

Expansion technique for skin grafts (Meek technique) in the treatment of severely burned patients

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Abstract

The important limiting factor in the treatment of the severely burned patient is the lack of autograft donor skin. The method of obtaining uniform widely expanded postage stamp autografts described by Meek in 1963 has been evaluated in this study amongst seven severely burned patients. The expansion ratio of 1:4, 1:6, 1:9 was mostly used. After the removal of polyamide gauze on seventh post-operative day the autografts island were covered with overlay allograft, if the expansion ratio of 1:6 and above was used. The mean epithelialization rate was 90% within 4–5 weeks. The preliminary experience suggests, and proves that, it is a method of choice in severely burned patients. © 2001 Elsevier Science Ltd and ISBI. All rights reserved.

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1. Introduction

Extensive full thickness burns pose a great challenge to the burn surgeon. In the past these patients died early because of a lack of full understanding of the management of shock. With improved knowledge of fluid and electrolyte balance and burn pathophysiology, death of severely burned patients during the early phase of treatment is now a rarity. However, improved survival of patients with extensive burn injuries demands an early excision of necrotic skin, failing which they may develop fatal septicaemia [1,2]. Lack of autograft donor sites is an important limiting factor in achieving wound closure [3,4]. To overcome this problem various methods of treatment have been suggested in the past, such as postage stamp grafting [5] mesh grafting [6] intermingled auto- and homograft transplantation [7,8] alternating strips of auto- and homograft transplantation [9] microskin grafting [10] and the Meek technique [11,12].

Meek in 1963 [12] described a technique of widely expanded postage stamp autografts in which pre-folded gauzes were used to achieve a regular distribution of

autograft island cut with a Meek–Wall dermatome [11]. However, with the introduction of mesh skin graft in 1964 by Tanner [6], the Meek technique was forgotten.

A modified Meek technique introduced by Kreis and his colleagues [13] was introduced to our unit 2 years ago. The apparatus was modified by the first author of this manuscript from air driven to hand driven in conjunction with Humeca B.V., The Netherlands and since then the Meek technique has been used in the treatment of extensively burned patients. The purpose of modification was to avoid cumbersome tubing, foot pedals and air pressure controls. In this paper our preliminary clinical experience with the modified Meek technique is described, in a series of seven severely burned patients.

2. Patients and methods

This study was carried out at the Al-Babtain Centre for Burn and Plastic Surgery Unit from March 1998 to April 1999. Seventeen early skin grafting operations using the modified Meek technique were performed on seven patients.

The mean age of the patients was 24 years (range 13–42 years). The mean percentage body surface

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Table 1

S. no.	Age	Sex	% TBSA burned	Inhalation injury	Outcome
1	13	M	85	No	Survived
2	15	F	73	No	Survived
3	20	F	80	Yes	Died
4	23	F	79	No	Survived
5	24	M	67	No	Survived
6	31	M	50	No	Survived
7	42	F	85	Yes	Died

burned was 74% (range 50–85%) and the full thickness injury was 56% (range 33–78%) (Table 1). Flame was the cause of burns in all the patients. Two patients had inhalation injury and were intubated on admission. All the patients were resuscitated with the Parkland formula. Burn wounds were dressed with Flamazine (1% silver sulphadiazine). Patients were operated upon at the third post-burn day when they had been stabilized with fluids and electrolytes. At each operating session 15–20% of full thickness burn was excised and the Meek technique was employed to close the wounds. The first dressing was changed after 48 h and subsequent dressings were done on alternate days until the seventh day. The graft take was assessed on the seventh day after removal of the polyamide gauze. Glycerol preserved homografts (Eurosken Bank) were used to cover the postage stamp autografts only when 1:6 expansion was used, while for 1:4 expansion no homograft overlay was used.

3. Operative technique

Two teams of surgeons worked simultaneously. One team excised the eschar while the other harvested the graft and prepared the micrografts. The wounds were excised down to the healthy surface and hemostasis was secured (Fig. 1). The harvested autograft skin was placed on 42×42 mm dampened cork with dermis side down and trimmed to its size and then placed on the carrier block and passed through a modified hand operated dermatome which contains 13 parallel blades, spaced 3 mm apart (Fig. 2). These blades cut the graft but not the cork. After the first pass, the cork plate is removed and rotated to 90° , reclamped and passed through the dermatome once more thus cutting the graft in to 14×14 small square islands measuring 3×3 mm.

The cork, with cut graft in place, is removed. The epidermal side of the graft was then uniformly sprayed with an adhesive dressing spray (Leukospray, Beiersdorf GmbH, Germany). After about 2 min the sticky surface of the graft was brought in contact with the pre-folded (pleated) gauze, and the pleats were pulled out on all the four sides to provide uniform expansion of the islands with ratios varying from 1:3 to 1:9 (Fig. 3). The aluminum foil was then removed and the expanded autografts were adherent to the polyamide gauze, ready for transplantation to the burn excised surface. The polyamide gauze is secured with clips (Fig. 4). The excess polyamide gauze



Fig. 1. Excision of full thickness burn of the whole lower extremity.

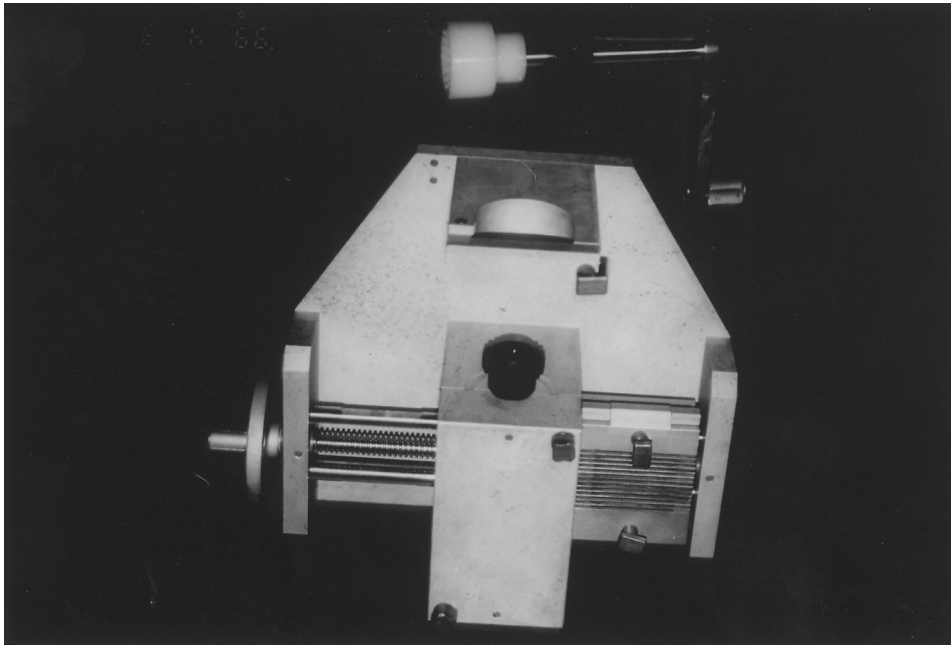


Fig. 2. Modified hand operated Meek dermatome (LARIS modification).

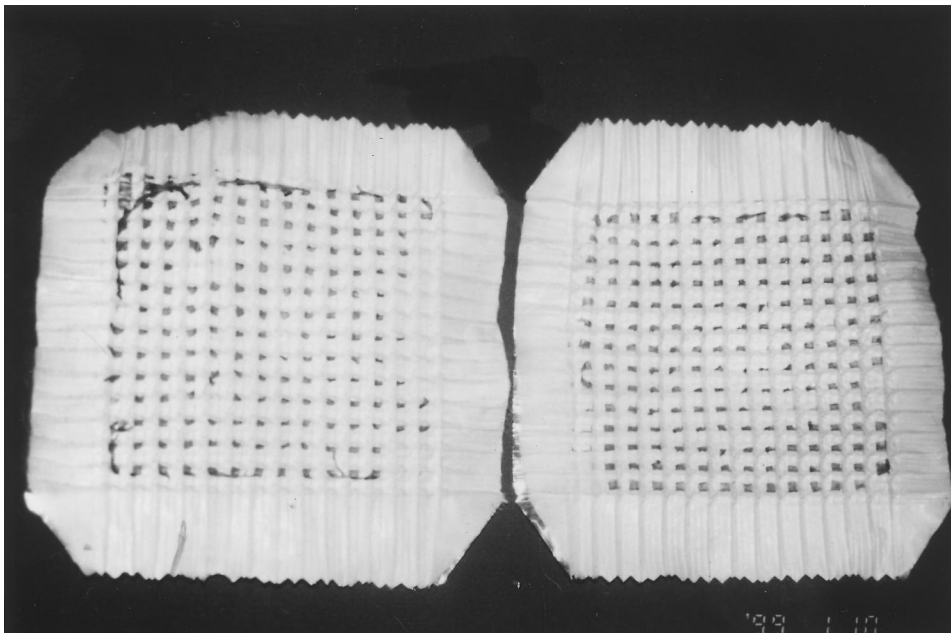


Fig. 3. Expanded pre-folded gauze with attached autograft islands.

was then removed, and dry compressive dressings applied.

The first dressing was changed after 48 h of operation and the autograft island could be seen through the polyamide gauze sticking to the wound surface (Fig. 5). After 7 days the polyamide gauzes were removed easily. The autograft islands were only covered with meshed overlay allograft if the expansion ratio of 1:6 or more was used.

4. Results

The mean area graft per procedure was 16.4% (range 15–20%). On the seventh post-surgery day an average of 90% of the grafts were in place. The remaining 10% of the micrografts had either been detached or deformed during the procedure. Two patients died on the eighth day and the eleventh day post-burn from respiratory failure due to severe inhalation injury. Both the

patients were operated on once and an average of 15% area was excised. Of the survivors one patient with 1:6 expansion covered with overlay allograft had MRSA infection resulting in 20% loss of the graft, despite being treated prophylactically with parenteral vancomycin. The mean rate of epithelialization was 90% at the end of the fourth week (Fig. 6). The remaining small areas between the grafts were dressed with Bac-troban (Mupirocin 1%) and hydrocortisone 1% oint-

ment. The organisms cultured from the wounds were methicillin resistant *Staphylococcus aureus* (MRSA), methicillin sensitive *Staphylococcal aureus* (MSSA), *Pseudomonas aeruginosa*, *Acinetobacter* and *Enterococcus*. Antibiotics were administered to patients according to culture and sensitivity reports. One patient had MRSA and did not respond to vancomycin therapy alone, but required rifampicin (600 mg i.v./day) as adjunct therapy, for 5 days.

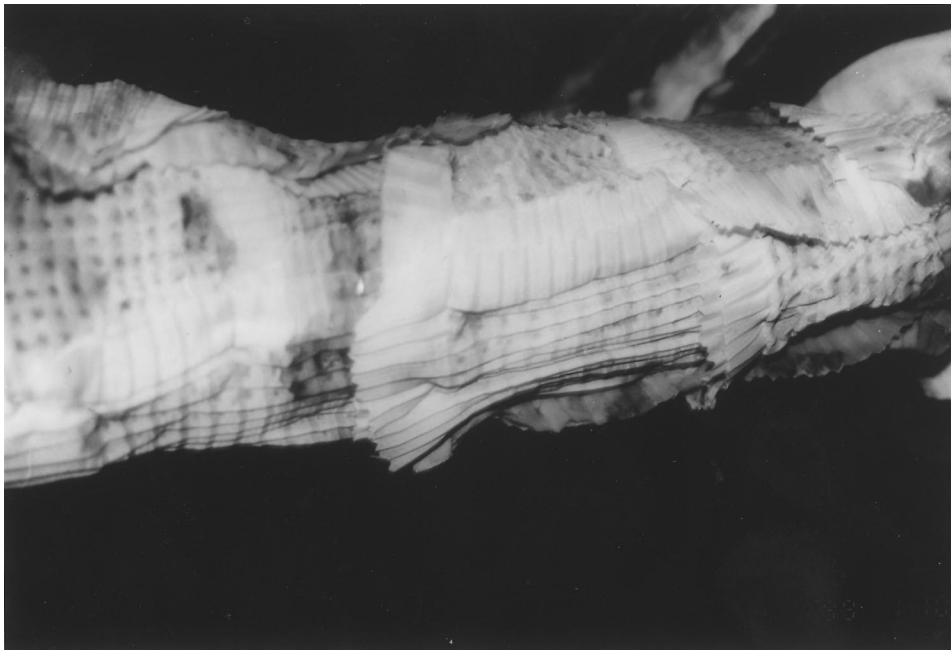


Fig. 4. Burn wound after excision covered immediately with expanded pre-folded gauze with attached autograft islands (1:4).

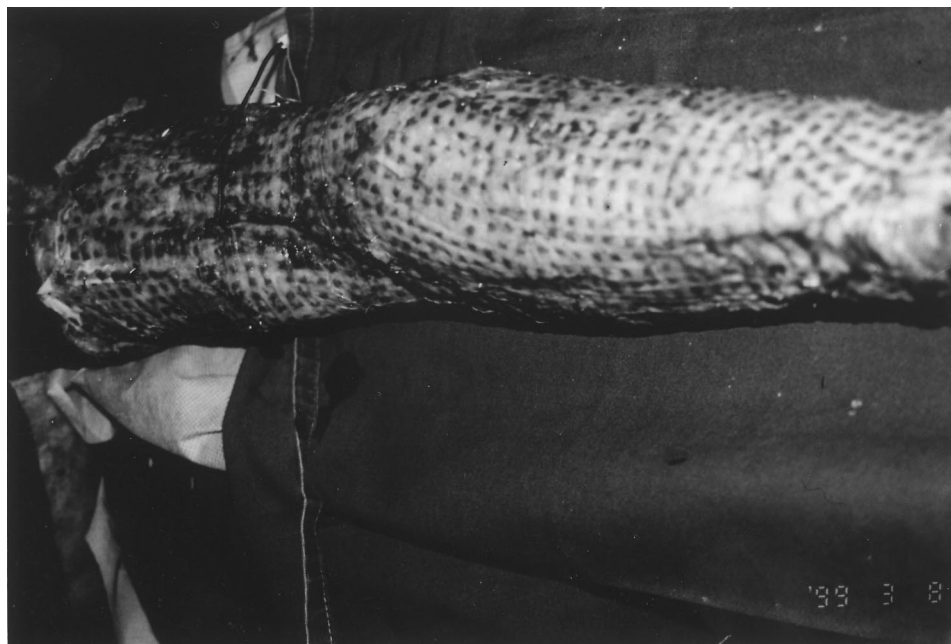


Fig. 5. Third post-operative day. Autograft islands could be seen through polyamide gauze.

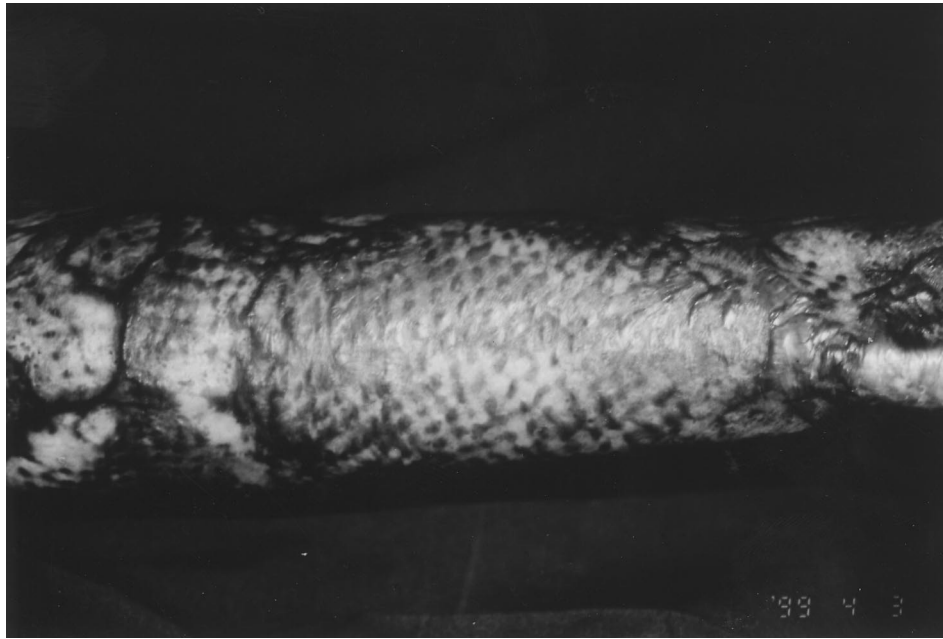


Fig. 6. At the end of 4 weeks epithelialization is complete.

5. Discussion

Meshed split thickness skin grafting has been an accepted method of treatment for severely burned patients at most of the burn centres [14–16]. However, lack of autograft skin is always a problem after the initial surgery, which limits the excision of remaining eschar thus inviting wound infection and septicaemia, that may prove to be fatal [4,17].

Our preliminary experience in the use of Meek technique in the severely burned patient suggests that it provides a reliable method to achieve wound healing with expanded autografts. The Meek technique allows a greater expansion ratio as compared to the mesh graft, as has been reported by other workers [17]. The small autografts are well supported by the gauze pieces and can be easily applied in contrast to the difficult handling of higher expansion (1:6 or 1:9) mesh graft [13,18].

The chances of lifting of the small autograft island at the time of dressing is negligible, as the polyamide gauze piece is removed only on the seventh day, by that time the autografts island have sufficiently grown into the tissues.

We found that spacing and distribution of the micrografts allows faster and more uniform epithelialization as observed by other workers [17–19]. Even if the wound gets infected, the chance of loss of graft is usually localized only to that particular area. However, in one patient the loss of graft was up to 20% due to severe MRSA infection and regrafting was necessary.

Although initially the Meek autograft islands of 1:4 expansion were covered with the overlay allograft until

the seventh post-operative day, after the first case it was realized that cover with overlay allograft is not necessary as the epithelialization progresses rapidly from the edges of the autograft islands. In the last case the polyamide gauze piece was removed after 10 days of surgery without any complication. However, higher Meek expansion grafting certainly needs overlay allograft coverage to avoid infection and promote faster epithelialization. This has earlier been verified even in the technique of intermingled auto- and homograft transplantation by other workers [8,15].

The cosmetic result following the Meek graft technique is comparable with that of widely expanded mesh grafts. The micrografting technique is expensive and needs more staff in the operating room to carry out the procedure [19].

In conclusion our preliminary experience with the Meek technique indicates that it is a method of choice in severely burned patients where there is always a lack of autograft donor sites.

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References

- [1] Bang RL, Gang RK, Sanyal SC, Mokaddas EM, Ebrahim MK. Burn septicaemia an analysis of 79 patients. *Burns* 1998;24:354–61.

- [2] Wurtz R, Karajovic M, Dacumos E, Jovanovic B, Hanumadass M. Nosocomial infections in a burn intensive care unit. *Burns* 1995;21:181–4.
- [3] Jackson D, Topley E, Carson JS, et al. Primary excision and grafting of large burns. *Ann Surg* 1960;152:167.
- [4] Macmillan BG. Early excision of more than 25% of body surface in the extensively burned patients. *Arch Surg* 1958;77:369.
- [5] Gabarro P. New method of skin grafting. *Br Med J* 1943;1:723.
- [6] Tanner JC, Vandeput JF, Olley JF. The Mesh skin graft. *Plast Reconstruct Surg* 1964;34:287–92.
- [7] Gang RK, Hamberg H, Arturson G, Hakelius L. Histological studies of intermingled transplantation of autografts and allografts in rabbits. *Burns* 1980;8:80–5.
- [8] Yang CC, Shin TS, Chu TA, et al. The intermingled transplantation of auto and homografts in severe burn. 1980;6:141.
- [9] Jackson D. A clinical study of the use of skin homografts for burns. *Br J Plast Surg* 1954;7:26.
- [10] Lin SD, Lai CS, Chou CK, et al. Microskin autografts with pig skin xenograft overlay: a preliminary report of studies on patients. *Burns* 1992;18:321–5.
- [11] Meek CP. Successful microdermagrafting using the Meek wall microdermatome. *Ann J Surgery* 1958;96:557–8.
- [12] Meek CP. Extensive severe burn treated with enzymatic debridement and micro dermagrafting: case report. *Am Surgeon* 1963;29(1):61–4.
- [13] Kreis RW, Mackie DP, Vloemans AWP, Hermans RP, Hoekstra. Widely expanded postage stamp skin grafts using a modified Meek technique in combination with an allograft overlay. *Burns* 1993;19(2):142–5.
- [14] Alexander JW, Macmillan BG, Law E, et al. Treatment of severe burns with widely meshed skin autografts and meshed allograft overlay. *J Trauma* 1981;21:433.
- [15] Gang RK, Arturson G, Hakelius L. The effect of split skin allografts on wound epithelialization from autologous patch grafts. *Scand J Plast Reconstruct Surg* 1981;15:1–4.
- [16] Minanov O, Peterson HD. Burn injury. In: Georgiade GS, Riefkohl R, Scott Levin L, editors. *Plastic maxillofacial and reconstructive surgery*, 3rd ed. Baltimore, MD: Williams & Wilkins, 1997:203.
- [17] Raff T, Hartman B, Wagner H, German G. Experience with modified Meek technique. *Burns* 1996;38(4):142–6.
- [18] Kreis RW, Mackie DP, Hermans RP, Vloemans AR. Expansion technique for skin grafts: comparison between mesh and meek island (Sandwich) grafts. *Burns* 1994;20(1):539–42.
- [19] Zermani RGC, Zarabini A, Trivisonno A. Micrografting in the treatment of severely burned patients. *Burns* 1997;23:604–7.