

EXPERIENCE WITH THE MODIFIED MEEK TECHNIQUE

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SUMMARY

In 1958 Meek described the so called Meek - Wall dermatome to cut postage stamp skin grafts. This method was eclipsed by the introduction of mesh skin grafts. In 1993 Kreis and colleagues reintroduced a modified Meek technique using a dermatome running on compressed air. This technique has been used in our burn unit since August 1994. The aim of this paper is to compare the modified Meek technique with the mesh graft technique.

Within a period of 20 months 41 patients were grafted using the modified Meek technique. The mean TBSAB was 54.4% with 50.0% full thickness burns. All patients were excised early. The expansion ratio was 1:4 and 1:6. In 20 patients the Meek technique was used exclusively for grafting of the trunk and the extremities with the exception of face, neck and hands. In 3 patients with a mean TBSAB of 68.3% a combination of postage stamp autologous skin grafts and cultured epithelial autografts (CEA) was applied.

Compared with the mesh graft technique the Meek technique showed the following advantages: 1. The Meek method provides the true expansion ratio. 2. Small graft remnants can be utilized. 3. Grafting of full thickness burns up to 70 to 75 % TBSAB becomes possible with one harvest of the donor sites. 4. The reliability of graft take is equal or better. 5. Epithelialization is achieved within 3 to 4 weeks depending on the expansion ratio. 6. The combination of widely expanded postage stamp split thickness grafts and CEA provides an excellent take rate and durable wound closure within a short time and avoids the problems associated with the engraftment of CEA on fascia.

The method is simple but more demanding than the mesh technique. Compared with the mesh graft technique the preparation of Meek grafts is more time consuming and requires more staff than the Mesh technique. The cost of materials is higher.

In our experience complete coverage of the Meek grafts with an overlay of meshed allografts after removal of the gauze as recommended by Kreis is not necessary using the 1:4 expansion ratio. Greater expansion ratios necessitate an overlay with meshed allografts. Regarding the scar formation no significant differences were observed compared with the mesh graft technique.

In conclusion the modified Meek technique is reliable and simple to perform. This technique provides a sufficient expansion ratio enabling to graft patients with burns up to 75% TBSA with only one harvest of donor sites and without the necessity of CEA. In our opinion the Meek technique is reliable and simple to perform. This technique provides a sufficient expansion ratio enabling to graft patients with burns up to 75% TBSA with only one harvest of donor sites and without the necessity of CEA. In our opinion the Meek technique is advantageous in patients with burns greater than 45% TBSAB. In smaller burns mesh grafts should be used because of lower material cost and staff requirements. Especially in extensively burned patients the Meek technique may be cost effective avoiding the need of CEA.

ZUSAMMENFASSUNG

Erfahrungen mit der modifizierten Meek Technik

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Einleitung: 1958 beschrieb C. P. Meek das sogenannte Meek - Wall Dermatom zur Herstellung briefmarkenähnlicher kleiner Hauttransplantate. Diese Methode geriet nach Einführung der Mesh graft Technik in Vergessenheit. Erst 1993 wurde sie von Kreis et al. wieder in die Verbrennungschirurgie eingeführt. Dabei wurde ein modifiziertes Dermatom verwendet, das mit Pressluft betrieben wird. In unserem Verbrennungszentrum wird die modifizierte Meek Technik seit August 1994 eingesetzt. Unsere Erfahrungen mit dieser Technik werden beschrieben.

Patienten und Methoden: In 20 Monaten wurden bei 41 Patienten Hauttransplantationen mit der modifizierten Meek Technik durchgeführt. Die mittlere verbrannte Körperoberfläche lag bei 54,4% mit 50,0% III.° Verbrennungen. Alle Patienten wurden früh excidiert und danach sofort nach der Meek Methode transplantiert. Bei 20 Patienten wurde die Meek Technik ausschliesslich verwendet. Die Expansionsrate der Spalthaut war 1:4 oder 1:6. Bei drei Patienten mit einer durchschnittlichen Verbrennungsgrossse von 68,3% wurde eine Kombination aus Meek Transplantaten und kultivierter autologer Haut verwendet.

Ergebnisse: Insgesamt wurden bei 103 Operationen die Meek Technik angewendet. Bei vier Patienten wurde eine Expansionsrate von 1:6 verwendet. Bei allen anderen Patienten wurde die Spalthaut im Verhältnis 1:4 expandiert. Nach spätestens 7 Tagen hafteten die Transplantate fest auf dem Wundbett. Die durchschnittliche Einheilungsrate lag bei 91% und die Epithelisierungsrate bei 93%. Bei 8 Patienten wurden die Gaze 3 Wochen auf den Transplantaten belassen und danach eine gute Epithelisierung beobachtet. In diesen Fällen konnte auf eine Fremdhauttransplantation verzichtet werden. Bei 3 Patienten führte die Kombination aus Meek Transplantaten und autologer Kulturhaut zu Einheilungsraten von 90%. Bei allen Patienten wurden die Spenderstellen nur einmal benutzt. Ver-

gleichen mit der Mesh Technik zeigte die Meek Methode folgende Vorteile: 1. Die tatsächliche Expansionsrate wird erreicht. 2. Ungünstige Spenderstellen können genutzt werden. 3. Kleine Transplantatreste können noch verwendet werden. 4. Die Methode ist sehr zuverlässig. Nachteile sind die höheren Kosten, der grosse Zeitaufwand zur Herstellung der Transplantate und der höhere Personalbedarf.

Schlussfolgerung: Die Meek Technik ist zuverlässig und einfach. Der wichtigste Vorteil besteht darin, dass die tatsächliche Expansionsrate erreicht wird. Das ermöglicht die Transplantation von Patienten mit Verbrennungen bis zu 75% der Körperoberfläche, ohne die Spenderflächen mehrmals zu verwenden. Besonders bei Patienten mit ausgedehnten Verbrennungen kann die Meek Technik kultivierte autologe Haut überflüssig machen und so Kosten sparen.

Key words: burns, surgery, skin transplantation

Early burn wound excision and grafting have been shown to improve survival (1-5), decrease length of hospital stay (5-8) and reduce expenditure (5). However, in extensively burned patients the limited areas which can be used for donor-site harvesting still remain a crucial point. Even if harvesting is performed at as shallow depth as possible, there is a point at which any further recropping is of largely nonviable epithelium (9).

To resolve the problem of severely limited donor-sites, different strategies were developed. Promising developments of artificial skin substitutes have been reported recently (10-12). Reliable results have been obtained using cultured epithelial autografts (CEA) (13, 14) among patients with scarce donor-sites. However in most patients with major burns more traditional techniques are still in use. In cases lacking donor-sites, staged grafting of the excised areas with intermittent coverage of the remaining areas with cadaver skin may be performed. Other strategies are directed to the expansion of the available autologous skin to enable grafting of massive burn wounds (15-18).

Another technique to expand split thickness skin grafts is the modified Meek technique, reintroduced by Kreis (19) and colleagues in 1993. In 1958 Meek (20) described the so called Meek - Wall dermatome to cut postage stamp skin grafts. This method became eclipsed by the introduction of mesh skin grafts. Since 1994 a modified Meek dermatome running on compressed air is offered

by a Dutch company (Fig. 1). This dermatome has been in use in our burn unit since August 1994. In this paper, our clinical experience with the modified Meek technique is described.

PATIENTS AND METHODS

Within a period of 20 months 41 patients were grafted using the modified Meek technique. The technique is described below. The mean TBSAB was 54.4% (range 30.5% to 80%) with 50.0% (range 30% to 68%) full thickness burns. The patient characteristics are shown on Table 1. All patients were excised early. The full thickness burns were excised beginning on the first day after burn injury. Further excisions were performed every second day until the whole burned area requiring excision and grafting had been excised. The operations were limited to 20% to 30% total body surface area per procedure. The excised areas were grafted immediately with postage stamp skin grafts which were prepared using the modified Meek dermatome. The expansion ratio was 1:4 and 1:6. In 20 patients the Meek technique was used exclusively for grafting of the trunk and the extremities with the exception of face, neck and hands. In 3 other patients with full thickness burns of 68.3% total body surface area a combination of postage stamp autologous skin grafts and CEA was applied.

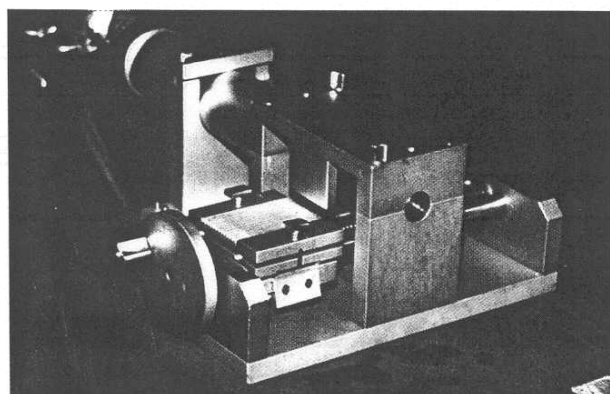


Fig. 1: The modified Meek dermatome.

Table 1: Patient characteristics.

		range
number of patients (no.)	41	
mean age (years)	35.7	15-81
TBSAB (%)	54.4	30.5-80
full thickness burn (%)	50.0	30-68
inhalation injury (no.)	17	

SURGICAL TECHNIQUE

At the beginning of the operation the extent of the excision was determined. Thereafter the esti-

mated amount of split thickness skin grafts was harvested required to graft the excised areas with postage stamp skin grafts at the end of the operation. The full thickness burns were excised down to fascia and complete hemostasis was performed. The skin grafts were prepared simultaneously using the modified Meek dermatome.

The split skin autografts are spread dermis side down on a cork square measuring 4.2 cm x 4.2 cm (Fig. 2). Then the cork with the split thickness skin is placed in the carrier block of the Meek dermatome and secured by a grill. The carrier block is passed through the dermatome which contains 13 parallel circular blades. The dermatome runs compressed air. The blades of the dermatome cut through the graft into, but not through the cork. After the first pass skin stripes of 3 mm in width are prepared (Fig. 3). Now the grill is removed and the cork with the graft is rotated 90°. Again the skin graft is secured with the grill and passed through the dermatome once more. Thereafter the graft is cut in 14x14 small squares measuring 3 mm x 3 mm (Fig. 4).

After removal of the cork from the carrier block the upper side of the graft is sprayed with

an adhesive dressing spray. The spray needs about two minutes to become sticky. Then a pre-folded gauze which is folded on an aluminium foil is pressed onto the grafts for a few seconds. Thereafter the cork is removed leaving the graft islands adhering to the gauze (Fig. 5). The gauze is pulled out on all four sides until the gauze becomes completely unfolded (Fig. 6). The aluminium foil can be peeled off.

After trimming the margins of the gauze with the adhering postage stamp skin islands grafting can be performed. The gauze is applied graft side down on the wound bed and fixed with staples (Fig. 7). After 6 or 7 days the gauzes are gently removed leaving the graft islands on the wound bed. The grafts are covered with an overlay of glycerol preserved meshed allografts (Fig. 8). The allografts meshed 1:1.5 are secured with staples. Dressings are performed using vaseline gauze. The dressings are changed for the first time four days after grafting of the postage stamp skin islands. After removal of the gauzes and grafting of the allografts, dressing changes are performed every second day until epithelialization is complete.

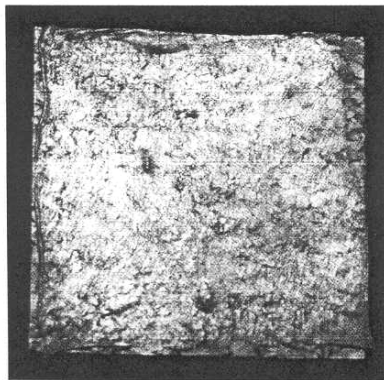


Fig. 2: The split skin grafts is spread dermis side down on the cork square.

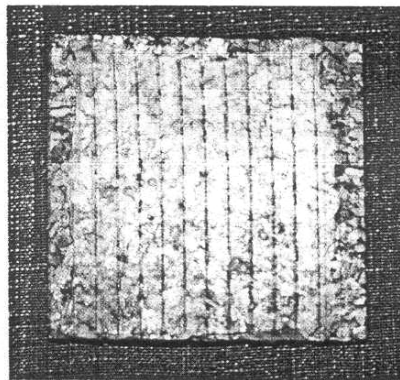


Fig. 3: After the first pass through the dermatome skin strips of 3 mm in width are prepared.

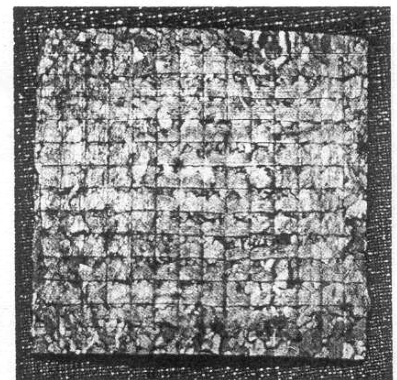


Fig. 4: After the second pass trough the dermatome the graft is cut in 10x10 small squares measuring 3 mm x 3 mm.



Fig. 5: The cork is removed leaving the graft islands adhering to the gauze.

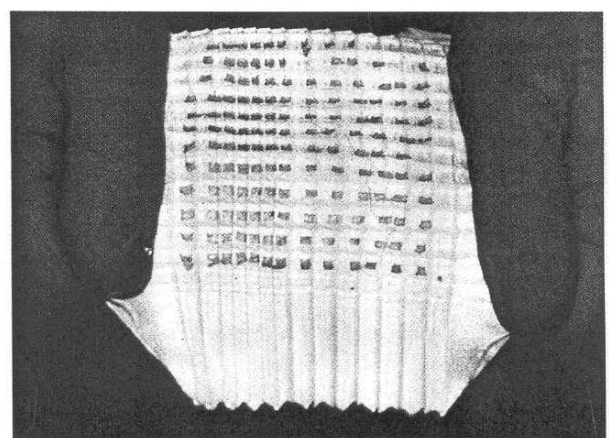


Fig. 6: The gauze is pulled out on all four sides until the gauze becomes completely unfolded.

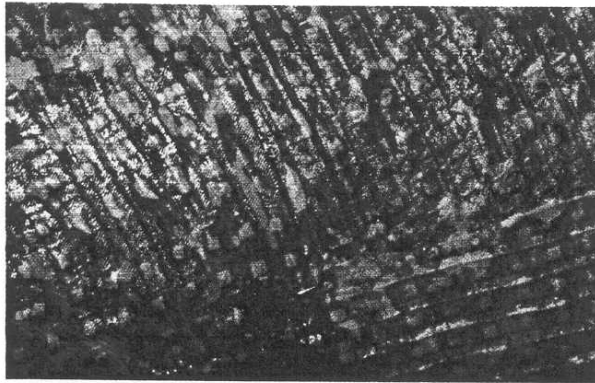


Fig. 7: The gauze is applied graft side down on the wound bed and fixed with staples.

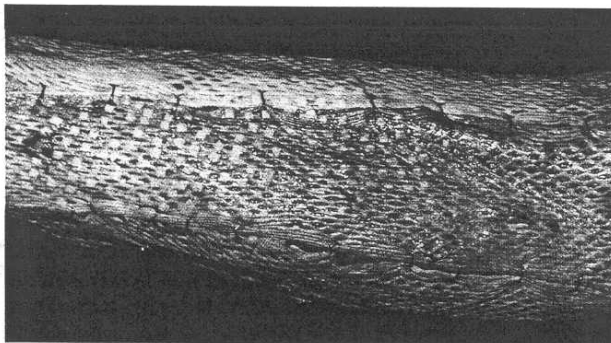


Fig. 8: Five days after coverage of the grafts with an overlay of glycerol preserved meshed allografts.

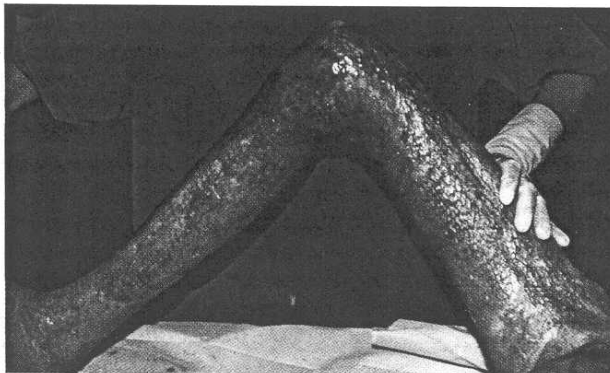


Fig. 9: The result 5 weeks after grafting.

RESULTS

In most of 41 patients Meek grafts with an expansion ratio of 1:4 were used. In four patients an expansion ratio of 1:6 was used. In all patients it was able to graft all excised areas with only one harvest of donor sites. The skin islands firmly adhered to the wound bed at the latest seven days after grafting. Overall 103 grafting procedures were performed. The mean take rate after removal of the gauzes amounted to 91%

(range 45% - 100%). Epithelialization was completed after about three to five weeks depending on the expansion ratio (Fig. 9). The observed rate of epithelialization was 93%.

In one patient we forgot to remove one gauze with an expansion ratio of 1:6. When the gauze was removed approximately three weeks after grafting epithelialization could be observed under the gauze. We tried to take advantage of this finding in patients grafted with an expansion ratio of 1:4. In eight patients the gauzes were left on the wound bed for three weeks. After removal of the gauzes epithelialization was observed and the application of allografts was unnecessary. In another two patients removal of the gauzes became necessary after ten days because of evidence of wound infection. In these patients epithelialization was reached using glycerol preserved allografts.

In three patients a combination of widely expanded postage stamp split thickness grafts and CEA was used. The widely expanded Meek grafts were grafted within the first week after injury. Further treatment followed according to standard protocol. Seventeen days after injury the allografts were removed and the remaining postage stamp skin islands were overlaid with CEA. The combination provided an excellent take rate (mean 90%) and durable wound closure within a short time and also avoided the problems associated with the engraftment of CEA on fascia.

Compared with the mesh graft technique the preparation of Meek grafts is more time consuming and requires more staff. In our experience it is favourable to harvest the split thickness skin at the beginning of the operation and to prepare the Meek grafts simultaneously with the excision of the burn eschar. Three additional staff are necessary to perform the preparation of the Meek grafts during excision time. Only in this way it is possible to prepare sufficient grafts so that at the end of excision grafting can take place without delay. Compared with the mesh graft technique cost of materials of the Meek technique is higher.

DISCUSSION

The results demonstrate that the Meek technique using an expansion ratio of 1:4 and 1:6 represents a reliable method to enable wound healing in extensively burned patients. In all patients it was possible to complete grafting of the excised burn wounds with one harvest of the donor sites. In our experience providing the true expansion ratio is the most important advantage of the Meek method. In patients with massive burns unfavourable donor site can be harvested and small graft remnants can be utilised. In contrast to the Meek technique it has been demonstrated that the expansion rate of meshed skin is significantly less than expected (21). Small graft remnants are not suited to prepare widely expanded mesh grafts. Furthermore the distribution of the post-

age stamp skin grafts on the wound surface seems to be more efficient when compared with mesh grafts (19).

On the other hand mesh grafts are easy to prepare requiring less staff than the Meek technique. The material cost are lower. Therefore mesh grafts are used by us in patients with suitable donor sites. In our experience the Meek technique is advantageous in patients with burns greater than 40% to 45% and enables grafting of full thickness burns up to 70 to 75% TBSAB. Especially in extensively burned patients the Meek technique may be cost effective avoiding the need of CEA.

We have used a combination of widely expanded postage stamp split thickness grafts and CEA. The results were favourable and comparable to the results observed in our patients grafted with CEA using the technique of Cuono (22). But the durability of wound closure seemed better in the patient with the combination of Meek skin grafts and CEA. In other patients epithelialization could be reached without utilising allografts. This technique failed when wound infection occurred. Further experience is necessary. In our experience Meek skin grafts in combination with an allograft overlay remains the standard technique.

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