RESEARCH

Comparative Study of Fixation of Split Skin Graft with Suture Versus Cyanoacrylate Tissue Adhesive

Abhishek Gaur[1], Nidhi Gaur[2]

[1]Assistant Professor, Department of Surgery, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India.
[2]Assistant Professor, Department of Anaesthesiology, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India

Abstract:

Context: The skin is widely regarded as the most effective natural covering of the human body, forming the interface between the internal organs and the external environment and serving a key immunological role in defending against pathogens. Given the many essential functions the skin performs, any significant loss of skin predisposes a patient to a wide range of complications, making prompt coverage of skin defects a clinical priority. Among the various reconstructive options available, split skin grafting (SSG) is one of the most widely used and practical techniques. However, an SSG is prone to failure if it is not adequately secured, since inadequate fixation permits graft movement, which in turn compromises revascularization and can progress to graft necrosis. Reliable fixation of the graft to the recipient bed is therefore essential for graft survival. A number of techniques and materials have been described for this purpose, each carrying its own advantages and limitations. This study compares the effectiveness of suture fixation against N-butyl-2-cyanoacrylate tissue adhesive for securing split skin

INTRODUCTION

Loss of skin commonly results from burns, trauma, surgical excision, and reconstructive procedures performed for post-burn contractures or congenital anomalies. A range of options is currently available to resurface such defects, including various forms of skin grafting (split skin graft, full-thickness graft, and composite graft), collagen sheet dressings, amniotic membrane application, and topical honey dressings, among others. Of these, split skin grafting continues to be one of the most practical and widely applied reconstructive techniques. Secure fixation of the graft is essential, as inadequate fixation predisposes to graft mobilization, impaired revascularization, and consequently poor graft take. The present study was designed to compare the effectiveness of suture fixation with N-butyl-2-cyanoacrylate tissue adhesive for securing split skin grafts.[1-8]

MATERIAL and METHODS

This prospective study was conducted in Unit-I of the Department of Surgery at Muzaffarnagar Medical College, Muzaffarnagar between 15 December 2017 and 31 March 2019. Forty-eight patients were enrolled and allocated to one of two groups. In Group I (25 patients), the split skin graft was secured using N-butyl-2-cyanoacrylate ester [Figure 1–3]. In Group II (23 patients), graft fixation was performed using 3-0 Prolene sutures [Figure 4–5].

Patients with clean, healthy wounds measuring 5 to 15 cm in size, arising from burns, trauma, tumour excision, or reconstructive surgery for post-burn contracture or congenital defects, were included in the study. Patients with uncontrolled type 2 diabetes mellitus, sepsis, unhealthy wound beds, HIV/AIDS, anaemia, uraemia, jaundice, or coagulation disorders were excluded. Routine investigations were performed in accordance with the exclusion criteria. For every patient, wound size and the time required for graft fixation were recorded, and graft survival was assessed at the first, second, and final dressing changes. The development of sepsis was also documented, along with postoperative haematoma or seroma formation, graft dislocation, graft necrosis, and overall graft take.

RESULTS

All assessments were performed by a single examiner. Of the 48 patients studied, 29 were male and 19 were female, with ages ranging from 3 to 70 years [Table 1]; graft fixation was achieved using either sutures or N-butyl-2-cyanoacrylate ester. Post-burn contracture surgery following burns was the

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Corresponding Author:
Abhishek Gaur
E-mail: dr.abhishek.gaur@gmail.com

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most common indication for split skin grafting [Table 2]. The time required for graft fixation was considerably shorter in Group I than in Group II [Table 3]. Infection and haematoma/seroma formation were the most frequently observed complications in both groups; however, only 8% of patients in Group I developed a complication, compared with 30.4% in Group II [Table 4]. The overall graft take-up rate was 100% in Group I and 91.3% in Group II [Table 5].

[Table 4] displays an intergroup comparison of spirometry and procedural complications. Between the two groups, there was no statistically significant difference in the spirometer results. Similar to several attempts, hypotension, fever, pneumothorax, and convulsions, neither group's risk experienced a discernible difference. However, just one patient in group 1 reported a problematic insertion, compared to six patients in group 2, which proved to be a statistically significant difference.

Overall, this study demonstrated favourable graft fixation and take -up with both techniques, with outcomes noticeably better in Group I, where N-butyl-2-cyanoacrylate was used for graft fixation, compared with Group II. This finding is consistent with the results reported by Adler et al. in their study of cyanoacrylate tissue adhesive for skin graft fixation in burn patients.

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DISCUSSION

The skin is the largest organ of the integumentary system, comprising up to seven layers of ectodermal tissue that protect the underlying bones, ligaments, and internal organs. As the interface between the body and its external environment, the skin plays a critical immunological role in defending against pathogens and preventing excessive water loss. It additionally provides insulation, thermoregulation, sensory perception, synthesis of vitamin D, and protection of vitamin B folates. When severely damaged, the skin heals through scar formation, which is frequently discoloured, depigmented, and may progress to contracture.[9-11]

Skin grafting remains one of the most practical and widely used methods for reconstructing defects caused by full-thickness burns, trauma, or tumour excision, and secure fixation of the graft is central to its success. Fixation using sutures or staples has long been regarded as the standard technique, and various modifications, such as the barbed suture tie-over technique described by Joyce et al., have since been reported.[12]

A number of alternative techniques and materials have also been explored for split skin graft fixation. Fibrin, introduced as a tissue adhesive by Bergel in 1909, was first used for skin graft fixation by Tidrick and Warner in 1944. Other approaches include fixation using silicone rubber dressings, negative pressure dressing techniques as described by Isago et al., vascular clips for graft approximation on burned hands as proposed by Payne et al., and medical honey, which has established antibacterial properties and has been used effectively as a natural fixation agent for split-thickness skin grafts.[13]

An ideal method of skin graft fixation should be simple, safe, rapid, inexpensive, painless, bactericidal, and should yield an optimal cosmetic outcome. N-butyl-2-cyanoacrylate, a surgical tissue adhesive developed in 1949 and applied externally to the outermost skin layer,

Table 1: Age Distribution

Age (Years)	No. of Patients
1–10	4
11–20	5
21–30	3
31–40	16
41–50	10
51–60	6
61–70	4

Table 2: Cause of Wound

Cause	No. of Patients
Burn	10
Operated cases of post-burn contracture	11
Diabetic foot	6
Non-healing ulcer	8
Trauma	7
Operated cases of congenital defect	6

Table 3: Time Taken for Fixation of Graft

SSG Fixation Time	Group I	Group II
In minutes	4 minutes	11 minutes

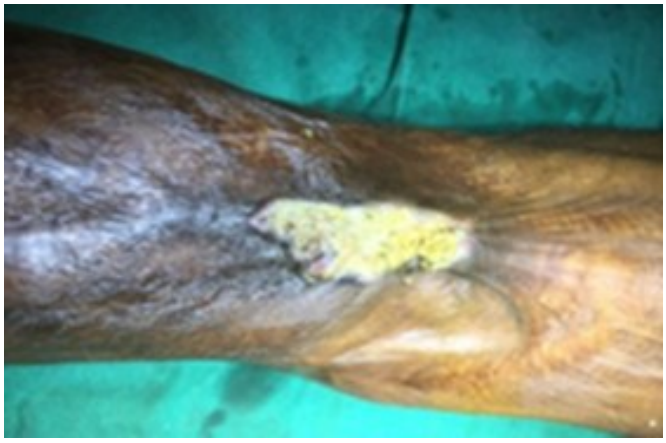
Table 4: Postoperative Complications

Complication	Group I	Group II
Infection	1	1
Haematoma/seroma	1	2
Graft dislocation	0	2
Graft necrosis	0	2

Table 5: Graft Take-Up Rate

Graft Survival	Group I	Group II
Number	25	21
Percent	100	91.3

Figure 1: Split skin graft fixed with N-butyl-2-cyanoacrylate tissue adhesive.



Figuire 2: Wound bed following split skin grafting, Group I (cyanoacrylate fixation).

Figure 3: Application of N-butyl-2-cyanoacrylate adhesive over the split skin graft.

Figure 4: Split skin graft secured with 3-0 Prolene sutures, Group II.

Figure 5: Postoperative appearance of a suture-fixed split skin graft, Group II.

CONCLUSION

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REFERENCES

1. Proksch E, Brandner JM, Jensen JM. The skin: an indispensable barrier. Exp Dermatol. 2008;17(12):1063–72.
2. Han HH, Jun D, Moon SH, Kang IS, Kim MC. Fixation of split-thickness skin graft using fast-clotting fibrin glue containing undiluted high-concentration thrombin or sutures: a comparison study. Springerplus. 2016;5(1):1902.
3. Place MJ, Herber SC, Hardesty RA. Basic techniques and principles in reconstructive surgery. In: Aston SJ, Beasley RW, Thorne CHM, editors. Grabb and Smith's Plastic Surgery.
4. Kilic A. Skin graft fixation by applying cyanoacrylate without any complication. Plast Reconstr Surg. 2002;110(1):370–1.
5. Adler N, Nachumovsky S, Meshulam-Derazon S, Ad-El D. Skin graft fixation with cyanoacrylate tissue adhesive in burn patients. Burns. 2007;33(6):803.
6. “Skin care” (analysis). Health-Cares.net; 2007.
7. Madison KC. Barrier function of the skin: “la raison d'être” of the epidermis. J Invest Dermatol. 2003;121(2):231–41.
8. Joyce KM, Joyce CW, Mahon N, Kelly JL. Use of a barbed suture tie-over technique for skin graft dressing. Arch Plast Surg. 2015;42(3):341–5.
9. Volemans A, Kreis RW. Fixation of skin grafts with a new silicone rubber dressing. Scand J Plast Reconstr Surg Hand Surg. 1994;28:75–6.
10. Isago T, Nozaki M, Kikuchi Y, Honda T, Nakazawa H. Skin graft fixation with negative pressure dressings. J Dermatol. 2003;30(9):673–8.
11. Payne RM, Quiroga LC, Cooney CM, Caffrey JA. Use of vascular clips to approximate skin grafts on the burned hand. Burns. 2018;44(1):e1–e4.
12. Emsen IM. A different and safe method of split-thickness skin graft fixation: medical honey application. Burns. 2007;33(6):782–7.
13. Gosain AK, Lyon VB; Plastic Surgery Educational Foundation DATA Committee. The current status of tissue glue, part II: for adhesion of soft tissues. Plast Reconstr Surg. 2002;110(6):1581–4.
14. Craven NM, Telfer NR. An open study of tissue adhesive in full-thickness grafting. J Am Acad Dermatol. 1999;40(4):607–11.