

Meek Micro-grafting Technique in Reduction of Mortality and Hospital Stay in Patients With Extensive Burns in a Resource Constrained Setting

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Abstract: Burns contributes to significant mortality. Among reasons for high mortality is inadequate burn wound management especially in patients with extensive burns and limited donor sites. Majority of the resource constrained countries do not have allografts or tissue cultures that would enable prompt and easy coverages of such wounds. Skin graft Harvesting techniques such as the Meek micrografts are considered expensive and are thus not available. Patients with extensive burn wounds in many resource constrained countries as a result of this do have poor outcomes with high mortality and prolonged hospital stay. This was a prospective study on patients with extensive burns operated on with the Meek micro-grafting technique in a tertiary teaching Hospital in Kenya. Variables analysed included, total burn surface area, sessions of skin grafts, length of Hospital stay, donor site morbidity and mortality. Twenty five patients with extensive burn wounds were managed with the micro grafting technique over the last three years. The mean total burn surface area for the patients was 46.7 percent with the range of 24 to 72 percent. Five patients died while undergoing treatment giving a mortality rate of 20 percent compared to a mortality rate of 35 percent reported in our centre for patients with the similar burn surface area operated on with the mesh technique. The mean length of Hospital stay was 73.92 days compared to a Hospital stay length of 97.4 days previously reported prior to this technique. The mean donor site surface area was 15.8%. The average length of time the donor site wounds healed was 16.7 days. Three patients had wound sepsis at the donor site that healed after dressing with silver based dressing materials. Meek micro grafting technique allows for extensive coverage of burn wounds with a relatively small donor site. The technique is associated with reduced donor site morbidity, mortality and length of Hospital stay. This technique should be encouraged in many burn centers in developing countries where there are patients with extensive burn wounds.

Keywords: Meek Micro-grafting, Length of Hospital Stay, Mortality

1. Introduction

Burns in many resource constrained countries are associated with high mortality [1-3]. Among contributors to high mortality is inappropriate wound management [1, 2]. Wounds requiring grafting have traditionally been managed by the humby knife or the electric dermatome and then expanded by meshing. Though good in managing small wounds the humby knife is difficult to use in extensive wounds. The electric dermatome is limited by the extend the

skin could be expanded with the recommended maximum level of 1 to 4; further expansion results in spaghetti like appearance of the skin that is difficult to fix at the recipient site. The true expansion of the meshed skin has been shown to be less than the purported expansion ratio making it difficult to use meshed skin to cover large burnt surface areas [4-6]. Meek micro-grafting technique allows for the skin to be expanded to a ratio of up to 1 to 9 [6]. The micro graft skin is

applied to the recipient site evenly and hence allowing for a bigger coverage of the recipient site. It has also been shown to have a better graft take rate.

2. Materials and Methods

This was a prospective study of patients operated on with Meekmicro-grafting technique between April 2015 and April 2018 at the Kenyatta National Hospital, a tertiary teaching hospital in Kenya. Ethical approval was sort from the local ethical and research committee. Patients admitted with deep burn wounds of more than 20 percent managed with Meek micro-graftingtechnique were followed up during the study. Variables identified were the Burn body surface area (TBSA), length of hospital stay, number of skin grafts sessions, donor site surface area, duration taken for the donor site to heal, morbidities and mortalities. All the information captured weresummarised and analysed.

Surgical Technique: All Patients had pre-anaesthetic review a day prior to surgery and assessed for suitability of surgery. Prophylactic antibiotic with cefuroxime was given to all patients at the time of induction. The recipient and the donor sites were cleaned withdilute povidoneiodine solution. Both recipient and donor sites were then draped. Tangential excision of the eschar tissue was done using a humby knife until all the dead tissues were removed. The donor site was theninfiltrated with adrenaline saline 1in 500000 until tumescence was achieved. A battery driven dermatome was then utilised to harvest two inch wide skin of depth 10 to 12 /1000 inch. [figure 1]



Figure 1. Two inch wide skin harvested by an elecetric dermatome.

The harvested skin was cut into cubicles and meshed using the Meek technique into small cubicles at the expansion ratio of 1:4, 1:6 or 1:9 depending on the extent of the burns wounds [figure 2]

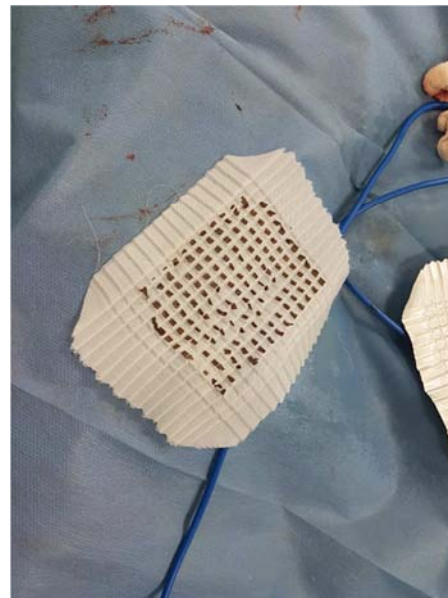


Figure 2. Harvested skin meshed into cubicles using the Meek technique.

The skin was secured at the recipient site with staples and dressed with Vaseline gauze, gauze and crepe bandages. Donor site was dressed with Aquacel Ag+. Dressing changes were done on the fifth post-operative day.



Figure 3. Micrografts at the recipient site on the 5th Post operative day during change of dressing.

The polyamide gauze was removed on the tenth post-operative day and wounds redressed with Vaseline gauze.



Figure 4. Change of dressing on the 10th Post operative day, note good graft take.

This was repeated until the graft fully took and the wounds were fully healed [figure A5].



Figure 5. wounds fully healed with graft fully taken.

The donor and recipient surface areas were approximated by using the Lund and Browder chart. The duration taken for the donor site wound to heal was noted together with the

overall duration of Hospital stay. Donor site complications including wound sepsis were also noted.

3. Results

Twenty five patients with burn wounds of more than 20 percent TBSA had skin grafts done with the Meek micro-grafting technique between April 2015 and April 2018. The male female ratio for the patients was 3:2. The mean age for the patients was 42.8 years with the age range of 12 to 74 years. Open flame burns accounted for 52 percent of the patients followed by scalded burns 40 per cent. Chemical burns accounted for eight percent of the patients. The average number of skin grafting session per patient was 3.33 days. The mean donor site surface area was 10.8% of the total body surface. The average duration for the donor site wounds to heal was 16.8 days. The average length of Hospital stay was 62.9 days with a range of 14 to 150 days. Three patients (12%) had donor site sepsis.

Table 1. The Demographics and results of the patients operated on.

Patient No	Age(yrs)	sex	TBSA	sessions of grafts	Donor site%	Donor healing time(days)	Hospital stay (days)
1	62	f	35	2	8	14	54
2	35	M	45	3	10	17	39 **
3	14	m	24	2	16	20	85
4	27	M	35	3	7	14	49
5	40	M	75	5	15	23	45 **
6	34	M	65	4	16	14	55
7	27	m	43	3	8	23	80
8	27	m	29	2	9	20	52
9	26	m	66	4	6	26	147
10	57	f	70	5	12	14	34**
11	56	m	29	3	10	17	155
12	30	m	40	2	8	17	97
13	36	f	47	3	7	20	94
14	17	f	55	2	9	20	77**
15	23	f	42	3	14	23	81
16	47	f	65	1	10-	-	74
17	52	m	52	3	15	20	57
18	46	M	33	1	10	23	50
19	33	f	35	2	10	26	55
20	36	m	40	2	13	23	54
21	42	m	42	2	15	20	62**
22	45	M	45	3	12	17	76
23	25	m	73	4	18	20	170
24	15	f	33	1	6	14	41
25	14	m	40	2	7	17	65
Total	48.8 yrs		46.7	2.32	10.8	16.3	73.92.

** Patients with asterisks (**) in the final column died while undergoing treatment.

4. Discussions



Figure 6. Patient with BSA of 65 percent after 3 months of therapy with micrografting. Note wounds almost fully healed.



Figure 7. Patient with Burns involvings both upper and lower limbs and trunk, TBSA 72 percent, responding well after 3 sessions of Meek micro grafting.

The mortality rate of burn patients in many resource constrained countries is high. Few patients with TBSA of more than 50 percent survive [1-3]. Poor or inadequate management of the burn wounds is one of the main contributors to high mortality rates in resource constrained settings. Burn wounds need to be closed within two weeks of the injury [7]. This could be achieved by early excision and grafting of the wounds [7, 8]. Failure to have wounds covered early predisposes to burn wound sepsis that could lead to septicemia with demise of the patients. Patients with extensive burn wound provide a challenge to have their wounds adequately and promptly covered. Most of these patients may have a limited donor site that may not be available for grafting. Skin cultures, substitutes and allograft have been shown to be of immense benefits in managing such patients [9]. These strategies are however not available in many resource constrained Countries.

Meek micro-grafting technique as demonstrated in this study allows for a small donor site to cover extensive area. The skin could be meshed to large ratio of up to 1 to 9 allowing for coverage of a large burned surface [4]. The

average donor site for our patients was 10.8% with a mean TBSA of 44 percent. With this technique we were able to save patients with TBSA of more than 70 percent; a rare occurrence in our unit (Figure 6, 7)

The mean number of graft sessions in our study was 2.22 implying an average of 20 percent wound coverage in every session. Quinterro in their review of Meek micro-graft found patients managed with the Meek technique to have almost half the number of surgeries compared to the patients who were managed with mesh (10 versus 19, 2) [10]. The mean duration of Hospital stay in their review was 51 days for Meek compared to 120 days for the conventional meshed technique [11]. In our series the mean duration for our patient was 73 days much lower than the previous mean of 97 days for patients who were managed by the conventional technique [1, 2]. Another study by Rode on the usage of Meek micro-grafting among paediatric patients reported a mean Hospital stay of 75.5 days [11]. They reported a graft take rate of more than 90 percent in majority of the patients at one month of follow up.

The mortality rate in our series was 20%. This was a remarkable improvement compared to the previously reported mortalities in our unit. Mogire in his dissertation had reported a mortality rate of 47 percent of all burnt patients admitted in the burns unit. Majority of the deaths occurred between the 3rd to the 28th day post admission. Mureithi in a more recent study reported a mortality of 36% of all the admissions [1] while Mugambi had a mortality of about 40%. Ndungu in his dissertation found a mortality rate of about 45% [1]. Rode *et al* reported a reduction in mortality with the use of Meek micro-grafting achieving a lethal dose of 50 percent for total burn surface area of 70%.

The disadvantages of the Meek micro-graft technique however is the dotted appearance of the recipient site (Figure 5). This however seems to improve as noticed in majority of the patients who had a relatively good colour match after about six months of follow up (Figure 6). The other disadvantage is the labour intensity in harvesting, meshing, facilitating and fixing of the skin.

5. Conclusion

Meek micro-grafting technique allows for skin graft to be harvested from a small donor area and expanded so as to cover a large recipient area. The technique is associated with reduced donor site morbidity, mortality, length of Hospital stay and skin graft sessions. It however has a long learning curve and is more labour intensive compared to the mesh technique. It should be encouraged in many developing countries where there is a large number of patients with burn disease.

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