

EVALUATION OF COMPLICATOINS AND BENEFITS OF HISTOACRYL TISSUE GLUE IN SURGICAL WOUNDS

M. R. Zafarghandy., A.R. Nuri., P. Irandoost., N. Chimeh. and A. Jafari

Department of Vascular Surgery, Sina Hospital, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran

Abstract - Healing of surgical wounds and their complications such as infection or scar formation are of major concern in surgery. Tissue glues are advanced to reduce these problems. In a prospective study, we have evaluated surgical wound healing in 76 patients whose surgical wounds were repaired by tissue glues (Histoacryl). This study was performed in four teaching hospitals (Sina, Shariaty, Shohada, Razi). The major parameters considered for this study were complete wound healing in the first postoperative week, early wound complications, late wound complications, and their relation with some other factors such as wound size and glue application techniques. In our study, complete wound healing in less than one week was seen in 81.9% of patients, whereas 18.1% had a longer course. Early complications consisted of (5.6%) infection and (2.8%) hematoma. Late complications included hypertrophy (0.48%) and widening (18.1%) of scars. There was a significant correlation between wound size and healing time ($P<0.05$), but not between faulty techniques and scar formation. *Acta Medica Iranica* 37 (2): 98 - 101; 1999

Key words: Tissue glue, suture, wound, scar, cosmetic results

INTRODUCTION

Tissue glue application alone, or as an adjunct to sutures, has been of interest for many scientists. At first alkyl-2- cyanoacrylate was introduced by Goover et al in 1959 (1). This material is polymerized by anions and free radicals while exposed to ionic solutions, epithelium, blood, mucus or skin (2-4).

After recognizing the various toxic effects of methyl and ethylcyanoacrylate compounds on tissues (6), the recent investigations have been focused on isobutylcyanoacrylates that are less detrimental (6-11). These compounds have rapid and effective hemostatic and bacteriostatic effects. Although tissue glues are used in European and Asian countries, there was no research on the effect of tissue glues in Iran. This study evaluates the advantages and disadvantages of tissue glue in

comparison with sutures. In one study on 50 children at London Guy Hospital in 1988, infection and hypertrophic scars were reported as side effects in 5% and 6% of the cases, respectively. The duration of procedure was 5 minutes as compared to 15 minutes for sutures (12). In a research in Bombay Medical College in 1983-1984 the wounds were managed by tissue glue and suture in 30 and 25 patients respectively. Patients were in the range of 16-65 years with 3-17 cm wound lengths. With Sutures, inflammatory reactions were seen in 32% and infection in 3.57%, as compared to 7.14% and 3.57% respectively with tissue glue (13). In another investigation in the emergency department of U.K. Leeds Hospital in 1998, the results of application of tissue glue in 50 cases of scalp wound, were entirely successful for wounds with less than 6 cm length (14). However, in the study from Ottawa, on 81 children, there were no differences between sutures and tissue glues. The wounds of these cases were clean and the diameters were less than 4 cm by 0.5 cm. The necessary time for the procedure was 7.9 minutes against 15.6 min for tissue glue and suture respectively ($P<0.001$) with less pain in the first procedure.

MATERIALS AND METHODS

This study evaluates 76 cases from September to March 1997 in surgical centers of four teaching hospitals (Sina Hos., Shohada Hos., Shariati Hos., Razi Hos.) which were chosen in a simple manner. Wounds were clean or contaminated.

Four cases were dismissed without analysis, the remaining 72 patients were under surveillance for one week, 62 cases of the latter were followed for 3 months. Variables included: age, sex, diameters of wound, coincident diseases, the quality of procedure, the number of healed wounds in the first week, contaminated wounds, hematoma, tenderness, purulent discharge, dehiscence, edema, erythema, hypertrophic scars, wide scars, itching, pain and burning.

The method included 5 steps:

- 1- Cleaning of wounds with water and then Povidone Iodine.
- 2- Approximation of wound edges: Wounds larger than 3 cm were sutured subcutaneously with 3/0 chromic and in those that were under pressure (e.g. midline abdominal skin) a cutaneous suture was used every 3 cm.
- 3- Complete drying of the wound's surface.
- 4- Applying a narrow layer of the glue at the surface of the wound in adequate amounts (the glue becomes whitish).
- 5- Sterile dressing of the wound.

Patients had been advised to be under surveillance for one week after discharge and 3 months later, for observation of early and late side effects. After completion of the master sheet, the data was entered in FOXPRO Version 2.6 and analyzed with SPSS Version 4. The results were analyzed with Mann - Whitney, Chi-square and Fisher exact tests.

RESULTS

In our study the sex ratio of male to female was 1.77 (63.9% male and 36.1% female). The background diseases which led to operation, are demonstrated in Table 1.

Mean age of patients, was 31 ± 21 years (range: 2-72 years). The length of wounds was less than 10 cm in 75%, greater than 10cm in 25%, and in 81.9% of patients, the wound healed in less than one week and in others (18.1)% it took longer. There were faulty techniques in 15.3% (11 cases).

Table 1. The background diseases which led to operation.

Disease	Numbers	%
Inguinal Hernia	29	40.3
Gallstone	7	9.7
Laceration	5	6.9
UDT, appendicitis, laparoscopy	4	5.6
TL, sebaceous cyst, varicocele, nevus, AV fistula	2	2.8
Hydrocele, hernia, achalasia, folliculitis, ovarian cyst, cystocele, lipoma, rectocele, esophageal cancer, splenomegaly, epigastric hernia	1	1.4
Total	74	100

Table 2. Complications of tissue glue application.

	Early Complications (In 72 cases)			Late Complications (In 62 Cases)				
	Infection	Hematoma	Dehiscence	Severe Scar	Mild Scar	Pruritus	Widening	Pain
Numbers	4	2	3	3	59	0	11	0
Percentage	5.6	2.8	4.2	4.8	95.2	0	18.1	0

Complications are demonstrated in Table 2.

By Pearson's correlation, there was a meaningful relation between wound length and healing time ($p=0.001$, $r^2=0.53$, $r=0.73$) which suggests a direct correlation between these two parameters.

The mean wound length in patients with widening of scars was 19.3 ± 11 cm versus 7 ± 5.4 cm in other patients. There was a faulty technique in 30.8% of patients with wound widening in comparison with 16.1% in other patients.

DISCUSSION

In this study the healing time with application of tissue glues was less than 7 days for the majority of patients that is similar to other studies. Wound infection was seen in 4 cases (5.6%) similar to other studies which reported 5-10%. In one infected patient, who was operated on for achalasia, we used sutures every 3 cm. The rate of infection was similar to that sutures, as reported in standard surgical textbooks (2 - 10%).

Severe hypertrophic scars were seen in three patients. One was a child who was operated on

for inguinal hernia. He had had an identical herniorrhaphy for the contralateral hernia one year earlier which was repaired by sutures and resulted in a similar hypertrophic scar.

The second case was an achalatic patient with infectious side effects in the second week. An esophageal cancer with 30 cm wound was the third case whose scar was similar to that of sutures. These results are in accord with the results of facial lacerations.

Great scars (18.1%) were usually accompanied with large wounds or faulty techniques. Enlargement of wound, specially in conditions that stretch the skin, are usual e.g a 1 mm wound in a nonretractile area can reach 10 mm by 3 weeks. This emphasizes the necessity of considering preparations for decreasing traction even after suture removal. This study verifies the benefit of these preparations for tissue glue usage particularly in large wounds. Correlation of large scars and faulty techniques was significant ($P=0.03$). With respect to the length of wound, however, this correlation is not significant ($p=0.25$ for wounds less than 10 cm and $P=0.57$ with wounds larger than 10 cm).

Hematoma was reported in 2 cases; in one of them the excision of a sebaceous cyst resulted in a 2cm × 2cm empty space, which rendered hemostasis difficult.

It must be noted that the repeated use of one tube of glue is against the recommendation of manufacturers. This study shows that the outcome of tissue glues and sutures in great wounds (>3 cm) is similar. In retractile and thin skins (eg. facial skin) however, tissue glues have better cosmetic results without any pain and consequent fear, that are problem for children and their parents, especially in facial suturing. Besides, tissue glue will become cost effective because of decreased dressing time, unnecessary of gloves or surgical sets etc.

Against the current concept, a significant correlation was not concluded between faulty techniques and any side effects, but the former

can affect the wound appearance in early phases. This study expands our applied knowledge about tissue glues and suggests application of glues in small wounds which should be further investigated. We recommend the training of medical staff for improving tissue glue techniques.

REFERENCES

1. Coover H.W., Joyner F.B., Shearer N.G., et al. Chemistry and performance of cyanoacrylate adhesives. *Soc Plastic Enger J.* 15: 413; 1959.
2. Bhaskar SN, Frisch J. Use of cyanoacrylate adhesives in dentistry. *J. Am Dent Assoc* 77: 831-7; 1968.
3. King DR., Reynolds DC, and Kruger GO. A plastic adhesive for non-suture sealing of extraction wounds in heparinized dogs. *Oral. Surg. Oral. Med. Oral. pathol* 24: 307-12; 1967.
4. Schmeissner H. chemical and physical characteristics of cyano-acrylates. *Deutsche Zahnarz Z.* 25: 15-7; 1970. Eng. Abstr.
5. Vinters HV., Galil KA., Lundie MJ., et al. The histotoxicity of cyanoacrylate. *Neuroradiology* 27: 279-91; 1985.
6. Galil KA., Scoffield ID, and Wright GZ. Effect of n-butyl-2-cyanoacrylate (Histoacryl Blue) on the healing of skin wounds. *J Can Dent Ass.* 7: 565-9; 1984.
7. Merrill GM., Dannen Baum R, and Cohen DW. A preliminary histologic study of the wound healing of mucogingival flaps when secured with the cyanoacrylate tissue adhesive. *J. Perikontol* 45: 608-18; 1974.
8. Bhaskar SN. Tissue response of rat tongue to normal and isobutyl cyanoacrylate. *Oral. Surg. Oral. Med. Oral. Pathol* 26: 573-8; 1968.
9. Bessermann M. Cyanoacrylate spray in the treatment of prolonged oral bleeding. *Int. J. Oral. Surg.* 6: 233-40; 1977.

10. Tse DT. Cyanoacrylate adhesive in securing Orvital implants. *Ophthalmic Surg.* 17: 577-80; 1986.
11. Quinn JV; Dizewiecki A; Limm; Stiell G; Sutcliffe T; Elmslie T J. and Wood WE. A randomized controlled trial comparing a tissue adhesive with suturing in the repair of pediatric facial lacerations. *ANN Emerg Med* 22 (7): 1130-35; 1993.
12. David P Watson, Use of Cyanoacrylate tissue adhesive for closing facial lacerations in children. *J. British medical* 299: 1014; 1989.
13. David A. Faria M., Pinto A. Non-suture closure of Wounds using cyanoacrylate. *J Postgraduate Medicine*; 32 (2): 97-100; 1988.
14. Morton R.J. Gobson M.F., Sloan J.P. The use of histoacryl tissue adhesive for the primary closure of scalp wounds. *Archives of emergency medicine*; 5: 110-112; 1988.
15. Text book of surgery. Schwartz 1994.