International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Role of Hydrocolloid Dressings on Healing of Split Thickness Skin Grafting Donor Sites - A Clinical Study

Dr. Palukuri Lakshmi[1], Dr. Sukhavasi Sree Sai Rekha[2], Dr. D. Hari Chandana[3], K. P. Ramtej. M. Ravindran[4], Dr. Ahlad Sreedharala[5]

[1]MS, MCh, Professor & HOD Department of Plastic Surgery, OMC/OGH

[2]MS, MCh, Assistant Professor, Department of Plastic Surgery, OMC /OGH

[3]MCh First Year Post Graduate, Department of Plastic Surgery, OMC /OGH (Corresponding Author)

[4]Independent, Mathura, Uttar Pradesh

[5]MBBS

Abstract: ***Skin grafting is a widely used procedure in reconstructive surgery, with split - thickness skin grafts (STSG) being a common method for covering wounds. However, donor site morbidity, including pain, itching, delayed healing, and scarring, remains a concern. This study evaluates the effectiveness of hydrocolloid dressings in managing skin graft donor sites compared to conventional dressings. Conducted on 15 patients at Osmania Government Hospital, the study found that hydrocolloid dressings provided a moist environment, reducing healing time to an average of 6.3 days while minimizing pain and discomfort. Most patients (80%) healed without scarring or pigmentation, demonstrating the efficacy of hydrocolloid dressings in promoting faster and better - quality healing. Additionally, these dressings reduced dressing frequency, hospital stay, and associated costs, making them a practical and patient - friendly choice for managing donor site wounds in STSG procedures.***

Keywords: skin grafting, hydrocolloid dressing, donor site healing, wound management, patient comfort

1. Introduction

Skin grafting is a common surgical procedure in burns and plastic surgery. Split - thickness skin grafts (STSG) include both the epidermis and a portion of the dermis (Fahrenkopf MP, Dec 2019) ([1]). This procedure involves harvesting skin from one area to cover extensive raw areas, creating a donor site that typically heals within two weeks through epithelialization of epidermal elements and the dermis from wound edges. Donor sites are usually covered with Vaseline and gauze pad dressings, but many patients report pain, itching, discomfort, and scarring at the donor site rather than the recipient site. To address this morbidity, our study explores the use of hydrocolloid dressings.

Introduced in the 1960s, hydrocolloids are semisolid dressings made of carboxymethyl cellulose and a gelatinous mass. Initially designed for mouth ulcers, they later proved effective for mildly exudative wounds, including burns and pressure ulcers. These waterproof, occlusive dressings promote healing by maintaining a moist environment and can remain in place for up to five days. Popular brands include Granuloflex, Duoderm, Tegaderm, and Comfeel Plus (Thomas S., 2008) ([2]).

In reconstructive surgery, STSG is widely used for wound coverage but often results in donor site morbidity. Conventional dressings have been associated with increased scarring, delayed healing, and greater discomfort, including pain, itching, and wound soakage (Phipps and Lawrence, 1988) ([3]). Integrating hydrocolloid dressings in donor site management may offer a more effective solution by reducing healing time, improving outcomes, and minimizing complications.

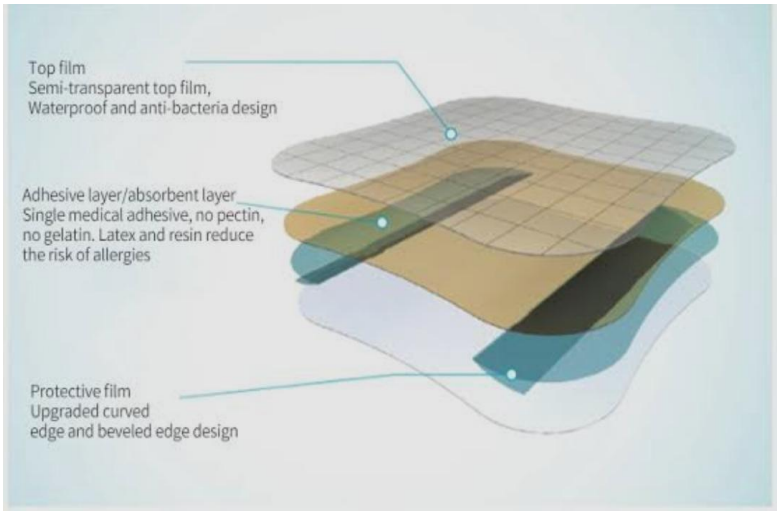

Figure 1: Hydrocolloid Sheet.
Source: Coloplast. us

Aim:
To study the effectiveness of hydrocolloid dressings for managing skin graft donor sites, while highlighting their potential benefits.

Objectives:
The study aims to analyse the necessity of dressings for each patient, assess their comfort or discomfort following the application of Hydrocolloid dressings, and evaluate the rate of wound healing along with the resulting scar status.

Patients and Methods:
This clinical trial involved 15 patients with donor site raw areas created for harvesting split - thickness skin grafts to cover primary defects such as microtia, trauma, and degloving injuries. The study was conducted at Osmania Government Hospital, Department of Plastic and Reconstructive Surgery. Skin grafts were harvested superficially, including the epidermis and part of the dermis, using a graft blade. The donor sites were primarily the anterior, anteromedial, or anterolateral thigh, depending on the requirement, with an average graft size of 10 cm × 7 cm.

After harvesting, the donor site was cleaned, and hydrocolloid sheets were applied. A minimal dressing was used to secure the sheet, as it is non - adhesive. Some brands offer adhesive edges that adhere to normal skin, eliminating the need for additional dressings.

Inclusion Criteria:
The study enrolled patients with various defects requiring split - thickness skin grafts, including microtia, burn wounds, physical trauma, and degloving injuries. Only patients who provided informed consent and had no co - morbidities that could interfere with the healing process were included in the study.

Exclusion Criteria:
The study excluded patients with co - morbidities that could hinder the healing process, such as diabetes and coagulation disorders. Additionally, patients who did not provide consent were also excluded.

2. Results

- A total of 15 patients were treated, including 13 males and 2 females (Table 1).
- The patients' ages ranged as follows: 2 in the 0–10 years group, 6 in 11–20 years, 5 in 21–30 years, 1 in 31–40 years, none in 41–50 years, and 1 in the 50+ group (Table 2).
- The patients healed in an average of 6.3 days, with a standard deviation of 1.3 days (Table 3).
- One - third (33%) of the sample group healed by the 5th day, nearly one - fourth (26.6%) by the 6th day, and one - fifth (20%) by the 7th day. Additionally, 2 out of 15 patients healed by the 8th day, while 7% of the group (1 patient) healed by the 9th day (Table 3) (Figure 2: A–F).
- **Sixty percent of the patients (9 out of 15) reported no pain, discomfort, or wound soakage. Five patients experienced itching between the 2nd and 5th day post - dressing, while only two reported mild pain. All discomfort resolved within seven days post - dressing (Table 3).**
- The one - week follow - up of all patients showed that 100% of the donor site raw areas were pink and healing, with dermal elements present (Table 4).
- One - month post - dressing, 80% of patients healed without scarring or pigmentation, while 20% developed hypertrophic scarring and hyperpigmentation. Only one patient exhibited mixed pigmentation, with 50% hyperpigmented and 50% hypopigmented skin (Table 5).

3. Discussion

Statistical analysis of the patient sample showed a mean recovery time of 6.3 days with a standard deviation of 1.3 days, aligning with the median recovery time of 6 days. These results are comparable to other clinical trials. Blitz et al., 1985 (4) conducted a comparative study between hydrocolloid dressings and saline gauze on 24 patients, reporting an average healing rate of 7.2 ± 1.1 days. Similarly, Madden MR et al., 1985 (5) studied 20 patients and found an average recovery time of 7.4 days for hydrocolloid dressings versus 12.6 days for fine mesh gauze. Champsaur et al., 1986 (6) observed a healing rate of 6.8 ± 1.1 days in a study comparing

hydrocolloid sheets to paraffin gauze on symmetrical donor sites. Additional studies by Doherty et al. (7) and Tan et al. (8) further support the superior healing efficacy of hydrocolloid dressings over conventional methods.

Hydrocolloid dressings promote wound healing by maintaining a moist environment, accelerating re - epithelialization compared to dry wounds (Winter et al., 1962, 1963 (9) (10)). Hinman et al., 1963 (11) demonstrated this effect on human skin wounds. While the exact cellular mechanisms remain complex, Takeuchi and Ito et al., 2020 (12) found that, in a controlled mice study, collagen III levels increased by day 7 in hydrocolloid - covered wounds, while similar increases occurred only after day 14 in gauze - covered wounds. Additionally, Vascular Endothelial Growth Factor (VEGF) localized in both the dermis and epidermis of hydrocolloid - treated wounds, whereas in gauze - treated wounds, VEGF was present only in the epidermis.

Patient comfort in this study was assessed based on pain, itching, and wound soakage. No patient reported wound soakage up to day 7, while 35% experienced itching between postoperative days 2–5, which resolved without intervention. Only two patients reported mild pain, both having larger donor site areas. The pain - relieving properties of hydrocolloid dressings remain unclear, but Friedman et al., 1984 (13) suggested that superior wound occlusion prevents nerve exposure, while moisture retention prevents drying, reducing superficial wound pain. Blitz et al. (4) also reported lower pain scores in hydrocolloid - treated patients compared to saline gauze.

One - month follow - up showed that only 3 out of 15 patients developed scarring and pigmentation. While two patients exhibited hyperpigmentation, one had mixed pigmentation. Three patients developed hypertrophic scars, notably the same subset with pigmentation. Similar results were observed by Srivastava S. et al., 2018 (14) and Shah VV et al., 2016 (15), where hydrocolloid gel occlusion was used to treat keloids and hypertrophic scars.

Takeuchi and Ito et al., 2020 (12) further demonstrated that hydrocolloid dressings promote macrophage polarization, shifting from M1 (pro - inflammatory) macrophages in early stages to M2 (anti - inflammatory) macrophages in later stages, which facilitate endothelial cell, keratinocyte, and fibroblast proliferation. This mechanism was also explained by Brancato SK et al., 2011 (16). Additionally, hydrocolloid dressings are impermeable to contaminants, supporting faster healing.

Beyond medical benefits, hydrocolloid dressings reduce workload for medical staff (Metzger S., 2004 (17)). Their transparency allows for daily wound inspection without disturbing the dressing, minimizing resource use. Doherty et al. (7) noted that reduced hospital stays offset the higher cost of hydrocolloid dressings, a trend similarly observed in this study, where patients had shorter hospital stays and lower medical expenses.

4. Conclusion

The Hydrocolloid dressings when used for the donor sites post - split skin grafting showed more comfort, less or no pain, less itch and faster healing rates in 6.3 days on an average with less scar tendency in follow up besides decreasing frequency of dressings, hence best for superficial wounds and less exudating wounds like donor sites of Split Thickness Skin Grafts.

References

Table 1: Gender spread across sample group

Gender	Number of patients
Male	13
Female	2

Table 2: Age range across sample group

Age Range	Number of patients
0 - 10	2
11 - 20	6
21 - 30	5
31 - 40	1
41 - 50	0
50+	1

Table 3: Patient Inquiry – Comfort, Healing Time, Hb% and Albumin levels:

Pseudonym	Age Range	Diagnosis	A) Site of Dressing B) No. of Sheets Used	Patient Complaint (Pain/Itch/Soakage)	No. of days for healing	Hb %	Albumin
PTOSMCD1	0 - 10	Microtia	Right Thigh 1Sheet	Itch from Day 3	6	11	3.8
PTOSMCD2	0 - 10	Microtia	Lt thigh, 1 sheet	No complaints	7	10.8	3.85
PTOSMCD3	11 - 20	Microtia	Rt thigh, 1sheet	No complaints	5	11.8	3.6
PTOSMCD4	11 - 20	Microtia	Rt thigh, 1sheet	No complaints	9	9.9	4
PTOSMCD5	11 - 20	PBC hand	Lt thigh, 1sheet	No pain, comfortable	5	11	3.97
PTOSMCD6	11 - 20	S/p SSG for PIRA	Rt thigh, 2sheets	Pain, itch from 5th day	6	9.5	3.55
PTOSMCD7	11 - 20	PTRA over abdomen	Rt thigh, 1sheet	No complaints	5	12.2	4.62
PTOSMCD8	11 - 20	Lt ear human bite s/p SSG	Lt thigh, 1sheet	No pain Itch from D2	5	13.4	4.56

PTOSMCD9	21 - 30	Degloving injury lt foot	Lt thigh, 1.5 sheet	Mild pain	8	14	4.2
PTOSMCD10	21 - 30	Microtia	Rt thigh, 1sheet	No pain, Itch from 4th day	8	15.2	4.24
PTOSMCD11	21 - 30	PTD rt leg	Rt thigh, 1.5 sheet	Itch from 3rd day	6	11.8	3.56
PTOSMCD12	21 - 30	PTRA rt hand	Rt thigh, 1sheet	No complaints	5	14.6	4.65
PTOSMCD13	21 - 30	Paraumbilical Flap with SSG for 15% electrical burns	Rt Hand 2 Sheets	No complaints	6	12	3
PTOSMCD14	31 - 40	PTD Left hand s/p PU flap	Lt thigh, 1sheet	No complaints	7	12.8	3.68
PTOSMCD15	50+	PTD rt IF	Rt thigh, Half sheet	No complaints	7	10	3

Table 4: Patient remarks after 1 week
Follow up after a week

Name of the patient	Wound status	Remarks
PTOSMCD1	Dermal elements+	Pink, healing
PTOSMCD2	Dermal elements+	Pink, healing
PTOSMCD3	Dermal elements+	Pink, healing
PTOSMCD4	Dermal elements+	Pink, healing
PTOSMCD5	Dermal elements+	Pink, healing
PTOSMCD6	Dermal elements+	Pink, healing
PTOSMCD7	Dermal elements+	Pink, healing
PTOSMCD8	Dermal elements+	Pink, healing
PTOSMCD9	Dermal elements+	Pink, healing
PTOSMCD10	Dermal elements+	Pink, healing
PTOSMCD11	Dermal elements+	Pink, healing
PTOSMCD12	Dermal elements+	Pink, healing
PTOSMCD13	Dermal elements+	Pink, healing
PTOSMCD14	Dermal elements+	Pink, healing
PTOSMCD15	Dermal Elements+	Pink, healing

Table 5: Patient remarks after 1 month:

PTOSMCD1	No scar	Healed
PTOSMCD2	Hyperpigmentation+ 60% area	Hypertrophic scar+ 5% area
PTOSMCD3	No scar	Healed
PTOSMCD4	No scar	Healed
PTOSMCD5	No scar	Healed
PTOSMCD6	No scar	Healed
PTOSMCD7	No scar	Healed
PTOSMCD8	No scar	Healed
PTOSMCD9	No scar	Healed
PTOSMCD10	Hypopigmentation - 50% Hyperpigmentation 50%	Scar+
PTOSMCD11	No scar	Healed
PTOSMCD12	No scar	Healed
PTOSMCD13	No Scar	Healed
PTOSMCD14	Hyperpigmentation - 30%	Hypertrophic scar+
PTOSMCD15	No scar	Healed

Patient References:

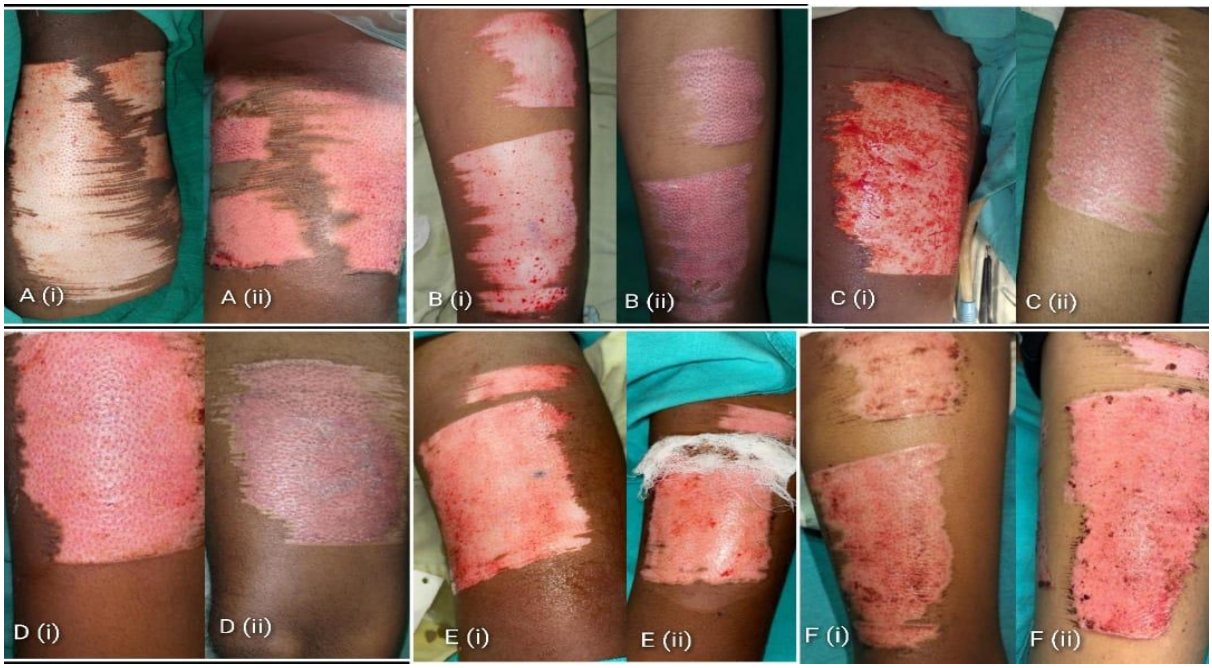

Figure 2: A – F Several cases with before and after hydrocolloid dressing.

References

[1] Fahrenkopf MP Study Guide from StatPearls Publishing, Treasure Island (FL), 20 Dec 2019
[2] Thomas S. Hydrocolloid dressings in the management of acute wounds: a review of the literature. Int Wound J 2008; 5: 602–613
[3] Phipps AR, Lawrence JC. Comparison of hydrocolloid dressings and medicated tulle - gras in the treatment of outpatient burns. In: Ryan TJ, editor. Beyond occlusion: wound care proceedings. London: Royal Society of Medicine, 1988: 121–6.
[4] Biltz H. Comparison of hydrocolloid dressing and saline gauze in the treatment of skin graft donor sites. In: R TJ, editor. An environment for healing: the role of occlusion. London: Royal Society of Medicine, 1985: 125–8.
[5] Madden MR, Finkelstein JL, HeftonJM, Yurt R. Optimal healing of donor site wounds with hydrocolloid dressings. In: R TJ, editor. An environment for healing: the role of occlusion. London: Royal Society of Medicine, 1985: 133–6.
[6] Champsaur A, Amamou R, Nefzi A, Marichy J. Use of Duoderm in the treatment of skin graft donor sites. Comparative study of Duoderm and tullegras. Ann Chir Plast Esthet 1986; 31: 273–
[7] Doherty C, Lynch G, Noble S. Granuflex hydrocolloid as a donor site dressing. Care Crit Ill 1986; 2: 193–4.
[8] Tan ST, Roberts RH, Blake GB. Comparing Duoderm E with scarlet red in the treatment of split skin graft donor sites. Br J Plast Surg 1993; 46: 79–81.
[9] Winter GD. Formation of the scab and the rate of epithelization of superficial wounds in the skin of the young domestic pig. *Nature*.1962; 193: 293–294.
[10] Winter GD, Scales JT. Effect of air drying and dressings on the surface of a wound. *Nature*.1963; 197: 91–92.
[11] Hinman CD, Maibach H. Effect of Air Exposure and Occlusion on Experimental Human Skin Wounds. *Nature*.1963; 200: 377–378.
[12] Tamaki Takeuchi, Morihiro Ito. Hydrocolloid dressing improves wound healing by increasing M2 macrophage polarization in mice with diabetes. Nagoya J. Med. Sci.82.487–498, 2020
[13] Friedman SJ, Su WP. Management of leg ulcers with hydrocolloid occlusive dressing. *Arch Dermatol*.1984; 120 (10): 1329–1336.
[14] Srivastava S, Patil A, Prakash C, Kumari H. Comparison of intralesional triamcinolone acetonide, 5 - fluorouracil, and their combination in treatment of keloids. *World J Plast Surg*.2018; 7 (2): 212 - 219.