

A Simple and Effective Technique to Close Neck Incisions Using Superglue

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ABSTRACT

Skin incisions can be closed using a number of surgical techniques. We describe here a simple surgical technique to close skin incisions in elective neck operations using superglue (2-Octyl Cyanoacrylate) and give a brief review of cyanoacrylate adhesives as a skin closure material.

Keywords: skin incision, cyanoacrylate, technique, superglue

INTRODUCTION

There are a variety of techniques practiced all over the world to achieve wound closure. These involve use of sutures, clips, tapes and glues and good surgical outcome can be achieved with either of these. There are proponents and opponents of these individual techniques and there are issues of wound infection, poor cosmesis and need for second visit to remove non absorbable sutures or clips. Glues were reported to cause acute and chronic inflammatory reactions^{1,2,3}.

Surgeons modify their practice according to their experience and local hospital policy and we personally feel that any method can be used to achieve adequate results depending upon the experience of the person using it. Aim of this article is to describe our technique of using cyanoacrylate glue to close neck incisions, and review these adhesives with a particular view to their use as a skin closure material.

Cyanoacrylate adhesives were first synthesized in 1949⁴. Since then they have enjoyed great success as commercial superglues. In 1950 – 1960s, they were first used to close wounds. They were histotoxic (short chain polymers) and demonstrated acute and chronic inflammatory reactions primarily as result of foreign body reaction^{1,2}.

With time it was found that long chain polymers can be used to hold wounds together without any significant toxicity⁵. In America, they were first approved for topical use in 1998.⁶

Cyanoacrylates monomers when exposed to certain substances containing OH ions e.g. moisture in skin, water or blood, polymerize to a solid polymer and heat is released during the process⁷⁻⁸. In general short chain compounds polymerize fast, produce more heat, make a strong but brittle bond and degrade early. They cause tissue damage due to heat and absorption of degradation products⁸⁻⁹. The breakdown products (formaldehyde and alkylcyanoacetate) can be histotoxic at high concentrations and can be absorbed cutaneously¹⁰.

Together with the toxic by products of a non medicinal manufacturing process, these may cause skin irritation, inflammatory responses and impair wound healing. For this reason, short chain cyanoacrylates available commercially as superglues should not be used for medicinal purpose¹¹.

Long chain compounds polymerize slowly and produce less heat and are therefore suitable for topical use. In longer chain butyl and octyl cyanoacrylates, hydrolysis may take months to years^{12,13}. These cause no tissue damage and flake off with superficial layer of skin cells in 1-2 weeks.

The slow reactivity of these compounds also is accompanied by a slow polymerisation process leading to longer setting times, Accelerators are added to them to decrease setting time so that they can make a bond with tissues quickly⁶. Also vesicofying agents and plasticizers are added to make them thick and flexible⁶.

It has also been claimed that cyanoacrylate adhesives have antimicrobial properties especially against gram positive organisms but exact mechanism is not known¹⁴⁻¹⁶.

Longer chain cyanoacrylate tissue adhesives have been used safely on millions of patients with no reported carcinogenicity in humans.¹⁷⁻¹⁸ This was detailed in a study commissioned to determine any carcinogenic potential in 1986⁵.

Ridgway DM et al demonstrated that the use of tissue glue for cervicotomy skin closure has no benefit over the use of staples¹⁹. Use of tissue glue prolonged operating times but achieved neck mobility and wound cosmesis scores comparable to stapled closures. Therefore they advocated use of staples over skin glue.¹⁹ These conclusions were drawn from results of very small number of patients however; only 29 patients were randomised in this trial.

In contrast to above, Shetty et al have implicated skin staples with increased rates of wound complication and infection compared with subcuticular suturing²⁰.

Chambers and Scarci reported that applying cyanoacrylate glue to a sternal wound has superior

outcomes in terms of infection rates post operatively in coronary artery bypass graft operations²¹.

Coulthard P et al, in a recent Cochrane Database Systematic review update concluded that sutures were significantly better than tissue adhesives for minimising dehiscence and were found to be significantly faster to use and that if higher tension is needed upon an incision, sutures may minimise dehiscence²². For all other analyses of infection, patient and operator satisfaction and cost there was no significant difference between sutures and tissue adhesives²².

Others have found use of Cyanoacrylate glue to be rather faster, cost effective with similar or better cosmetic results in comparison to the standard methods of skin closure in various disciplines of surgery²³⁻²⁷.

Farion K et al, in another Cochrane Database Systematic review concluded that tissue adhesives are an acceptable alternative to standard wound closure for repairing simple traumatic lacerations. No significant difference was found in cosmetic outcome between tissue adhesives and standard wound closure, or between different tissue adhesives. These adhesives offer the benefit of decreased procedure time and less pain, compared to standard wound closure. A small but statistically significant increased rate of dehiscence with tissue adhesives was highlighted in this review²⁸.

The use of tissue adhesives is contraindicated the presence of infection, gangrene or ulceration, bleeding or oozing from the incision, incisions under tension such as at joints, partial-thickness skin loss, burns, animal bites, mucosal surfaces or across muco-cutaneous junctions, areas of high moisture or dense hair and in those who are allergic to these adhesives²⁹.

SURGICAL TECHNIQUE

We have been using this technique since January 2004 to close elective neck incisions for a variety of operations with excellent cosmetic outcome. These operations include Thyroidectomies, Parathyroidectomies, Thyroglossal Cyst excisions, Parotidectomies and lymph node excisions, (>700 cases).

Before wound closure, haemostasis is completely ensured and Platysma is approximated using interrupted absorbable stitches (Fig 1)



Fig. 1: Platysma being closed with interrupted absorbable stitches

Then a subcuticular 3/0 polypropylene stitch is inserted for apposition of skin edges. We use polypropylene suture on straight cutting needle. The needle is inserted approximately 1 cm away from the wound end and skin edges are approximated with small subcuticular bites. To finish the stitch the needle is brought out of skin at about the same distance at the other end (Fig. 2 and 3). This suture maintains the accurate approximation of skin edges preventing any seepage of glue inside. Instillation of glue inside the wound edges acts as barrier to cell migration across delaying wound healing.



Fig. 2: Subcuticular polypropylene stitch being inserted, note that needle is inserted about a centimetre away from the wound end through normal skin.



Fig. 3: Completely inserted subcuticular stitch, note the exit of thread about a centimetre away from wound end.

Polypropylene suture ends are not cut and are left as such at the wound ends. Wound is cleaned and dab dried with a swab. After making sure that there is no gap in between the edges, a thin layer of Glue is applied and left for about a minute to set (Figure 4 - 5). As this hardens, another layer is applied on top and left to dry as before.



Fig. 4: The Glue is ready for application

When the glue is dry, polypropylene suture is then pulled out of the skin (Figure 5). This leaves the skin edges staying in place approximated to each other with glue only (Figure 6).



Fig. 5: The subcuticular polypropylene stitched being pulled out



Fig. 6: The end result, the Glue only holding wound edges together

Glued wound is left open and no dressings are needed. Care is taken not to cover the layer of glue with any dressing or plaster which may be required for drain sites. The danger with this is that the Glue can be pulled off from the wound on removal of this plaster and wound can open.

At the end of operation, drapes used to isolate surgical site are removed carefully as the skin edges can be pulled apart accidentally.

DISCUSSION

Closure of a clean surgical skin wound requires good approximation of the two edges of the wound and keeping them together till a time when with natural healing process they gain sufficient strength to stay together and withstand the physical stress during the normal daily life.

Use of a variety of materials and techniques is in common practice for wound closure. These include a range of sutures of both absorbable and non absorbable type, staples, surgical tapes and most recently tissue adhesives. All are used in a variety of ways employing different techniques.

All are described to have advantages and disadvantages in comparison to each other in terms of achieving good functional and cosmetic outcome, risk of infection, wound dehiscence and transmission of infection when using sharps.

Non absorbable sutures and clips although cheap, need a visit to the health professional for removal. Also when used interrupted, may lead to formation of centipede like scar. Subcuticular absorbable sutures leave foreign tissue inside body which is absorbed over time. They need tying at the ends and the knots may not absorb in time eroding out to skin. This leads to poor cosmetic outcome and makes wound more prone to infection.

Most common way of applying surgical glue is to hold the two ends of the wound in a toothed forceps and putting glue on top. This may lead to poor approximation and edge inversion or eversion. The glue may seep inside the wound and acts as a barrier to cell migration across (Fig. 7), this may cause foreign body reaction and therefore delay healing process. The degradation products may get absorbed over time to produce toxicity.

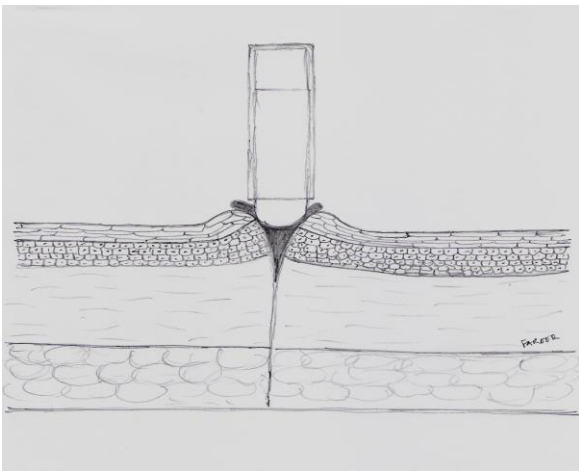


Fig. 7: Incorrect method: the glue entering into the wound creating barrier to cell migration across.

In our technique, wound is approximated accurately with subcuticular polypropylene stitch which also seals the wound and prevents seepage of glue inside, preventing above mentioned complications (Fig. 8).

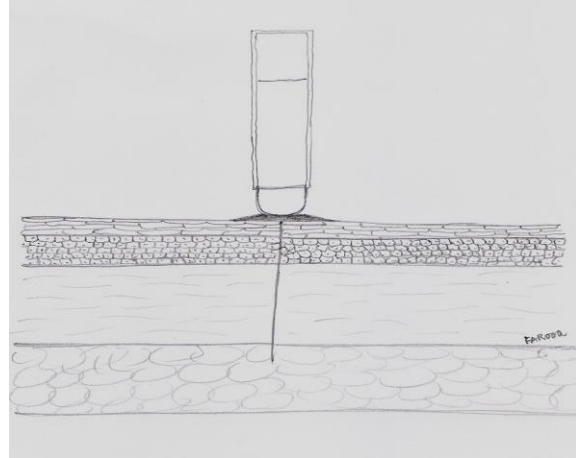


Fig. 8: Correct method: accurate approximation, the glue staying out on skin only

As the glue is waterproof, patient can have shower the very next day. The glue itself is flexible and transparent, therefore there is no need of any protective dressing on top and wound can be readily examined through it. The glue flakes off in a few days on itself with the superficial layer of skin cells; therefore there is no need for patient to come back for suture removal. Although the glue may be expensive is expensive in comparison to the sutures, a second visit to remove them balances the overall cost of the wound care.

CONCLUSIONS

Though there are many techniques to close skin incisions in neck, our technique of closure using glue not only has an excellent cosmetic outcome but also it is simple, cost effective and very convenient for the patient as there is no need for wearing a dressing, wound can be readily seen through the glue, patient can have shower as glue is water proof and also there is no need for an appointment with health care professional for removal of stitches.

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