming down more and more surgeons are using Cyanoacrylate glue for skin closure. The shorter time of application and the longer time to analgesic medication is added advantage of cyanoacrylate application. Some surgeons fear that the art of skin suturing will be lost in the near future as more and more surgeons are using staples and glue for skin closure.

CONCLUSION

2-butyl cyanoacrylate glue application takes far less time compared to conventional sutures. Postoperative pain is less with glue application. The cost of cyanoacrylate glue is marginally more than the conventional sutures.

REFERENCES