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Original Research Article

The Meek technique versus partial-thickness skin graft in major burns patients: experience in the National Center of Research and Care of Burns Patients in Mexico City

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ABSTRACT

Background: The Meek technique, originated in the 1950s by Cicero Parker Meek is one of the most important techniques used in the treatment of major burns, particularly due to the scarcity of donor sites for single skin grafts. Despite advances in the care of burn patients, there is no universally effective treatment, particularly for major burn patients. Meek grafts exhibit reduced susceptibility to loss due to infection, favorable outcomes are achieved, with reported graft survival rates ranging from 86-95%, along with satisfactory functional and aesthetic outcomes. The modified Meek technique was associated with shorter operation times (p=0.04) and a greater expansion ratio (p=0.04). The Meek technique is considered a cornerstone in the treatment of extensive burns, particularly when donor sites are limited for conventional split-thickness skin grafts. Despite advances in burn care, there is still no universally effective treatment for patients with major burns.
Methods: A clinical, observational, cross-sectional study conducted from March 2022 to February 2024, comparing hospital length of stay (LOS), intensive care unit LOS, and outcomes in patients with major burn injuries. We compared these data between the Meek technique (n=11) and split-thickness skin grafting (STSG) (n=27).
Results: Among the patients, in the Meek group (n=11), 6 were male, while in the STSG group (n=27), 18 were male. The mean total body surface area (TBSA) for the Meek group was 63.9±17.9%, and for the STSG group, it was 63.6±19% (p=0.97). The mean LOS at the hospital for the Meek group was 41.1±18 days, while for the STSG group, it was 27.2±22 days (p=0.10). The LOS in the intensive care unit was 32.1±13.1 days for the Meek group and 19.4±11.2 days for the STSG group (p=0.04). A higher frequency of deaths was observed with the STSG technique compared to the Meek technique (59.3% versus 45.5%; p=0.03).
Conclusions: Preliminary results with the Meek technique are encouraging, showing a lower death rate in patients with severe burns. However, the prolonged LOS is a risk factor to consider in this group of patients.

Keywords: Meek technique, Partial-thickness skin graft, Major burns, Micrografting

INTRODUCTION

Burn injuries represent a major public health concern due to their high prevalence among the working-age population, substantial healthcare costs, long-term morbidity, and associated mortality. Globally, burn injuries account for a significant burden of disease, with high rates of disability and death. The cornerstone of burn

management is the early removal of necrotic tissue and prompt wound coverage, which has been shown to reduce mortality.[1] However, patients with extensive burns frequently present with a critical limitation: insufficient donor sites for autologous skin grafting. Consequently, reconstructing large burn wounds with limited available skin has become a key focus of research in recent years.[2] In addition, these patients develop significant systemic alterations secondary to trauma, including electrolyte imbalances such as hyponatremia, hyperkalemia, metabolic acidosis, and renal dysfunction.[3,4] Sepsis remains one of the most serious complications, particularly in deep burns and in cases with large total body surface area (TBSA) involvement. The loss of skin integrity predisposes patients to dehydration and infection, contributing to the development of multiple organ dysfunction syndrome, which is the leading cause of mortality in this population.[5]

Skin grafting continues to be the gold standard for the reconstruction of deep dermal and full-thickness defects.[6] Advances in critical care have improved survival rates among severely burned patients over the past decade; however, reconstructive challenges persist.

The Meek technique, originally described in the 1950s by Cicero Parker Meek, represents an important advancement in burn reconstruction. This technique allows for significant expansion of split-thickness skin grafts through the use of specialized instrumentation, including the Meek dermatome and its later modification, the Meek-Wall dermatome. The micrografting approach has been widely studied and has demonstrated several advantages over conventional split-thickness skin grafting, including higher expansion ratios, faster re-epithelialization, applicability in poorly vascularized wound beds, and improved long-term functional and aesthetic outcomes.[6,7] The modified Meek technique enables predictable expansion ratios ranging from 1:3 to 1:9 and promotes uniform epithelialization through evenly distributed dermoepidermal islands. Additionally, it reduces the required donor site area and may decrease complication rates. Its clinical relevance is particularly significant in patients with major burns due to the limited availability of donor skin graft sites. Patients with major burns are typically defined as those with burns involving more than 20% of TBSA in adults and more than 15% in pediatric patients.[8] Its use has also been reported in other complex conditions, including necrotizing fasciitis, Fournier gangrene, vitiligo, piebaldism, and massive extravasation injuries.[9-12]

METHODS

A clinical, observational, cross-sectional study was conducted from March 2022 to February 2024. Medical records were reviewed from the National Institute of Rehabilitation “Guillermo Ibarra Ibarra”.

Inclusion criteria were patients with major burn injuries, defined as burns involving more than 20% of TBSA and patients who had not undergone skin grafting prior to admission. Exclusion criteria included incomplete medical records, admissions outside the study period, and duplicate records. A convenience sampling method was used.

All patients were treated at the same institution and underwent surgical management by different surgeons according to institutional protocols.

To evaluate differences between study groups, means and their corresponding standard deviations were calculated according to the data distribution. Qualitative variables were summarized as percentages, and differences between them were assessed using Chi-square and Fisher’s exact tests, respectively. Statistical significance was defined as a $p<0.05$. All analyses were performed using STATA statistical software, version 17. The primary variables analyzed included hospital length of stay (LOS), intensive care unit (ICU) LOS, and clinical outcomes, including mortality. Patients were divided into two groups based on the reconstructive technique used: the Meek technique (n=11) and split-thickness skin grafting (STSG) (n=27). Comparative analysis between both groups was performed (Figure 1).

RESULTS

According to Figure 1, a total of 38 patients were include, we divided the groups between major burn patients treated with meek technique and STSG. Among the patients, in the Meek group (54.5%) were male while in the STSG group (66.7%) were male. The mean LOS at the hospital for the Meek group was 41.1±18 days, while for the STSG group, it was 27.2±22 days (p=0.10) (Table 1).

Table 1: Characteristics of 38 patients with severe burns treated according to the Meek versus STSG technique.

Characteristics	Surgical technique		P value
	Meek (n=11)	STSG (n=27)	
Sex, male (%)	6 (54.5)	18 (66.7)	0.14
Age	22.1±7.1	31.2±8.4	0.17
Deaths (%)	5 (45.5)	16 (59.3)	0.03
Days of hospitalization	41.1±18	27.2±22	0.10
ESQ	63.9±17.9	63.6±19	0.97
Days of ICU	32 ± 13.1	19.4±11.2	0.04

Data are reported as mean ±SD or percentages, ICU: intensive care unit; ESQ: extent of burned surface

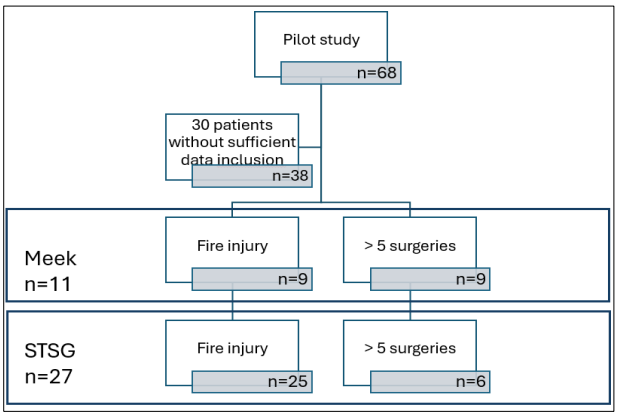

Figure 1: Major burn patients treated with Meek technique and STSG.

STSG: Split-thickness skin graft

The mean TBSA for the Meek group was 63.9±17.9%, and for the STSG group, it was 63.6±19% (p=0.97) (Figure 2). The LOS in the intensive care unit was 32.1±13.1 days for the Meek group and 19.4±11.2 days for the STSG group (p=0.04) (Figure 3). A higher frequency of deaths was observed with the STSG technique compared to the Meek technique (59.3% versus 45.5%; p=0.03).

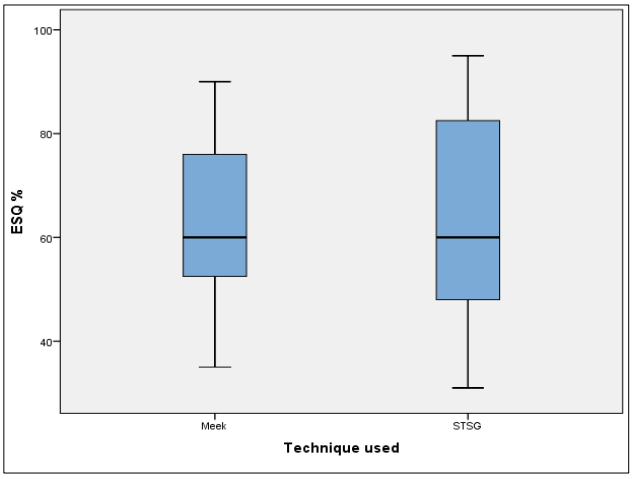

Figure 2: Median values and interquartile ranges comparing both techniques (Meek versus STSG).

DISCUSSION

Patients with major burns continue to represent a significant reconstructive challenge for the plastic surgeon, where early and effective wound coverage plays a critical role in systemic recovery and survival rates. Optimal management not only involves local wound care but also the maintenance of homeostasis, nitrogen balance, immune function, and infection control.[6]

Due to coverage challenges in major burn patients a wide range of coverage strategies has been described, including biological dressings, amniotic membranes, and synthetic substitutes, each with inherent limitations.[3,18] Despite these alternatives, split-thickness skin grafting remains the most widely used technique when donor sites are available.[3] However, in patients with extensive burns, donor site scarcity becomes a limiting factor, which has led to the re-emergence of expansion techniques such as the Meek micrografting method, capable of achieving higher expansion ratios (Figure 4).

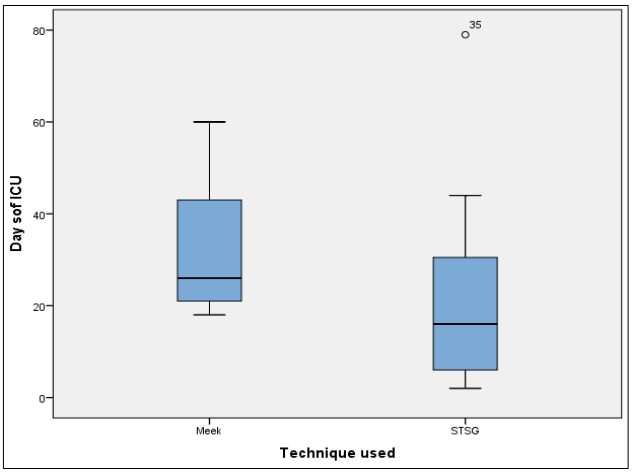

Figure 3: Median values and interquartile ranges comparing both techniques (Meek versus STSG).

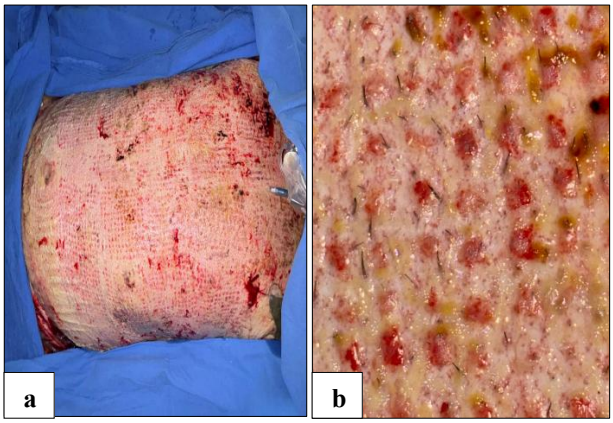

Figure 4: Postoperative result following coverage with the Meek technique, (a) macroscopic image demonstrating the use of the technique for anterior chest coverage, and (b) close-up view showing micrograft integration with a characteristic mesh pattern, adequate vascularization, and no areas of micrograft loss.

In our pilot study, statistically significant differences in mortality were observed, with a trend toward improved survival in patients with TBSA burns >60% treated with the Meek technique. These findings are consistent with those reported by Hu et al, who demonstrated that Meek micrografting—particularly when performed in staged procedures after adequate wound bed preparation—enhances graft survival under adverse conditions such as edema or excessive exudate. Additionally, previously reported graft takes rates ranging from 86% to 95%, results

that could partially explain the lower mortality observed in our case series in Mexico City.[2,13]

A relevant finding in our study was the increased length of stay in the intensive care unit (ICU) in the Meek group (p=0.04). Similar observations have been reported by Rijpma et al, suggesting that although Meek is an effective salvage technique, it requires more intensive postoperative monitoring due to the management of specialized material and the need to assess epithelialization between graft islands.[2] This prolonged ICU stay likely reflects the higher severity and physiological compromise of patients selected for this technique. Nevertheless, as noted by Dahmardehei et al, once graft take is achieved, Meek micrografting provides more predictable expansion and faster epithelialization, which may offset the initial increase in resource utilization.[6,18]

Comparative studies between Meek and meshed grafts have also provided valuable insights. Noureldin et al demonstrated in a prospective pediatric cohort that Meek micrografting may offer advantages in extensive burns, as expansion depends on the carrier material rather than the intrinsic elasticity of the skin, which is limited in children. Furthermore, Maruccia et al have reported improved functional scar outcomes when combining Meek micrografting with acellular dermal matrices. In our series, patients treated with the Meek technique were slightly younger (22.1±7.1 versus 31.2±8.4), which may further support its role in individuals with higher reconstructive demands and limited donor site availability.

Beyond thermal injuries, the Meek technique has shown versatility in other reconstructive scenarios. Ng et al reported its successful application in extensive defects following necrotizing fasciitis, where donor site limitations resemble those seen in major burns.[6] Additionally, emerging applications in conditions such as vitiligo and piebaldism suggest that the geometric distribution of micrografts may result in improved aesthetic outcomes, particularly in terms of repigmentation.[4]

However, these findings must be interpreted with caution. It is not possible to establish a definitive causal relationship or to assert the superiority of one technique over another based on the present data. Several limitations must be acknowledged, including the small sample size, the heterogeneity of burn patients—particularly regarding comorbidities and clinical severity—and the potential for selection bias, as Meek micrografting is often reserved for more complex cases.

Additional limitations include the cost associated with the required materials, such as dermatomes, specialized gauze, and adhesives, which may restrict widespread adoption.[11,16] Moreover, the characteristic “island” appearance of Meek grafts may persist for several months, although this typically improves with scar maturation.[16]

Overall, our findings suggest that the Meek technique represents a valuable tool in the management of extensive burns, particularly in patients with limited donor sites. Nevertheless, further prospective studies with larger sample sizes and improved control of confounding variables are necessary to better define its comparative effectiveness and optimize patient selection.

CONCLUSION

The Meek micrografting technique appears to be a useful option for coverage in patients with extensive burns and limited donor sites. In our series, its use was associated with a trend toward improved survival in patients with TBSA >60%, potentially related to its high graft take rates and reliability under adverse wound conditions. Although increased ICU length of stay was observed, this likely reflects the severity of the treated population. Preliminary results with the Meek technique are encouraging, showing a lower death rate in patients with severe burns. However, due to the small sample size, patient heterogeneity, and potential selection bias, no definitive conclusions regarding superiority over meshed grafting can be drawn. Further prospective studies are required to better define its role in burn care.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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