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Research Article

Efficacy of cyanoacrylate glue in operative wound closure

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ABSTRACT

Background: Amongst all the causes wound disruption, suture material plays a very significant role and the surgeon's interest therefore in this subject is obvious. In surgery the choice of suture material has been largely empirical. One learns the art and craft of surgery from one's chief and tendency is to use the suture material used by him. The objective of the study was to study the efficacy of cyanoacrylate glue in operative wound closure.
Methods: This comparative study of efficacy of cyanoacrylate glue in operative wound closure was carried out at S. R. T. R. Government medical college, Ambajogai, Maharashtra, India for a period of two years. The study consisted of 100 patients all of whom underwent elective surgical procedures. They were divided into two groups: in group I patients (n = 50) cyanoacrylate glue was used for wound closure and in group II patients (n = 50) the wound was closed with interrupted silk sutures.
Results: 54 were males and 46 were females. The most common operative procedure in this study was appendicectomy (28%). Maximum numbers of patients i.e. 42 were seen in the age group of 21-30 years. Time taken in the closure of wound by cyanoacrylate in group I was considerably lesser than the time taken in the closure of wound by silk suture in group II. The incidence of wound infection or dehiscence was also significantly lower in group I. The incidence of dehiscence in group I was 4% compared to 8% in group II.
Conclusions: Use of cyanoacrylate glue was found to be more effective and conventional suturing.

Keywords: Efficacy, Cyanoacrylate glue, Sutures, Operative wound closure

INTRODUCTION

Sutures, staples and adhesive tapes are the traditional methods of wound closure, whilst tissue adhesives have entered clinical practice more recently. Closure of wounds with sutures enables meticulous closure, but they may show tissue reactivity and can require removal. Tissue adhesives offer the advantages of no risk of needle stick injury and no requirement to remove sutures later. Tissue adhesives have been used primarily in emergency rooms but this review looks at the use of tissue adhesives in the operating room where surgeons are increasingly using these for the closure of surgical skin incisions.[1]

Traditional skin sutures (TSS) and metal skin clips (SC) are the most common devices utilized for closure of surgical incisions. They are safe and effective, although they require instruments to apply them, are time consuming and, above all, create an extra staff and cost burden for removal of sutures/staples. The ideal incision closure should be simple, effective, safe, rapid, inexpensive, painless, cosmetic and bactericidal.[2]

Recent studies suggest that the use of tissue adhesive for closure of both traumatic lacerations and incisional surgical wounds leads to cosmetic outcome comparable to conventional sutures.[3]

It was very clearly demonstrated by Ordman and Gillman in their studies that tape closed wound was in no way inferior to suture closed wound. The absolute values obtained from the tensile strength of tape closed incisions after 5th day was found very high and found sufficient enough to make spontaneous rupture unlikely in the normal postoperative period. The greater tensile strength of the suture over glued wound has been ascribed to some extent to the greater fibrosis provoked only internally along the incision by the perisutural reaction.[4]

Kamer and Joseph found that cyanoacrylate is safe, reliable and cost effective alternative to conventional wound closure techniques if properly used, cyanoacrylate prevents suture marks and milia formation. Patients have minimal complaints and are certainly pleased with the manner in which their wounds heal in comparison to their counterparts from the suture control group. There is no need to remove suture, which was very inconvenient to the patients.[5]

Advances in surgery and anaesthesia have not been paralleled by advances in the treatment of wound problems and skin closure is one of the many factors that are involved. The conventional and universally used methods of skin closure with stitching the edges together have been subjected to the scrutiny of laboratory research and clinical trials. Nevertheless, the results of suturing are not always completely acceptable. The end result of natural healing process is of paramount importance and much effort is given to the production of an invisible scar. The shortcomings of sutures are well documented in literature and we continued to be worried about minor inflammatory reactions with sutures and by skin marks either temporary or permanent.

Hence present study has been undertaken to study the efficacy of cyanoacrylate glue in operative wound closure.

METHODS

This comparative study of efficacy of cyanoacrylate glue in operative wound closure was carried out at S. R. T. R. Government medical college, Ambajogai, Maharashtra, India for a period of two years. The study consisted of 100 patients all of whom underwent elective surgical procedures. They were divided into two groups: in group I patients (n = 50) cyanoacrylate glue was used for wound closure and in group II patients (n = 50) the wound was closed with interrupted silk sutures.

Institutional ethics committee permission was obtained. Informed consent was taken from each and every patient.

Inclusion and exclusion criteria

Patients from the age group of 1 year to 80 years of both the sexes were included. All the patients underwent elective surgery. The cases done consisted of appendicectomies, thyroidectomies, supra-pubic cystolithotomy, epigastric or incisional herniorrhaphies, varicocelectomy, excision of dermoid cyst, breast surgeries, herniotomy, orchoidopexy etc. For inclusion in the study, the patients must have a clean wound. Patients with wounds crossing mucocutaneous junctions or joints and infected wound were excluded from the study.

Adhesive used

Tissue adhesive employed in this study was n-butyl-2-cyanoacrylate (Nactacryl) tissue adhesive. The approximate amount required for the closure of various lengths of wound are 0.25 ml for 5 cm incision, 0.5 ml pack for 10 cm incision and 1 ml for 15-20 cm of incision.

Procedure of closing wounds

The basic pre requisite to achieve suture-less skin closure is a dry, uncontaminated wound in which skin edges can be brought together without undue tension. The skin surface should be suitable for the application of adhesive and hemostasis should be perfect. In all cases of group I the wounds were closed by using n-butyl-2-cyanoacrylate (Nactacryl). Absolute hemostasis was achieved with pressure application if the ooze was minor or trying with plain catgut if there is a major bleeder. Subcutaneous interrupted sutures were applied in all cases with chromic catgut of size 2-0 or 3-0. All knots were buried while applying the subcutaneous sutures. It was ensured that the level at which subcutaneous suture immerged near the skin edge was through the dermoepidermal junction and returned through other edge exactly opposite and at the same depth. By giving particular attention to the above step, precise approximation of the skin edge could be achieved.

After the above step the end, of the skin incision were held together by skin hooks or clips or allis forceps. The skin was washed and thoroughly dried. The assistant achieved approximation of the wound edges manually by holding the skin edges together by finger or forceps as the case may be. Alternatively in some cases subcuticular continuous stitches taken to approximate the wound precisely. The glue was loaded in the syringe supplied and applicator nozzle was applied to the syringe. The glue was applied directly over the edges in droplet from taking care not to apply the glue between the wound edges. The film of glue extended to at least 5 mm on either side of the healthy skin around the wound area. The wound was held together, till it was dry to allow complete polymerization of the glue as was evident when the film of glue opacified. Clean and dry dressing was applied to the wound and removed the next day.

The patient was allowed to take bath from 3rd day onward and told to dry the adhesive struck wound by gentle dabbing and only in some cases had to be removed with acetone.

Postoperative antibiotics were given in cases according to the requirement of case. The wound was examined on the 3rd and 7th postoperative day to see for any evidence of infection, which was evident as any erythema surround edges of wound, pain or serous and seropurulent discharge from the wound. Resultant scar for assessment for cosmetic outcome was seen at 2 weeks and 4 weeks when the patient came for follow up visit.

RESULTS

54 were males and 46 were females. The most common operative procedure in this study was appendicectomy (28%) followed by thyroidectomy (20%) and inguinal herniorrhaphy (20%).

The age ranges of patients were between 1 to 70 years. Maximum numbers of patients i.e. 42 were seen in the age group of 21-30 years.

Table 1: Operative procedures and sex wise distribution of cases.

Procedure	Male	Female	Total
Appendicectomy	14	14	28
Thyroidectomy	2	18	20
Inguinal herniorrhaphy	20	00	20
Herniotomy	04	00	04
Orchidopexy	04	00	04
Supra pubic cystolithotomy	02	00	02
Epigastric/ incisional/ umbilical hernia repair	04	02	06
Caesarean section	00	02	02
Variocelectomy	02	00	02
Breast surgeries	00	10	10
Dermoid cyst excision	02	00	02
Total	54	46	100

Table 2: Operative procedures and age wise distribution of cases.

Procedure	0-10	11-20	21-30	31-40	41-50	51-60	>60
Appendicectomy	00	04	12	08	04	00	00
Thyroidectomy	00	02	16	02	00	00	00
Inguinal herniorrhaphy	00	04	04	04	04	00	02
Herniotomy	04	00	00	00	00	00	00
Orchidopexy	04	00	00	00	00	00	00
Supra pubic cystolithotomy	02	00	00	00	00	00	00
Epigastric/incisional/umbilical hernia repair	02	00	02	02	00	00	00
Caesarean section	00	00	02	00	00	00	00
Variocelectomy	00	02	00	00	00	00	00
Breast surgeries	00	02	06	02	00	00	00
Dermoid cyst excision	02	00	00	00	00	00	00
Total	14	14	42	18	08	00	04

Table 3: Time distribution of wound closure in various operative procedures.

Site of infection	Length of incision (cm)	Group I mean closure time in sec.±SD	Group II mean closure time in sec. ± SD
McBurney's	4-6	39.72±3.22	183±5.43
Suprasternal transverse	10-12	100.6±3.77	306.8±4.63
Inguinal incision	4-7	60.4±3.50	260.8±3.42
Midline supra umbilical	6-10	70.66±3.53	310.00±2.00
Midline infra umbilical	10	104.0±0.00	310.00±0.00
Supra pubic	5	40.00±0.00	80.00±0.00
Supra orbital	5	42.00±0.00	176.00±0.00
Radial incision in breast surgeries	6-8	64.00±3.16	300.00±3.16

Of the 50 cases studied, the results were satisfactory in all the cases compared to suturing of the skin. The glue was found to easier and quicker to use. Time taken in the closure of wound by cyanoacrylate in group I was considerably lesser than the time taken in the closure of wound by silk suture in group II. The item taken in closure of wound was directly proportional to the size of wound and location of wound.

Table 4: Comparison of incidence of wound infection.

Type of wound closure	No. of cases	Wound infection	Percentage
Group I	50	2	4
Group II	50	4	8

All wound were inspected daily for any evidence of wound infection. This was assessed by the presence of any erythema, serous/serosangneous or frankly purulent discharge from the wound. The incidence of wound infection or dehiscence was also significantly lower in

group I. The incidence of dehiscence in group I was 4% compared to 8% in group II.

DISCUSSION

This comparative study of efficacy of cyanoacrylate glue in operative wound closure was carried out at S. R. T. R. government medical college, Ambajogai, Maharashtra, India for a period of two years. The study consisted of 100 patients all of whom underwent elective surgical procedures. They were divided into two groups: in group I patients (n = 50) cyanoacrylate glue was used for wound closure and in group II patients (n = 50) the wound was closed with interrupted silk sutures.

54 were males and 46 were females. The most common operative procedure in this study was appendectomy (28%) followed by thyroidectomy (20%) and inguinal herniorrhaphy (20%). The age ranges of patients were between 1 to 70 years. Maximum numbers of patients i.e. 42 were seen in the age group of 21-30 years. Time taken in the closure of wound by cyanoacrylate in group I was considerably lesser than the time taken in the closure of wound by silk suture in group II. The incidence of wound infection or dehiscence was also significantly lower in group I. The incidence of dehiscence in group I was 4% compared to 8% in group II.

Elek and Conen clearly 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.[6]

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.[7]

Forrester has shown that in skin per cutaneous sutures are the best avoided.[8] Saxena and Willital also have extensively used cyanoacrylate tissue adhesive in the closure of extremity wound in paediatric emergency department. 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 frightenend child. 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.[9]

Quinn et al compared tissue adhesives and sutures in the management of lacerations. They conducted a study on 130 patients with 136 lacerations overa a 5 months period. The lacerations included all eligible non mucosal facial lacerations, as well as selected extremity and torso lacerations (not on hand, feet or joints). A 3 month photograph of the wound was assessed by a plastic surgeon and the results were found to be comparable to closure by sutures. They found the tissue adhesive to be a faster method of wound repair as well as being less painful and better accepted by the patients.[10]

Messi et al studied the cost and benefit of use of cyanoacrylate glue in paediatric emergency departments. They found the use of adhesive glue much easier and economical because of its advantages: no need oflocal anaesthesia, syringes, sterile suture instruments and dressing materials; no further dressing; no suffering of children during the treatment and good aesthetic results.[11]

Hallocck GG in his study on the varied use of cyanoacrylate glue in plastic surgery found it to be a rapid, painless, suture free method for closure of simple lacerations and surgical wounds. They found that the glue has now been used in more than 100 different occasions for off label applications including nailbed repair, skin graft fixation, temporary otoplasty, wound sealant, and other forms wound closure. In their study, complications were virtually non-existent and there was no evidence of histiotoxicity.[12]

CONCLUSION

Thus the results achieved in the present study are comparable to those of the above workers as regards very low incidence of wound infection, excellent cosmetic results, easy application and painless removal, lack of skin reaction and very high patient acceptability.

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Ethical approval: The study was approved by the institutional ethics committee

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