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Case Report

The use of MATRIDERM® as a single stage salvage procedure to cover exposed dura Mater

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ABSTRACT

Reconstruction of large full-thickness scalp defects with exposed cranial bone or dura are usually performed with free flaps. However, certain medical conditions in fragile patients may contraindicate this type of surgery. In those circumstances, Dermal Regeneration Templates (DRTs) can provide an alternative solution to flap surgery. We here report the case of a 79-year old woman presenting with a large cranial defect and exposed dura mater after developing postsurgical Pyoderma Gangrenosum and subsequent free flap failure. A one-stage salvage reconstruction was successfully performed with MATRIDERM® (MedSkin Solutions Dr. Suwelack AG, Germany) and a split-thickness skin graft (STSG) with a Vacuum-Assisted Closure (VAC) dressing.

Case report

A 79-year-old female presented with cranial bone exposure. The patient had a history of subdural hematoma drainage and decompressive craniectomy with bone flap removal. The cranial flap was replaced a few months later, but the patient developed full-thickness skin flap necrosis, with exposure

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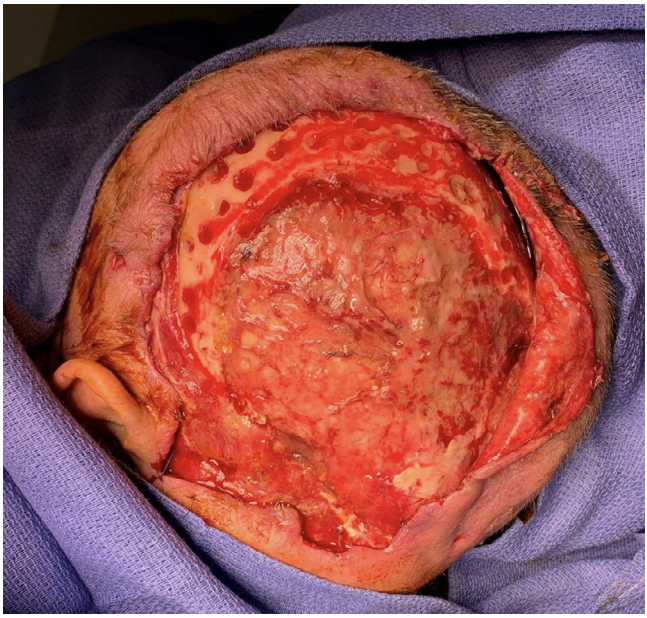

Figure 1. Per operative view after debridement showing the surface of exposed dura and bleeding of the peripheral cranial bone after burring.

of the non-vascularized cranial bone graft. We decided to remove the nonviable bone and to cover the underlying dura with a latissimus dorsi free flap. The patient had a history of essential thrombocythemia. Due to the high risk of vascular thrombosis, we opted for a two-stage free flap strategy in order to minimize the risk of brain exposure.

In the first stage, a musculocutaneous latissimus dorsi free flap was raised and microvascular anastomoses were performed to the superficial temporal vessels. The skin paddle was secured to the scalp with separate sutures. The muscle was folded on itself and covered with MEPITEL® (Mölnlycke Health Care AB, Belgium) sheets. The flap was well perfused and the second stage was carried out 5 days later. After radical calvarial skin and bone debridement, the muscle flap was raised, unfolded and positioned to cover the resulting defect. The skin paddle was removed and the muscle covered with a split-thickness skin graft (STSG) taken from the excised skin paddle.

Three days later, the patient started to complain about increasing pain in the dorsal donor site. Blood testing showed a C-reactive protein level of 315 mg/L and a white blood cell count of 24,65 $\times$ $10^3/\mu$L. The donor site was surgically explored and necrotic tissues were excised. Two days later the flap developed late venous congestion which could not be salvaged. No improvement in the back wound was noted and the inflammatory markers continued to rise. Post-surgical Pyoderma Gangrenosum (PSPG) was suspected. Frozen biopsies of both the scalp and the back were performed and showed marked neutrophilic infiltration of the dermis, compatible with the suspected diagnosis of PSPG. Immediate treatment with Methylprednisolone (2 mg/kg) was commenced and Cysclosporin (3 mg/kg/d) was introduced 4 days later. The decision was taken to cover the exposed dura with MATRIDERM® (MedSkin Solutions Dr. Suwelack AG, Germany) as a salvage procedure. Necrotic tissues were excised. Bleeding of the peripheral cranial bone was obtained with a round bur (Figure 1). The MATRIDERM® (MedSkin Solutions Dr. Suwelack AG, Germany) used was 210 $\times$ 297 mm and 1 mm thick. The sheet was cut in order to fit the entire defect (Figure 2) and immediately covered with a 1:1.5 meshed STSG harvested from the thigh. The DRT together with the skin graft were fixed using staples. Vacuum-Assisted Closure (VAC) dressing was applied at 75 mmHg and removed 4 days later, showing non-adhesion and a pale appearance of the skin graft, known as the « Ghost-

Figure 2. Per operative view after Matriderm® (MedSkin Solutions Dr. Suwelack AG, Germany) sheet application.

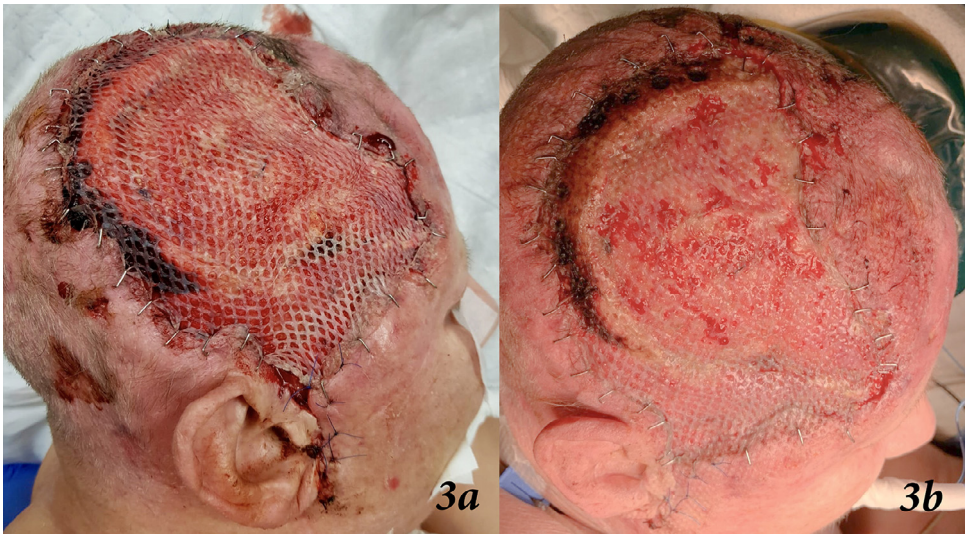

Figure 3. 3a) Removal of the VAC dressing after 4 days showing the "Ghosting Effect" with pale appearance and non-adhesion of the skin graft. 3b) Complete take of the skin graft after 8 days. Notice the darker marginal area where the matrix was applied on the bleeding edges of bone.

ing Effect » (Figure 3a). The VAC dressing was reapplied at 125 mmHg for another 4 days and a 100% take of the skin graft was obtained (Figure 3b). Healing however, occurred more slowly on the burred bone edges than on the dura. Daily wound care was pursued and long-term follow-up showed complete healing with an acceptable appearance (Figure 4). Despite the absence of bone reconstruction, the calvarial restoration was stable, with no secondary ulceration, after 3 months of follow up.

Figure 4. Follow-up at 3 months showed complete and uniform healing on the dura and bone edges with good aesthetic results.

Discussion

Reconstruction of complex scalp and calvarial defects remains a challenge. The patient's intrinsic factors along with the functional and aesthetic requirements must be considered together.[1] In large defects, the best reconstructive outcomes are achieved with microvascular free flap transfers. Numerous options are available depending on the location and extent of the calvarial defect, but also on the required pedicle length to reach the recipient vessels, in front of the auricle or in the neck. Perforator flaps allow large surface coverage with low donor site morbidity and have been increasingly used with good results.[2] In our department however, the muscular latissimus dorsi free flap remains our first choice when a tight closure is needed. The muscle is harvested larger than the defect in order to allow complete filling of the soft tissue defect, with a generous overlap above the bone edges and under the surrounding heathy skin. In our experience, this strategy, along with a STSG cover, provides a better contour and skin match to the surrounding scalp than a thick and pale skin paddle arising from the thigh. Given the risk of microsurgical complications associated with essential thrombocythemia, we opted for a two-stage procedure as described by Ray AC, et al..[3] This was done to limit the risk of brain exposure in case of microsurgical failure. The main drawbacks of this procedure are the risk of wound infection and iatrogenic pedicle injury during the second stage.

Post-surgical Pyoderma Gangrenosum (PSPG) is a very rare post-operative condition and is frequently misdiagnosed as a surgical site infection. The breast and the abdominal area are the most frequently involved, while PSPG of the head and neck region seems less common.[4,5] Risk factors include previous history of PG, underlying systemic diseases and hematologic disorders.[4,5] The possible association with essential thrombocythemia has also been described.[6] Given the risk of severe local and general septic complications, a one-stage emergency procedure was mandatory to remove the necrotic flap and to ensure stable brain coverage. Despite a slow improvement in the back donor site wound under medical treatment, another long lasting procedure on the skull was not possible, mainly due to the poor general condition of the patient. Therefore, we opted for urgent dural coverage with MATRIDERM® (MedSkin Solutions Dr. Suwelack AG, Germany) and immediate skin grafting.

Acellular Dermal Matrices have been described as a good alternative in complex cranial reconstructions after oncological resection and post traumatic defects with exposed bone or dura.[7] Full-thickness

defects are usually covered with a bilayer matrix but they require a two-stage approach with an average time of 3 to 6 weeks between the two procedures.[8] The use of a single layer dermal matrix with simultaneous STSG for brain coverage was first described by Vilela et al., with favorable outcomes.[9] In our case, a VAC dressing was applied aiming to secure the MATRIDERM® (MedSkin Solutions Dr. Suwelack AG, Germany) and the skin graft together, and to avoid multiple dressings. The Ghosting appearance is described as normal up to 5 days and is explained by the slow integration of the matrix into the wound. Healing should thus be reevaluated at each dressing change. In this case, the use of a single layer dermal matrix with immediate skin grafting, combined with VAC dressing, allowed us to obtain a stable coverage in a single stage. It therefore should be considered as an alternative option when a free or a local flaps cannot be performed, or as a salvage procedure in other complex situations.

Declaration of Competing Interest

All authors declare to not have any conflict of interest.

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