E-ISSN: 2616-3470
P-ISSN: 2616-3462

www.surgeryscience.com
2019; 3(1): 61-64
Received: 11-11-2018
Accepted: 13-12-2018

Dr. Harish Patel BN
Assistant Professor of Surgery, J.J.M. Medical College, Davangere, Karnataka, India

Dr. Pradeep Kumar J
Associate Professor of Surgery, P K DAS Institute of Medical Sciences, Vaniamkulam, Palakkad, Kerala, India

Dr. Kailas CT
Assistant Professor of Surgery, J. J. M. Medical College, Davangere, Karnataka, India

Dr. RL Chandrasekhar
Professor & HOD Department of Surgery, J.J.M. Medical College, Davangere, Karnataka, India

Correspondence
Dr. Pradeep Kumar J
Associate Professor of Surgery, P K DAS Institute of Medical Sciences, Vaniamkulam, Palakkad, Kerala, India

A study on wound asepsis score for skin closure in surgical procedures

Dr. Harish Patel BN, Dr. Pradeep Kumar J, Dr. Kailas CT and Dr. RL Chandrasekhar

DOI: https://doi.org/10.33545/surgery.2019.v3.i1b.11

Abstract
Acute wounds progress through the phases in an orderly fashion for normal healing to occur. Chronic wounds begin the healing process in a similar fashion; however, they have prolonged inflammatory phase in which there is significant destruction of the matrix elements caused by the release of proteolytic enzymes from the neutrophils. This was a comparative study in which patients were studied in two groups. One group comprised of incision closure with subcuticular 3-0 polyamide suture material and the other group comprised of closure with 2 - octylcyanoacrylate adhesive glue. The ASEPSIS score on 5th day shows a mean score of 0.12 for the adhesive glue group and a mean score of 0.28 for subcuticular skin suturing group (P=0.4). Here again there is a numerical difference in favor of adhesive glue group which n is statistically insignificant.

Keywords: Wound dehiscence, skin closure, surgical procedures

Introduction
Dermal wounds heal by 3 main mechanisms: connective tissue deposition, contraction, and epithelialization. Depending on the type of wound, these 3 distinct processes come into play to varying degrees. For example, an acute linear wound, such as a surgical incision that is closed by the surgeon using sutures, staples, tapes, perhaps dermal glue, heals by what is termed primary intention. The major mechanism needed to heal wounds by primary intention is the process of connective tissue deposition. No contraction is needed because the surgeon has closed the incision by mechanical means. There is only minimal epithelization, which occurs along the wound line on the surface [1, 2]

Open wounds, in which there is a loss of tissue, such as seen when a fingertip is injured, heal by a process termed secondary intention. These open wounds heal mainly by tissue contraction in which a centripetal force is generated by an interaction between fibroblasts and the matrix to advance the edges toward the center of the wound. There may be some matrix deposition, and what is not achieved by those 2 processes is then covered by epithelization. Some chronic wounds, such as pressure ulcers, also heal by secondary intention once the chronic inflammation is controlled and granulation tissue is allowed to form [3, 4]

If an open wound is suspected to be contaminated with foreign debris or bacteria, then the wound must be kept open and treated with gentle irrigation until the foreign materials and infectious agents are removed. As a general guide, the total bacterial burden should be lower than 105 organisms/g of tissue, as determined by biopsy and culturing [5]. Surface swabs are generally thought to be inaccurate. The wound should be gently irrigated with saline or lactated Ringer, and pressures greater than 15 psi should be avoided because they can force materials deeper into the wound bed and also damage newly forming granulation tissue [6]. Once these goals are achieved and if the wound can be closed, then the wound heals by a mechanism termed delayed primary intention.

Epithelialization is the process whereby epithelial cells surrounding the wound margin or in residual skin appendages, such as rete pegs, hair follicles, and sebaceous glands, migrate into the wound because of the loss of contact inhibition of cuboidal basal keratinocytes. This type of healing is termed partial thickness healing and is observed in minor abrasions and skin graft donor sites when an approximately 0.015 in thick piece of skin is removed for coverage elsewhere on the patient. After an extensive multistep process, these basal epithelial cells proliferate near the wound margin, producing a monolayer that moves over the wound surface [7, 8]

Acute wounds progress through the phases in an orderly fashion for normal healing to occur. Chronic wounds begin the healing process in a similar fashion; however, they have prolonged inflammatory phase in which there is significant destruction of the matrix elements caused by the release of proteolytic enzymes from the neutrophils [9]. Once the excessive inflammation is controlled by aggressive wound care, then the proliferative and remodeling phases begin; however, the resulting scar is often excessive and fibrotic [10]. These chronic non healing ulcers are examples of severely deficient healing. Despite extensive research into the mechanisms underlying wound healing, patients continue to be plagued by such pathologic conditions of abnormal wound healing in other tissues and organs, including recurrent and incisional hernias, anastomotic leaks, and wound dehiscence.

In conditions of fibrosis, the equilibrium between scar deposition and remodeling is such that an excessive amount of collagen deposition and organization occurs. This condition leads to a loss of both structure and function. Fibrosis, strictures, adhesions, keloids, hypertrophic scars, and contractures are the outcome of excessive pathologic healing.

Chronic wounds are associated with a higher level of proinflammatory cytokines than acute wounds. Elevated protease activities in some chronic wounds may directly contribute to poor healing by degrading proteins necessary for normal wound healing, such as extra cellular matrix proteins, growth factors, and protease inhibitors [11, 12].

Steed and Colleagues reported that extensive debridement of diabetic ulcers resulted in improved healing in patients treated with placebo or with recombinant human PDGF. Frequent debridement may therefore allow a chronic wound to heal in a similar fashion to an acute wound. In addition to the local wound environment, there are data to suggest that cells of chronic wounds may have an altered capacity by which to respond to various cytokines and growth factors and are in a senescent state.

Methodology

Study Design: This was a comparative study conducted on 50 patients in two groups.

Source of Data: 50 patients (25 in each group) undergoing clean elective surgery with no focus of infection on the body admitted in the department of general surgery.

Method of Collection of data: This was a comparative study in which patients were studied in two groups. One group comprised of incision closure with subcuticular 3-0 polyamide suture material and the other group comprised of closure with 2 - octylcyanoacrylate adhesive glue.

In both the groups the outcome of wound is assessed at 3rd, 5th, 7th post-operative days using ASEPSIS score. Wound is scored from 0 to 10, according to the proportion of wound involved and presence of serous collection, erythematous changes, purulent exudates and separation of deep tissues.

Inclusion Criteria; Cases undergoing clean elective surgical procedure and skin closure with polyamide subcuticular suturing or with 2 octylcyanocrylate adhesive glue under same antibiotic coverage.

Exclusion Criteria

- Surgical Incisions which require to be closed under tension.
- Clean contaminated and contaminated surgeries
- Traumatic wounds
- Patients with diabetes mellitus
- Known personal or family history of Keloid formation or scar hypertrophy
- A known allergy to Cyanoacrylate compound.
- Patients not coming for follow-up on 7th post – operative day or 1st month or 3rd post – operative month.
- Surgical closures involving mucocutaneous junctions like lips, oral cavity.

Results

Table 1: Gender distribution of study population

Sex	Frequency	Percent
Male	31	62
Female	19	38

In the above table the gender distribution was 62% males and 38% females in the present study.

In the present study different surgical procedures were performed in each study group. The split up of the surgical procedures in each group is indicated in the following table. All cases were clean and elective.

Table 2: Distribution of surgical procedures according to type of material used

	Type of Material used		
Surgical procedures	**Adhesive glue**	**Subcuticular Skin suturing**	**Total**
Exicision of Fibroadenoma	5	4	9
Excision of Lipoma	6	3	9
Excision of Sebaceous Cyst	2	-	2
Orchidectomy in a case of undescended testis	1	-	1
Lichensteins Tension free hernioplasty	5	11	16
Subtotal thyroidectomy	1	1	2
Excision of Lymph node	1	1	2
Herniotomy	3	4	7
Mesh repair of Incisional hernia	1	1	2
Total	25	25	50

Wound Asepsis score

The outcome of wound is assessed on 3rd, 5th and 7th post-operative days using asepsis score. Wound is scored from 0 to 10 according to the proportion of wound involved and presence of i) serous collection ii) Erythematous changes iii) Purulent exudates and iv) separation of deep tissues.

Table 3: Incidence of ASEPSIS score parameters at different intervals in the two study groups

Interval (days)	Type of Material	No complication	Seroma	Erythema	Purulent exudates	wound separation	Total
3rd Day	Adhesive Glue	21	2	1	0	0	25
	Subcuticular Skin Suturing	19	3	2	0	0	25
	Total	40	5	3	0	0	50
5th Day	Adhesive Glue	23	1	0	1*	1*	25
	Subcuticular Skin Suturing	22	2	0	1+	1+	25
	Total	45	3	0	2	2	50
7th Day	Adhesive Glue	24	0	0	0	1*	25
	Subcuticular Skin Suturing	24	0	0	0	1+	25
	Total	48	0	0	0	2	50

*and + same patient in glue group and subcuticular suture group had purulent discharge and wound separation.

It is observed that on day 3, in adhesive glue group there were 2 seromas (8%), 1 erythema (4%) amounting to 12% of the group. In subcuticular skin suturing group on day 3, there were 3 seromas (12%), 2 erythema (8%), amounting to 20% of the group. On day three adhesive glue group has a clear advantage over the skin suture group.

On day 5, there was 1 seroma (4%) and 1 purulent discharge with wound separation(4%) amounting to a total of 8% of the adhesive glue group, where as in subcuticular skin suture group there were 2 seromas (8%) and 1 purulent discharge with wound separation(4%) amounting to 12% of the group. On comparing the day 5 results with day 3 results the difference in the outcome between the two groups narrowed.

On day 7, the incidence of complication in adhesive glue group is 1 wound separation (4%) and in subcuticular skin suturing group also 1 wound separation (4%) indicating a similar outcome at the end of 7 days.

After going through the data, it can be concluded that though there existed a difference in the outcome of wound between the two study groups in the initial part of the post-operative period there existed no difference in the outcome of the wound between the two groups at the end of 7 days.

Table 4: ASEPSIS scores of the study groups on 3rd, 5th and 7th days.

Time interval (days)	Type of material	Seroma	Erythema	Purulent discharge	Wound separation	Total score/ mean	t Value	p Value
3rd Day	Adhesive Glue group	4	3	0	0	7 (0.28)	0.4103	0.7
	Subcuticu lar Skin suture group	5	4	0	0	9 (0.36)		
5th Day	Adhesive Glue group	1	0	2	0	3 (0.12)	0.8055	0.4
	Subcuticu lar Skin suture group	3	0	4	0	7 (0.28)		
7th Day	Adhesive Glue group	0	0	0	2	2 (0.08)	0	0
	Subcuticu lar Skin suture group	0	0	0	2	2 (0.08)		

The above score is calculated on the basis of the proportion of wound involved and presence of serous collection, erythematous changes, purulent exudates and separation of deep tissues. The wound is scored from 0 to 10 as per the following table.

Table 5: ASEPIS score based on the proportion of wound involved

Wound	Proportion of wound affected %					
characteristics	0	< 20	20-39	40-59	60-79	> 80
Serous exudate	0	1	2	3	4	5
Erythema	0	1	2	3	4	5
Purulent exudate	0	2	4	6	8	10
Separation of deep tissues	0	2	4	6	8	10

It is observed that on day 3 mean ASEPSIS score for adhesive glue group is 0.28 and for the skin suturing group is 0.36(P=0.7). Though there is a numerical difference in favour of the adhesive glue group, this difference is found to be statistically insignificant.

The ASEPSIS score on 5th day shows a mean score of 0.12 for the adhesive glue group and a mean score of 0.28 for subcuticular skin suturing group (P=0.4). Here again there is a numerical difference in favour of adhesive glue group which n is statistically insignificant.

Mean ASEPSIS score on 7th day for adhesive glue group was 0.08 and subcuticular skin suturing was 0.08 implying similar out come in the end.

Discussion

The outcome of wound was assessed on 3rd, 5th and 7th Post-operative days using ASEPSIS score. Mean ASEPSIS score on 3rd day for Adhesive glue group was 0.28 whereas the same for Skin suturing group was 0.36(P=0.7). Mean ASEPSIS score on 5th day for Adhesive glue group was 0.12 and the same for skin suturing was 0.28(P=0.4) indicating a larger separation of the two means than on the 3rd day but statistically insignificant. This difference in the mean ASEPSIS score can be attributed to (i) suture materials facilitate microbial colonization and (ii) Adhesives glues have some antibacterial properties. This finding is specially highlighted in comparative studies on contaminated lacerations. One such study by John M Howell et. al. [13] concluded that contaminated wounds closed with Cyanoacrylate alone have significantly lower staphylococcal counts than lacerations containing suture material.

On day 7 there was one case of wound separation in each group and the mean ASEPSIS score for both the groups was the same 0.08. This finding of the present study is supported by earlier published studies by Singer. A.J. [14] *et al*., which concluded that the infection rates at the end of one week after surgery were similar and fewer cases of Adhesive glue were erythematous.

They also concluded that there were no differences in wound dehiscence rates (Adhesive glue – 1.6% vs. suturing group 0.9% p = 0.35) and there was no difference in the percent of wounds with optimal appearance (Adhesive glue – 82% vs. suturing group 83% p = 0.67)

Conclusion

In conclusion the concept of using surgical tissue adhesives for superficial skin closure looks an attractive and a fast emerging alternative to the use of sutures for both surgeons and patients. Octylcyanoacrylate gives faster, comfortable and easier skin closure. So octylcyanoacrylate is effective and reliable skin closure in clean elective surgeries.

References

1. Nwomeh BC, Liang HX, Diegelmann RF, *et al*. Dynamics of the matrix metalloproteinases MMP-1 and MMP-8 in acute open human dermal wounds. Wound Repair Regen. 1998; 6(2):127-34.
2. Yager DR, Chen SM, Ward S, *et al*. The ability of chronic wound fluids to degrade peptide growth factors is associated with increased levels of elastase activity and diminished levels of proteinase inhibitors. Wound Repair Regen. 1997; 5:23-32.
3. Diegelmann RF. Excessive neutrophils characterize chronic pressure ulcers. Wound Repair Regen. 2003; 11(6):490-5.
4. Diegelmann RF, Cohen IK, Kaplan AM. The role of macrophages in wound repair: a review. Plast Reconstr Surg 1981; 68(1):107-13.
5. Shah M, Foreman DM, Ferguson MW. Neutralisation of TGF-beta 1 and TGF-beta 2or exogenous addition of TGF-beta 3 to cutaneous rat wounds reduces scarring. J Cell Sci. 1995; 108(Pt 3):985-1002.
6. Ten Dijke P, Hill CS. New insights into TGF-beta-Smad signaling. Trends Boichem Sci. 2004; 29(5):265-73.
7. Stelnicki EJ, Bullard KM, Harrison MR, *et al*. A new *in vivo* model for the study of fetal wound healing. Ann Plast Surg. 1997; 39(4):374-80.
8. Bhushan M, Young HS, Brennchley PE, *et al*. Recent advances in cutaneous angiogenesis. Br J Dermatol 2002; 147(3):418-25.
9. Semenza GL. HIF-1 and tumor progression: pathophysiology and therapeutics Trends Mol Med. 2002; 8(4 suppl):s62-7.
10. Clore JN, Cohen IK, Diegelmann RF. Quatitation of collagen types I and II during wound healing in rat skin. Prof Soc Exp Biol Med. 1979; 161(3):337-40.
11. Chen WY, Rogers AA, Lydom MJ. Charterization of biologic properties of wound fluid collected during early stages of wound healing. J Invest Dermatol. 1992; 88(5):559-64.
12. Vaalamo M, Leivo, Saarialho-Kere U. Differential expression of tissue inhibitors of metalloprotienases (TIMP-1, -2, -3, and -4) in mormal and aberrant wound healing. Hum Pathol. 1999; 30(7):795-802.
13. John M Howell, Kevin A Bresnahan, Thomas O Sair, Harinder S Dhindra, Barbara A Edwards. “Comparision of effects of suture and cyanoacrylate tissue adhesive on bacterial counts in contaminated lacerations”. Antimicrobial agents and chemotheraphy 1995; 39(2):559-60.
14. Singer AJ, Quinn JV, Clark RE, Hallander JE. Closure of Lacerations and Incisions with Octylcyanoacrylate: A multicenter randomized controlled trial, surgery. 2002; 131(3):270-6.