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CASE REPORT
Craniofacial/Pediatric

A Case of Giant Congenital Melanocytic Nevus Treated with Combination Therapy of Autologous Mesh-skin Grafts and Cultured Epithelial Autografts

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Summary: Surgical excision of a giant congenital melanocytic nevus (GCMN) results in a full-thickness skin defect that is usually difficult to reconstruct even with tissue expansion or skin grafting. Here, we report the first case of GCMN treated with a combination of cultured epithelial autografts (CEAs) and mesh-skin grafts to reconstruct a large skin defect after surgical excision. A 14-month-old girl had a GCMN occupying 20% of the total body surface area of her neck and back. A 5-stage, full-thickness excision was performed between the age of 14 and 25 months. In each intervention, the wound after excision was covered with 1:6 mesh-skin grafts and CEAs, except for the neck, where patch skin grafts and CEAs were used. The skin grafts and CEAs were engrafted without shedding and epithelialization was completed within 3-4 weeks. Eighteen months after the last surgery, a mesh-like scar remained, with no recurrence or severe contracture observed. The cosmetic appearances of the donor sites (the scalp and lower abdomen) were acceptable. The application of CEAs with mesh-skin grafts has been established for the treatment of severe burns. This combined method also provides a possible option for the treatment of GCMNs. *(Plast Reconstr Surg Glob Open 2021;9:e3613; doi: 10.1097/GOX.0000000000003613; Published online 7 June 2021.)*

Giant congenital melanocytic nevus (GCMN) is commonly defined as a melanocytic lesion present at birth that reaches a diameter of ≥20 cm in adulthood.[1] Two points should be noted for the treatment of GCMN. First, these lesions are associated with a risk of malignant melanoma, with a reported incidence of melanoma in patients with GCMN of 0.7%–8.2%.[1,2] A larger nevus has an increased risk of malignant transformation. Second, the cosmetic appearance of black hairy lesions can cause psychosocial effects. Based on these considerations, various methods, including surgical excision, curettage, and dermabrasion, have been reported.[1] Among these, early prophylactic surgical excision is recommended to reduce the risk of malignant transformation of skin lesions.[3] As nevus cells are histologically present in the entire dermal layer, complete removal of GCMN results in a full-thickness skin defect, which is usually difficult to reconstruct.

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In Japan, cultured epithelial autografts (CEAs, JACE; Japan Tissue Engineering Co., Ltd., Gamagori, Japan) were approved for the treatment of patients with GCMN in 2016. While the take rate of CEAs on partial-thickness skin defects to the dermis is high (>80%), the rate for full-thickness skin defects is quite low (<20%)[4]; thus, its application for GCMN has been limited to partial-thickness skin defects after curettage or dermabrasion.[5] However, the combination of an autologous mesh-skin graft and a CEA achieved good epithelialization of large full-thickness skin defects in the treatment of severe burns.[4] Theoretically, this combined method can be applied to reconstruct large skin defects after surgical excision of GCMN. Here, we present the first case of GCMN that underwent reconstruction of the large skin defect caused by surgical excision with a combination of autologous mesh-skin grafts and CEAs.

CASE REPORT

A 14-month-old girl had a GCMN covering 20% of the total body surface area of her neck and back (Fig. 1). The nevus was large; thus, we planned serial excision and reconstruction using a combination of autologous mesh-skin grafts and CEAs. After preparing a CEA from a 20-mm^2 full-thickness skin area of her right groin, surgeries were performed at the age of 14, 19, 21, 23,

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Fig. 1. A gross photograph before treatment. A 14-month-old girl with a GCMN comprising 20% of the total body surface area of her neck and back.

and 25 months, and the surgical areas were the right back, left back, upper back, left upper extremity, left neck, and right neck in the first through fifth surgeries, respectively.

In each surgery, the full thickness of the nevus was excised, and the skin defect was covered with a 1:6 mesh-skin graft and a CEA (Fig. 2), except for the neck, where patch skin grafts and CEAs were used. The skin grafts from the lower abdomen (15–48 cm^2 in size) were adjusted to 0.3 mm in thickness using a dermatome, and skin grafts of 0.3-mm thickness were taken from the scalp using an electric dermatome. The donor site of the lower abdomen was closed primarily, while that of the scalp was covered with wound dressings until epithelization was completed.

In the first, fourth, and fifth surgeries, skin reconstruction was performed after granulation tissue formation with the use of acellular artificial dermis (Integra, Integra Life Sciences, Princeton, USA) and negative pressure wound therapy (NPWT, PICO; Smith & Nephew plc, Watford, England, UK). In the second and third surgeries, Integra and NPWT were not used, and skin reconstruction was performed primarily.

In all surgeries, the skin grafts and CEAs survived (Fig. 3) and epithelialization was completed within 3–4 weeks. Eighteen months after the fifth surgery, no recurrence was observed. A mesh-like scar remained, but contracture was not observed (Fig. 4). The donor site of the lower abdomen left only a linear scar.

DISCUSSION

The risk of developing cutaneous melanoma in patients with GCMN is relatively high; however, prophylactic excision can reduce the risk of this development. Based on studies with large retrospective data sets, Marghoob et al reported melanoma incidence rates of 7.5% (23/304) in cases without surgery and 0.6% (4/650) in cases with partial or complete excision.[3] In the present case, the GCMN area was >20% and its thickness had increased by >10 mm at the first visit; therefore, we decided to remove the GCMN completely to eliminate the risk of melanoma.

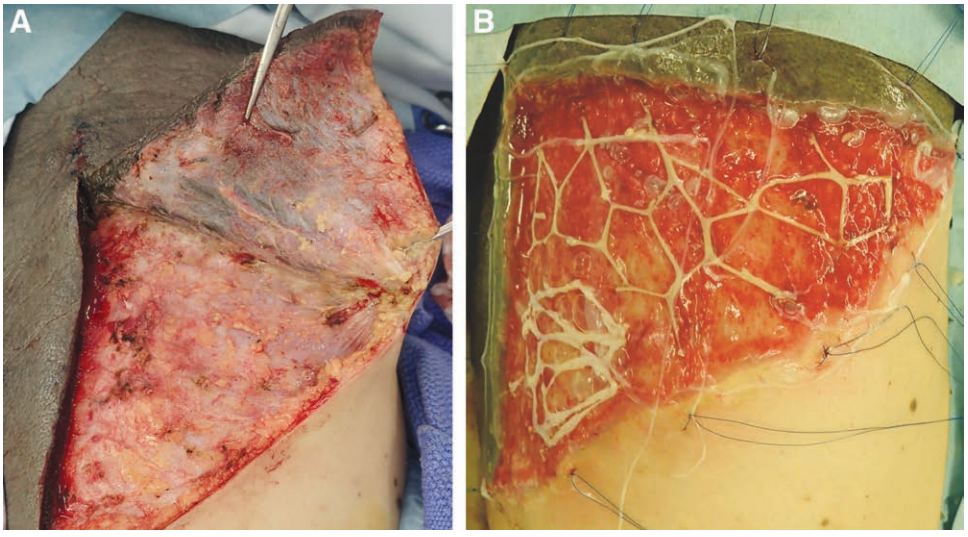

Fig. 2. A gross photograph during the first surgery. The full thickness of the nevus was excised (A), and the skin defect was covered with a 1:6 mesh-skin graft and a CEA after granulation tissue formation with the use of acellular artificial dermis (B).

Fig. 3. A gross photograph taken 10 days after the first surgery.

Fig. 4. A gross photograph at 3 years and 7 months of age. The nevus has been completely removed, and no hair loss is observed.

When the donor sites for skin grafts are limited, a highly meshed autograft is generally applied; however, it increases the risk of wound infection or scar contracture due to retarded wound healing.[6] The take rate of a CEA applied to full-thickness skin defects is quite low, and the presence of dermal components is essential for CEA survival.[4] The combination treatment of mesh-skin grafts and CEAs demonstrated the successful use of CEAs to reduce the epithelialization time compared with that for mesh-skin grafts.[4] In addition, Akita et al. reported that the combination of 1:6 mesh autografts and CEAs resulted in a similar scar quality as that for 1:3 mesh autografts,[7] indicating that CEAs provide good skin texture. We applied this combined method for a case with a GCMN occupying 20% of the total body surface area and completed its removal, leaving only a linear scar at the lower abdomen. Integra was used mainly for the neck lesion to reduce postoperative contracture.[8] Although it might have improved the scar quality of the neck, no clinically relevant contractures were observed even at other sites where Integra was not used.

The disadvantages of this combined method are that it requires normal skin harvesting and leaves a mesh-like scar. In our case, the mesh-like scar can be partially replaced with tissue-expanded adjacent skin in the future, but not the entire lesion. To address these issues, we are developing a novel treatment to use the nevus tissue itself as a cell-inactivated sheet-form scaffold for the regeneration of autologous dermis, which could be the recipient for CEA survival.[9] This treatment will employ high hydrostatic pressure to inactivate nevus tissue without damaging the epidermal basal membrane of the dermal structure.[10] The high cost of CEA remains a problem.

In conclusion, currently, the combined method of mesh-skin grafts and CEAs is a possible option for the reconstruction of large skin defects after full-thickness excision of GCMN.

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PATIENT CONSENT

The parents of the patient provided written consent for the use of the patient's images.

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