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## Polyethylene Surgical Drape Dressing for Split Thickness Skin Graft Donor Areas

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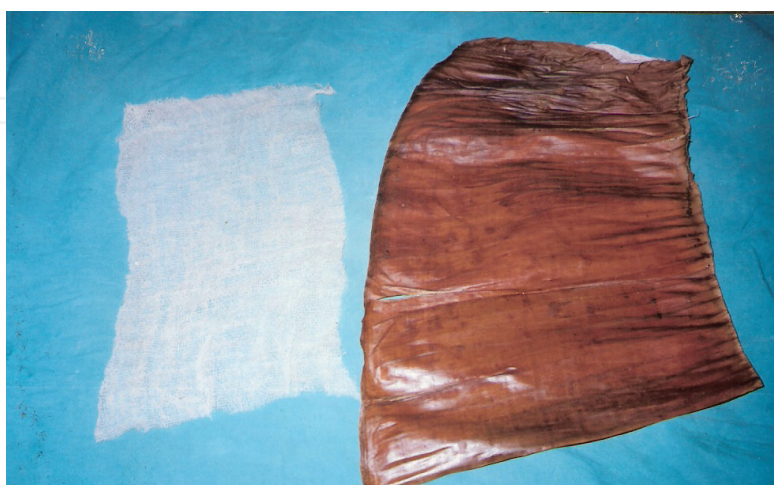
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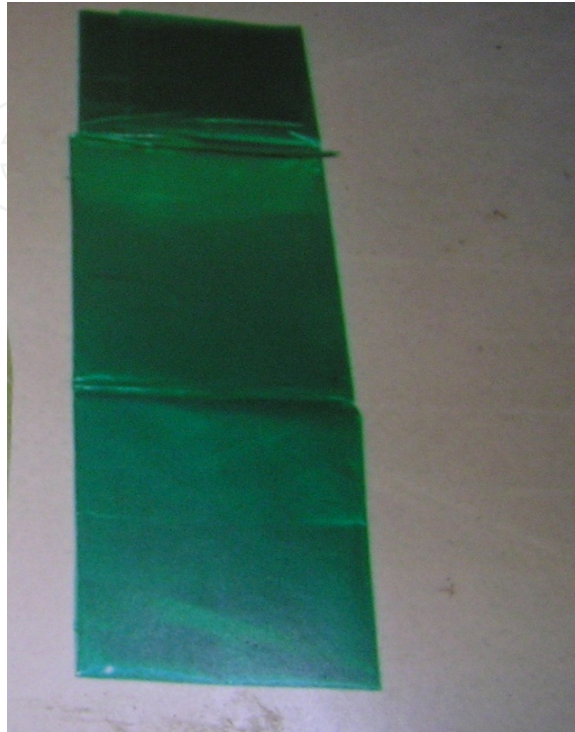
### 1. Introduction

A variety of dressings has been used for covering the split thickness skin graft donor areas. Some of these are alginates, collagen sheets, films and the most commonly used impregnated tulle gras dressing. The chief goal of management of donor area is to achieve early epithelisation without infection. Minimum pain, easy availability and low cost of dressing are other desirable criteria. A controlled clinical trial was conducted to compare Vaseline impregnated gauze and Banana leaf dressing (BLD) (Fig 1) developed at the burn unit at LTM medical college and hospital in 1997. [1] The results showed BLD to be effective with significantly less pain and at much lower cost.



**Figure 1.** Vaseline impregnated gauze and autoclaved banana leaf dressing

While BLD needs to be prepared, polyethylene surgical drape (PSD) (Fig 2) is readily available. Hence it was decided to compare the efficacy of PSD with already established BLD as dressing for skin graft donor areas.



**Figure 2.** Polyethylene surgical drape

## 2. Materials and methods

A prospective controlled study was conducted in fifty patients of either sex between 18 to 65 years of age undergoing split thickness skin grafting - STSG. The patients were blinded to the type of dressing applied on the donor area till the first dressing change. The study protocol was approved by the Institutional Ethics Committee prior to commencement of the study. Informed written consent was obtained from every patient prior to enrollment in the study.

## 3. Patient inclusion criteria

- Patients between 18 to 65 years of age
- Patients of either sex
- Patients undergoing STSG with thigh as donor area

- Surgery under general anaesthesia

#### **4. Patient exclusion criteria**

- Patients with diabetes or hypertension
- Pregnant females
- Patients in whom area other than thigh was used as donor site.
- Surgery under regional anaesthesia.

#### **5. Banana leaf dressing preparation**

Banana leaf dressing was prepared by cutting the midrib of the leaf and then pasting the leaf on a piece of bandage cloth with thin paste made by cooking fine flour. These dressings were then hung on clothes' drying stand for 24 hours for the paste to dry. The dressing was rolled; packed in paper bag and autoclaved and was then ready for use.

#### **6. Polyethylene surgical drape dressing**

A single sheet of ethylene oxide sterilised polyethylene surgical drape available at the hospital was used in this study. It was cut appropriately to match the size of the donor area.

#### **7. Trial protocol**

Split thickness skin grafts were harvested from one or both thighs using Humby's skin grafting handle fitted with number 12 skin grafting blade. Partial thickness of donor areas was judged by the appearance of punctate hemorrhages. Gauze pieces soaked in adrenaline: saline (1:300,000) solution were applied over the raw surface to achieve haemostasis over donor areas.

After ensuring haemostasis the upper half of donor area (Area A - control) was dressed with BLD while the lower half was dressed with PSD dressing (Area B - study) (Fig 3). Both the dressings were covered with gamjee pad rolls and then firmly bandaged.

All patients were blinded to the type of dressing applied over a given area as the dressing was applied while the patients were under of general anesthesia. The patient remained blinded till the first dressing change.





**Figure 3.** Application of BLD and PSD on donor area



**Figure 4.** Epithelisation under BLD and PSD

The dressing on donor area was opened on 7<sup>th</sup> post-harvest day, unless indicated earlier. Thereafter, the dressing was changed and area was inspected every day till complete epithelisation. (Fig 4)

## 8. The following observations were made

1. Age and sex of patient
2. Status of donor area epithelisation on seventh post-harvest day.
3. Evidence of donor area infection
4. Days needed for complete epithelisation
5. Background and dressing removal pain scores.

## 9. The following scores were evaluated

1. Background pain score : The patients were asked to award a score from 0 to 10 on visual analogue scale for each of the areas under the two different dressing materials on day 1 and day 3 post harvest (before they underwent first dressing change)
2. Dressing removal pain score : The patients were asked to award a score from 0 to 10 for each of the dressing materials while the dressing was being removed on 7<sup>th</sup> day post harvest and at subsequent dressing changes.

The data obtained; was analysed and subjected to test of statistical significance using paired 't' test.

## 10. Results

From Jan 2009 to July 2009, 50 patients undergoing STSG were included in this study. The patient population included significantly more number of females younger than 33 years of age. The average age of males and females in our study was 41.54 and 27.63 years, respectively. This difference was statistically highly significant ( $P=0.000$ ) (Table 1)

Age group in yrs	Sex				Total
	Male		Female		
18-33	11	42.3%	19	79.2%	30(60%)
34-49	5	19.2%	5	20.8%	10(20%)
50-65	10	38.5%	0	0%	10(20%)
Total	26	100%	24	100%	50(100%)

**Table 1.** Age and sex distribution of patients in both the groups

Average donor area covered under each dressing material was 177cm<sup>2</sup>

(Range : Minimum area – 156 sq cm; maximum area – 198 sq cm)

Complete epithelisation of donor area was seen in 37 patients (74%) on 7<sup>th</sup> post-harvest day in both study and control group. Out of the thirteen patients with incomplete epithelisation on 7<sup>th</sup> post-harvest day under both BLD & PSD; 11 donor areas under BLD and 12 donor areas under PSD dressing were completely epithelised on 9<sup>th</sup> post-harvest day. So, a total of 48 donor areas (96%) under BLD and 49 donor areas (98%) under PSD dressing epithelised completely by 9<sup>th</sup> post-harvest day. The remaining 3 donor areas showed complete epithelisation by day 11 post harvest. There was no evidence of infection of donor areas under both BLD and PSD dressing in this study (Table 2)

Post harvest days	Status of epithilisation	Groups of Areas	
		A (Control)	B(Study)
Day 7 post-harvest	Complete	37(74%)	37(74%)
	Incomplete	13(28%)	13(26%)
Day 9 post-harvest	Complete	48(96%)	49(98%)
	Incomplete	02(4%)	01(2%)
Infection		0	0

A : Group of areas under BLD B : Group of areas under PSD

**Table 2.** Status of epithalisation of donor areas on day 7 and day 9 post-harvest

The average time taken for complete epithelisation of donor area under BLD was 7.6 ± 1.087 days and it was 7.56 ± 0.993 days under PSD. This difference was not significant statistically (P=0.322) ( Table 3)

Time taken in days for complete epithelisation		Groups of Areas	
		A(Control)	B(Study)
Mean number of days taken	X ± SD	7.6 ± 1.087	7.56 ± 0.993
Range in days taken for complete epithelisation	Minimum	7	7
	Maximum	11	11

A : Group of areas under BLD B : Group of areas under PSD

**Table 3.** Time taken for complete epithelisation

The background pain scores under PSD dressing were significantly less than that under BLD on day 1 and day 3 post-harvest (day 1, P = 0.002 & day 3; p= 0.000). There was also

highly significant decrease in background pain scores on day 3 post -harvest under both BLD & PSD dressing. This mean decrease in background pain under BLD from day 1 to day 3 was 1.48 (p=0.000) while the same under PSD dressing was 1.64 (p=0.000). This difference in mean decrease was not statistically significant (Table 4)

Days post harvest	Background pain scores		Groups of Areas	
			A(Control)	B(Study)
Day 1	Range	Minimum	3	2
		Maximum	6	6
	Mean	(X ± SD)	4.82 ± 0.941	4.52 ± 1.035
Day 3	Range	Minimum	2	2
		Maximum	5	5
	Mean	(X ± SD)	3.34 ± 0.823*	2.88 ± 0.824**

Decrease in background pain score \* Group A (P = 0.000) \*\*Group B (P=0.000) Highly significant

**Table 4.** Background pain score on day 1 (d1) & day 3 (d3) post-harvest.

The dressing removal pain scores under PSD dressing were significantly less than that under BLD on both the days i.e. day 7 and day 9 post-harvest. There was a decrease in dressing removal pain scores on day 9 post-harvest under both BLD and PSD dressings. This mean decrease under PSD dressing was (0.583 ± 0.660) statistically significant while the same under BLD was ( 0.076 + 0.76) not statistically significant. The difference in mean decrease in pain scores in both the groups was 0.461 which though not significant (p=0.082) was close to significance (Table 5)

Days post harvest	Dressing Removal pain scores		Groups of Areas	
			A(Control)	B(Study)
Day 7	Range	Minimum	6	1
		Maximum	9	4
	Mean	(X ± SD)	8.42 + 0.731	2.34 ± 0.658*
Day 9	Range	Minimum	6	1
		Maximum	9	3
	Mean	(X ± SD)	8.384± 0.870	2.00 ± 0.408**

Difference in dressing removal pain scores in group (A & B) on day 7 \* (P=0.000) and day 9 \*\* ( P=0.000) Highly significant

**Table 5.** Dressing removal pain score on day 7 (d7) & day 9 (d9) post-harvest



The cost of 100cm<sup>2</sup> of BLD is 20 paise while that of 100cm<sup>2</sup> of PSD is 26.19 paise. Both these dressing materials are very cheap especially when compared to commercially available paraffin impregnated gauze dressing (Rupees 5.80 per 100cm<sup>2</sup>) and collagen dressing (Rupees 175 per 100cm<sup>2</sup>) ( Table 6) ( 1 Rupee = 100 paise, 1 \$ == 54 Rs)

Sr. no.	Material	Average cost in Rupees per 100 cm <sup>2</sup>
1	Collagen	175
2	Vaseline/ Paraffin Impregnated gauze	5.80
3	PSD	0.262
4	BLD	0.20

Rs 1 = 100 paise, \$ 1 = 54 Rs

**Table 6.** Cost comparison of donor site dressing materials

11. Discussion

Every year about 7-8 million people suffer from burn injury in India and approximately 0.2 million die. [2] At our burns unit in Mumbai, we treat about 600 patients with burns every year and this accounts for 1.5% of total hospital admissions. Our own data shows that the average per capita monthly income of the patients admitted in our unit is less than Rs. 200. This is true for majority of burns victims in India.[1]

Skin grafting is an integral component of burn management for achieving wound closure in full thickness burn wounds[3]. The need for early epithelisation of STSG donor area in burn patients cannot be overemphasized as donor sites may be limited and reharvesting may be needed to obtain wound closure.

The pain experienced by the patients in the postoperative period is more at the donor area than at the recipient site. It may make the patients reluctant to undergo further procedures. [4] Till date, there is no consensus regarding the optimal donor site dressing that would result in early healing with minimal or no pain at the donor area. [5],[6],[7] Petroleum Jelly impregnated gauze i.e. Vaseline gauze (VG) is the most commonly used dressing for STSG donor areas in majority of centers. But in a study conducted at our Burns unit in the past, we observed that this dressing was not completely non adherent and the pain experienced by the patients was significant.[1]

The ideal dressing for STSG donor area should be painless when applied, non- adherent, non – toxic, non – antigenic, cheap, easily available and should achieve epithelisation of the STSG donor areas as early as possible. Non- adhesive dressings are ideal for these areas as they are not only pain free but also minimize damage to the new epidermis during dressing removal thus aiding the process of healing. A study conducted in 1996-97 comparing BLD

with VG, proved that BLD is a more suitable dressing for STSG donor areas and also, the cheapest of all the available dressings.[1]

Polythelene surgical drape is made up of polythelene which is an artificial inert chemical compound impermeable to gases and water. It has a smooth surface which allows it to fall off when the outer dressing is removed. It is very commonly used at our center as an integral part of surgical draping before carrying out any surgical procedure. So it is easily available in the hospital as ethylene oxide sterilized, ready to use packs and is provided free of cost to the patients from the hospital supply. Commercially available polyethelne surgical drape costs 26.19 paise per 100cm<sup>2</sup>. (Rs 55 for sheet size 140 X 150 cm). So, we decided to evaluate the efficacy of PSD as STSG donor site dressing and compare it with BLD which is the most commonly used dressing material for STSG donor areas at our center.

The review of literature failed to reveal any reference about the use of PSD as a dressing material. However, various researchers have tried out many different materials in an effort to identify the most ideal STSG donor site dressing.

Persson K and Salemark L found that polyurethane film caused less pain and discomfort and was also the easiest to remove amongst paraffin gauze, polyurethane foam, polyethane film and polyurethane film. [8] Similar findings were observed by Weber RS et al in the trial comparing polyurethane foam dressing with a petroleum gauze dressing. [9] Lawrence J E and Blake GB compared scarlet red with calcium alginate as a dressing material for STSG donor sites [10] Misir liogly A et al have used honey for STSG donor sites [11] Yadav JK et al in their study compared topical phenytoin with conventional antibiotic impregnated tulle dressing (Sofratulle) and polyurethane membrane drape (Opsite) [12]. Santamaria AB et al have tried out hydrocolloid dressings [13] and P Halankar et al have tested collagen sheets in their study [14]. But none of these studies have been able to establish the superiority of one dressing over the other and question of ideal STSG donor site dressing remains unanswered.

Fifty patients of either sex and between 18 to 65 years of age undergoing STSG were included in our study. As the dressings were applied in the operating theatre while the patient was under general anaesthesia, the patient was blinded to the type of dressing till the first dressing change.

The study subjects included significantly higher number of young females. This corresponds with the generally higher incidence of burn injury in young females as compared to males.

Epithellisation was complete in 37 donor areas (74%) under BLD (control) as well as PSD(study) dressing on the seventh post-harvest day. In addition, 11 (22%) donor areas under BLD and 12 (24%) donor areas under PSD dressing epithelised completely on the ninth post -harvest day. So, ninety six percent donor areas (48) under BLD and 98%(49) donor areas under PSD dressing had healed completely by ninth post-harvest day. The average number of days required for complete epithelisation under BLD and PSD dressing were similar, that is  $7.6 \pm 1.087$  and  $7.57 \pm 0.993$  days, respectively. Gore reported significantly earlier healing with BLD as compared to VG dressing (8.67 days with BLD and 11.73 days with VG dressing) [1]. Horch RE and Stark GB found complete donor site healing within 7.5 days

with collagen dressing and 12.5 days with polyurethane film dressing [15]. In another Indian study by Yadav JK and Singhvi AM, mean time for complete healing of donor areas under topical phenytoin, opsite and tulle dressings was 6.2, 8.6 and 12.6 days, respectively [12]. Our study shows that PSD dressing is as effective as BLD as a STSG donor site dressing material in achieving complete epithelisation in shorter time period than tulle dressings and polyurethane film dressing.

The background pain score was significantly less for donor areas covered by PSD dressing than those covered by BLD. The mean background pain score decreased significantly on day 3 post-harvest (3.34 for BLD & 2.88 for PSD dressing) from day 1 post-harvest (4.82 for BLD and 4.52 for PSD dressing) for both BLD and PSD dressing.

Thirteen patients (26%) in both the groups required second dressing change on day 9 as their donor sites had not completely epithelised by day 7. The mean dressing removal pain score was significantly less (2.34 on day 7 and 2.00 on day 9 post-harvest) for PSD covered areas than those covered with BLD (8.42 on day 7 and 8.38 on day 9 post-harvest). The difference in dressing removal pain scores between the groups (A & B) was highly significant on day 7 ( $P=0.000$ ) as well as day 9 ( $P=0.000$ ). So PSD dressing covered donor areas had significantly less pain and discomfort as compared to BLD covered donor areas.

Gore had observed BLD offered better pain relief and led to earlier epithelisation as compared to VG dressing.<sup>1</sup> So, it is apparent that both PSD dressing and BLD are far superior to VG dressing in terms of STSG donor site pain as well as donor site healing. Hence, their use is recommended over VG for dressing of STSG donor areas.

Today the cost of banana leaf dressing is 20 paise per 100cm<sup>2</sup> (Rs 3.00 for dressing size 75 cms X 20 cms) and it is 26.19 paise per 100 cm<sup>2</sup> for PSD dressing (Rs 55.00 for sheet size 140 cms x 150 cms). So both these dressing materials are much cheaper than collagen dressing which is the most expensive with a cost of Rs. 175 per 100 cm<sup>2</sup> (Kollagen; company Eucare). Even the cheapest of vaseline / paraffin impregnated gauze dressing which is used in many other centers costs RS. 5.80 per 100cm<sup>2</sup> (Rs 58 for 10 sheets of 10 x 10 cm –Jelonet). Many burnt patients need use of large donor areas. So the actual cost of these expensive donor site dressings is prohibitive for majority of burn victims in India. Hence both BLD which is the cheapest and PSD dressing which is also very cheap, are effective and economical donor site dressing materials with shorter healing time and lesser pain.

There was no evidence of donor area infection under BLD as well as PSD dressing in our study. There were no local as well as systemic allergic reactions observed while using PSD. However, soakage of the secondary dressing was found in a significantly higher number of donor areas (32 i.e. 64%) covered by BLD than those covered by PSD dressing (21 i.e. 42%). This may be due to the fact that during preparation, rolling and autoclaving process, BLD develops a few cracks. These cracks allow the egress of exudate. This can be taken care by providing extra layers of gamjee pads. However, it did not warrant earlier dressing change.

Twenty one (42%) PSD covered donor areas showed soakage with seepage of yellowish exudate. This may be due to the fact that PSD is an artificial membrane which does not absorb wound exudates at all. This exudate then seeps under the dressing and also soaks the outer

layers. This can be tackled by making slits in PSD before it is applied so that, exudate can come out through these slits and get absorbed in the secondary dressing of gamjee pad.. Even though, PSD literally falls off the donor site once the outer supporting layer is removed during dressing change, there was not a single case of slippage of dressing in PSD covered donor areas.

## 12. Conclusions

1. Polyethelene surgical drape is as effective as Banana leaf dressing for STSG donor area dressing.
2. Polyethelene surgical drape caused less background pain as well as dressing change pain as compared to banana leaf dressing.
3. Polyethelene surgical drape though little more expensive than Banana leaf dressing, is cheaper than all the other conventional dressings.

Thus, polyethylene surgical drape is a non-adherent, non-allergic, non- antigenic, cheap, easily available, effective and acceptable alternative dressing for split thickness skin graft donor areas

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