Chapter 2

Evaluation of Skin Grafting Procedure in Burnt Patients

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Additional information is available at the end of the chapter

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1. Introduction

Skin grafting is integral to burn wound management and is the only way of providing permanent wound closure of full thickness burn and deep partial thickness burn that fails to heal within 3 weeks. With pre-existing burn wound, paucity of autograft donor site and compromised status of patient, successful autografting is the key to patient survival. With periodic change in the team of surgical trainees working in the burn unit, it was considered necessary to develop a protocol for the skin grafting procedure. Implementation of this protocol was expected to yield uniform outcome despite change in the operating team. Validation of this protocol was considered necessary to evaluate its efficacy. This study was carried out over a period of 22 months from 1st July 2003 to 31st April 2005.

2. Aims & objectives

1. To evaluate the efficacy of the protocol for skin grafting procedure, primary end point being percentage graft take on 8th post grafting day.
2. To assess the difference in efficacy of procedure in relation to time of surgery.
3. To evaluate the need for blood transfusion during the grafting procedure.

3. Materials and methods

The patients with burn injury subjected to Split Skin Grafting over 22 months from 1st July 2003 to 31st April 2005 were studied prospectively. Specially prepared proforma was used for data collection.

The patients were categorized in three groups

Group 1: Early Excision and Grafting: Patients were stabilized and tangential excision of burn wound was done within 2nd to 5th post burn day.

Group 2: Delayed Excision and Grafting: Burn wound was excised and grafted between 10-14 th post burn day.

Group 3: Grafting on Granulating Wounds: Grafting on granulating wound after eschar separation.

The skin grafting procedure was undertaken if the following criteria were satisfied

Afebrile for at least 24 hours

Hemoglobin >8 gm/dl

Serum albumin >2.5gm/dl

No streptococcal growth on wound culture

Procedure Protocol:

- Maximum of 15 to 20 % total body surface area was grafted at one procedure
- Excision of wound or eschar or hypergranulating tissue upto healthy tissue with punctuate bleeding using Humby's knife handle after infiltration of adrenaline:saline 1:300000 solution.
- Hemostasis with saline + adrenaline soaked pads and compression.
- Simultaneous harvesting of split thickness skin grafts from suitable donor site with second Humby's knife and expansion of graft.
- Sprinkling of chloramphenicol powder on recipient area using spoon or salt pepper dispenser. (Fig 1 A and B)
- Application of skin grafts on recipient site.
- Pressing of skin graft with saline soaked gauze.
- Removal of all blood clots from skin grafts on recipient area.
- Covering the grafts with Vaseline and chlorhexidine impregnated tulle grass.
- Cover with single layer of saline soaked gauze.
- Wrapping of gamjee roll.
- Firm bandaging and application of plaster of paris splint for immobilization of part if extremity or neck is involved.
- Donor site dressed with autoclaved banana leaf dressing, gamjee roll and firm bandaging.
- First change of recipient site dressing at 48 hours, variable schedule later. Donor site dressing change on 8th post op day.

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The data was analyzed at the end of study period.

Figure 1. Showing Wound bed preparation. A : Burn wound before early excision; B: Sprinkling of Chloramphenicol powder after adequate excision of burn wound

4. Results

This study included 214 patients subjected to skin grafting procedure. Majority of the patients were adult females (76.2%). Adult males were 15.9% while children comprised 7.9% of the patients. The ratio of females : males : children was 9.6 : 2: 1. Total extent of burn ranged from 5-70% TBSA. (Table 1)

Patient group	No. of patients (%)	Burn size range/ Average extent %TBSA	No. of procedures
Pediatric(male+ female)	17 (7.9%)	5-28% (13%)	17 (6.7%)
Adult male	34 (15.9%)	6-70% (28%)	42 (16.5%)
Adult female	163 (76.2%)	10-70% (40%)	196 (76.8%)
Total	214		255

TBSA – Total Body Surface Area

Table 1. Showing distribution of patients, burn extent and procedures

A total of 255 skin grafting procedures were performed in these 214 patients divided in three groups; early excision and grafting, delayed excision and grafting, grafting on granulating wounds. (Table 2)

Type of procedure	Number of procedures	Number of patients
Early excision & grafting	14 (5.5%)	11 (5.1%)
Delayed excision & grafting	142 (55.7%)	106 (49.5%)
Grafting on granulating wound	99 (38.8%)	97 (45.3%)
Total	255	214

Table 2. Showing distribution of patients and procedures

Deep partial thickness and full thickness burn wounds ranging from 4-30% TBSA were grafted during either a single or more number of procedures.

Early Excision and Grafting: 14 procedures were done in 11 patients with the first procedure within 72 hours of burn injury. 3 patients required the procedure twice due to the extent of burn wound.

Delayed Excision and Grafting: 142 procedures were done in 106 patients more than 10 days after receiving the burn injury. Single procedure was done in 70 patients. 36 patients required the procedure twice due to either partial graft rejection or extensive total burn surface area. In this group 2 patients expired due to systemic sepsis.

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Grafting of Granulating Wounds: Granulating wounds of 97 patients required 99 procedures of skin grafting more than 3 weeks after the burn injury. 2 patients required the procedure twice. (Table: 3)

Average graft take in this series was 85% and average requirement of blood transfusion was 2.1 units per procedure.

Donor area infection was found in only 1 patient in delayed excision and grafting group. Duration of donor area epithelization was 9-12 days with an average of 10 days

5. Discussion

In this study, 255 skin grafting procedures performed on 214 burnt patients were analysed and evaluated. Majority of the patients were females (76.2%) with average burn extent (40% TBSA) larger than males (28% TBSA) (Table 1) This has been the consistent observation at our burn unit.

Skin grafting is an integral part of burn wound management and is the only way of providing permanent skin closure for full thickness and deep partial thickness burn wounds. Closure of burn wound has been described at various stages of healing- early excision & grafting, delayed excision & grafting and grafting on granulating wounds after spontaneous separation of eschar.

'Early closure' of burn wounds by excising the burned tissues and promptly covering it with skin-grafts or its substitutes within first 'five' post-burns day is the standard of care today. [1,2] and should ideally be offered to all minor burns and for the major burns who are admitted to a well-equipped burns centre.[3] In addition to improvement in the prognosis, early excision and grafting procedures have been shown to decrease the duration of hospitalization, incidence of metabolic complications, blood transfusion requirements, burn wound contamination, post burn contractures and cost of burn treatment.[4,5,6,7] But large number of patients with large extent of burn and paucity of trained surgeons are the chief factors that make it difficult for us to perform early excisions routinely at our burn unit. In the present study only 11 (5.1%) patients were subjected to early excision and grafting contributing to 14 (5.5%) procedures out of 255.(Table 2)

Burn-wound excision and closure beyond 6 days to 11th or 12th day post-burn still offers "primary intention healing" of the burn-wounds.[2] Our experience indicates that delayed excision & grafting is a feasible and suitable option for patients at our unit with the constraints that we face. We prefer to do it 10 th postburn day onwards. This allows healing of most of the superficial partial thickness burns, thus effectively reducing the total extent of burn. The eschar is well formed and hence is technically easier to excise (Fig 2 A and B). In this series majority of patients i.e. 106(49.5%) were subjected to 142 (55.7%) delayed excision and skin grafting procedures.

Figure 2. Delayed excision and skin grafting. A: Dry eschar on full thickness burn wound before excision; B: Graft take on 8 th day after excision and grafting

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The patients who were unsuitable for both of the above options most often due to infectious complications, were the candidates for grafting after spontaneous separation of eschar and granulation of wound. In this group 99(38.8%) procedures were performed in 97 (45.3%) patients. (Table 2)

The surgical trainees are posted in the burns unit by rotation. With this changing team, having a defined protocol for skin grafting procedure was considered appropriate.

The chief thought was to keep the protocol simple and cheap.

We decided to accept Haemoglobin level of 8 gm% or more for conducting the procedure and found no reason to regret the decision. Agarwal et al [8] have reported similar observations.

All patients were receiving enteral nutritional supplement and we accepted serum albumin level of 2.5 gms% or more. Mogazy et al have reported better correlation between serum pre-albumin levels and graft take in burnt patients[9]. But we have no experience about this.

Several methods like use of fibrin glue to negative pressure device have been described for fixing the graft to the wound bed. In the experience of the first author, Choramphenicol powder acts like a glue as it becomes sticky on contact with recipient site. This helps in fixation of the grafts without use of sutures or staples and helps cut the time and the cost of the procedure without compromising the graft take. Immobilization of the patient in the bed is ensured for atleast first 48 hours post grafting.

Vaseline and Chlorhexidine impregnated tulle gras –readily available in the institution was used as the first layer to cover the skin grafts according to the protocol. Though the literature describes use of Xeroform[10], Acticoat[11], these materials are expensive and difficult to procure for our patient population. No reports of controlled trials are available for comparison.

One of the key factors for the success of skin grafting procedure is removal of dead tissue and adequate preparation of recipient area. The adequacy of excision and harvesting of skin grafts was demonstrated, assisted and/or supervised by the senior surgeons in the team for each procedure.

The average take of skin graft was 95% (range 85-100%) in early excision and grafting group. It was 85% (range 60-90%) in delayed excision and grafting group and was 90% (range 65-100%) when grafting of granulating wounds was performed.(Table3) The average graft take was 85% in all the procedures performed. Literature search did not reveal much information to compare our observations. But with average 85% graft take, our protocol for skin grafting procedure can be considered effective.

The requirement for transfusion of packed red blood cells during surgery or within 2 days post-procedure was the lowest (1.2 unit, range 0-3 units) in early excision and grafting group. It was the highest (2.9 units, range 0-5 units) when granulating wounds were grafted and the delayed excision and grafting group required average 2.4 units (range 1-4 units). (Table 3)

	Early Excision & Grafting	Delayed Excision & Grafting	Grafting of Granulating Wound
No. of procedures	14	142	99
No. of patients	11	106	97
Grafted burn size	4-23% TBSA	7-30% TBSA	3-17% TBSA
Transfusion requirement in units/ procedure (average in units)	0-3 (1.1)	1-4 (2.4)	0-5 (2.9)
Graft take % (average %)	85-100 (95%)	60-90 (85%)	65-100 (90%)

TBSA : Total Body Surface Area

Table 3. Showing procedures, graft take and transfusion requirement

Two patients in the delayed excision and grafting group died within 8 days of the procedure due to multi-organ failure due to systemic sepsis.

The donor area healing was satisfactory under banana leaf dressing. This dressing has been developed and evaluated at the burn unit earlier[12].

6. Conclusions

The results of our study suggest that

1. Our protocol for skin grafting procedure is effective with average graft take of 85% with application of the protocol.
2. Early excision and skin grafting was the most successful procedure with 95% graft take.
3. Early excision and skin grafting group had the least transfusion requirement amongst the three groups.

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