



One-Step Reconstruction of Severe Burn Injury on the Face of A Child by Using the Collagen-Elastin Matrix

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Abstract

We present 10 months-old girl patient with severe facial burns which include total face treated with using the collagen-elastin matrix and simultaneously an unmeshed split-thickness skin graft on the 4th day of admittance. Total surface burn area was 50% and all burned area was almost 3rd degree. Graft survival was 100% in this technique. In regard to early results, graft quality was close to normal skin in terms of elasticity, pliability, texture and the color. Good contour was also achieved and no hypertrophic scar occurred. Aesthetic and functional results have been encouraging. The collagen-elastin matrix as a dermal substitute can be a useful adjunct to severe post burn facial reconstruction and may permit to obtain a quick healing. This is the first case of using the collagen-elastin matrix (Matriderm®).

Key Words: Burns; Dermal Substitution; Facial Burns; Graft Survival; Children.

Ağır Yüz Yanıklı Bir Çocukta Kolajen-Elastin Matriks Kullanılarak Yapılan Tek Aşamalı Rekonstrüksiyon

Özet

Bu olgu sunumunda; yanığının 4. gününde, aynı anda kolajen-elastin matriks uygulaması ve üzerine deri greftlemesi yapılan çok ağır total yüz yanıklı 10 aylık kız hastayı sunuyoruz. Toplam yanık alanı tüm vücudun %50'si olup neredeyse tüm alanlar 3. derecedeydi. Bu yöntemle yapılan tüm greftler canlı kaldı. Erken sonuçlara göre, greft kalitesi; elastisite, pliability, doku kalitesi ve renk bakımından normale yakındı. Hastamızda yara kontürleri güzeldi ve yara bölgesinde hipertrofik skar yoktu. Dermis eşdeğeri olarak kolajen-elastin matriks, ağır yanık sonrası yüz rekonstrüksiyonunda yararlı bir yardımcı olabilir ve hızlı iyileşmeyi sağlamaya izin verebilir. Burada sunulan hasta kolajen-elastin matriksin (Matriderm®), bu türk yanıklarda greft olarak kullandığı ilk hastadır.

Anahtar Kelimeler: Yanık; Dermis Eşdeğeri; Yüz Yanıkları; Greft Survivi; Çocuklar.

INTRODUCTION

The gold standard for the coverage of full-thickness skin defects is autologous skin grafts. However, poor skin quality and scar formation are well-known problems in functional and facial regions. The use of dermal substitutes is an appropriate way to minimize scar contraction and, thereby, to optimize the quality of reconstructed skin. However, these dermal substitutes were associated with two-stage procedures due to the increased distance between the wound bed and the skin graft and the presumed diminished take rate of the skin graft (1,2). One of these substitutes consist of collagen and elastin matrix and serves as a scaffold or a foundation (Matriderm®). It has proven to be suitable for a single grafting procedure in the critical sites of the body such as soft tissue, neck, hands, feet, etc (3-7). Although full-thickness burns to the face represent one of the most difficult challenges for burn surgeons and often have unsatisfactory outcomes. Key features of facial skin remain difficult to reproduce (e.g., color, texture, contour, and expression), there is only two case reports in the literature about using the collagen elastin matrix in reconstruction of the deep facial burns in adult patients (8,9).

The aim of this case report, that is the smallest and 3rd

patient in literature, was to evaluate the impact of the collagen elastin matrix for the single-step reconstruction of full-thickness facial burn in a child.

CASE REPORT

A child with severe full-thickness facial burns was considered for treatment with 1 mm thick collagen elastin matrix (Matriderm®, Dr. Suwelac Skin & Health Care AG, Billerbeck, Germany) and simultaneously split thickness autograft. This collagen elastin matrix is a three-dimensional matrix composed of native structurally intact type 1, 2 and 5 collagen fibrils and elastin to support dermal regeneration.

A 10 months-old girl had burned by gas-blast in Syria in where there was a conflict in nationwide. Total surface burn area was 50% and all burned area was almost 3rd degree. Burns were on face, two hands, trunk and upper and lower extremities. At 4th days of week of admittance, after fully removal of scab, necrotic and scar tissues of the full-thickness burn wound in the face by excision or surgical debridement and after hemostasis, the collagen elastin matrix was implanted on those areas and simultaneously grafted in general anesthesia if the condition of the patient and the wound bed were appropriate. Split-thickness grafts were applied as an unmeshed sheet and overlapped the wound margin

slightly on wound that treated by the collagen elastin matrix in the face (Figure 1-3).



Figure 1. Appearance of patient's face at 4th day of admittance.



Figure 2. Per-operative appearance of using the collagen-elastin matrix (Matriderm®) onto face



Figure 3. Appearance of patient's face after grafting

On the other hand, early excision and simultaneously application of split-thickness skin grafts were performed for other burned sites of patients' body. Split-thickness grafts were fixated with staples. Five layers of paraffin gauze free of drugs and 4 bulky gauze dressing and tight bandaging was used to cover the autograft on the

collagen elastin matrix in the face and hands. After 4 days the dressing changed for the first time and after 8-10 days the staples were removed.

All grafts implanted on face in all patients were viable. Early postoperative evaluations of the faces were very good (Figure 4). On the other hand, the Vancouver scar scales (VSS) for face would be assessed at the end of postoperative 5th month.



Figure 4. Appearance of patient at postoperative 1st week.

DISCUSSION

Full-thickness burns to the face represent one of the most difficult challenges for burn surgeons and often have unsatisfactory outcomes. Key features of facial skin remain difficult to reproduce (e.g., color, texture, contour, and expression).

The first generation dermal substitute has previously been used in facial burns as a two-stage procedure. In addition, someone prefers to use thick autograft if sufficient donor skin is available (8,9).

Matriderm® as a collagen elastin matrix for dermal regeneration is an acellular tissue substitute. The native structurally intact collagen serves as an essential component of the new extracellular matrix for the migration of cells and vascularisation. The programmed thickness of Matriderm® allows initial supply to the graft by diffusion and rapid vascularisation. As the healing process advances, the fibroblasts produce their own collagen matrix while Matriderm® is degraded. Experiences from a human clinical trial on the treatment of punch biopsy wounds demonstrated that Matriderm® is completely resorbed 6 weeks after implantation (1-3). Nowadays, dermal substitutes are considered to play a more prominent role in burn surgery and have shown to minimize hypertrophic scarring, contractures and increase scar elasticity in acute burn wounds (3,4). Clinical studies on the treatment of burn wounds showed that the elasticity of the regenerated skin was significantly better after 3-4 months with the combined use of Matriderm® and split thickness skin graft, than

which wounds were treated with split-skin graft alone (1-9).

A randomized controlled trial of early burn excision and simultaneous application of Matriderm® demonstrated a significant improvement in skin elasticity. Matriderm® has also been used in the acute setting for hand burn wound closure, where again the quality of the dermis was highlighted and range of movement was improved (1,3,5). In our patient, we easily applied the same technique. Early postoperative facial examination shows good results with 100% graft survival and very good elasticity. Because our experience about grafting without using dermis substitution in severe facial burn was very troublesome, especially, due to low graft survival and bad elasticity results, these results obtained are very important and hopeful. Graft survival is very important such a patient who has large burn area and need large donor sites, our patient has got a large severe burn area, TBSA 50%, which needed a large skin donor sites, as well.

It has been demonstrated that the elastin component improves the stability and elasticity of the regenerating tissue. Moreover, reduced wound contraction has been observed in both an animal and a human study (4,5,7,10). At this point, our results also support this role of the elastin component in Matriderm®.

This is the first case of using the collagen-elastin matrix (Matriderm®) for primary burn wound closure on the face in a child. We believe we have shown that the procedure can be performed safely and that it results in improved cosmetic and skin quality compared with alternative techniques. The proven benefits of increased skin pliability and function in hand reconstruction clearly lend themselves to facial burn surgery. We appreciate that at 5 months this represents a relatively early result; however, we feel that this is likely to offer a useful and reliable reconstructive tool in the future.

None of the authors has any commercial associations that might pose or create a conflict of interest with information presented in this article. No intramural or extramural funding supported any aspect of this work.

2nd National Pediatric Burn Congress, 10-14 April 2013, Antalya, Turkey.

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Received/Başvuru: 04.06.2013, Accepted/Kabul: 09.07.2013

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For citing/Atf için

Demircan M, Karaman A, Cicek T, Yetis I. One-step reconstruction of severe burn injury of the face in a child by using the collagen-elastin matrix. *J Turgut Ozal Med Cent* 2013;20:342-3. DOI: 10.7247/jtomc.2013.922