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CASE REPORT

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Management of a complex scalp defect with cryopreserved placental membrane containing viable cells resulted in rapid wound closure

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Abstract

Reconstructive methods are most commonly used to treat scalp defects. However, patients with complex defects are often not good candidates for surgical procedures due to the severity of the wound, advanced patient age, and multiple comorbidities. In these instances, alternative nonsurgical advanced therapies should be considered.

KEYWORDS

complex, cryopreserved, placental membrane, viable, wound

1 | INTRODUCTION

We present a case utilizing vCPM as an adjunct to standard of care (SOC) in the treatment of a 35 cm^2 large chronic scalp wound. Outcomes, including wound size and adverse events, were assessed at weekly visits. Complete wound closure was achieved at day 21 following 2 applications of vCPM.

The incidence of cutaneous carcinomas has risen during the past couple of decades, especially of the head and neck area. Surgical excision or Mohs micrographic surgery (MMS) is two commonly used treatment modalities for skin carcinomas.[1] Typically, this requires a wide local excision in order to obtain clean margins, which can result in large tissue defects with exposed structures. For scalp carcinomas specifically, the resulting defect can be difficult to heal due to size and poor elasticity of the soft tissue.[2]

Reconstructive methods are most commonly used to treat scalp defects with the aim to provide vascularized soft tissue coverage of the defect and to achieve positive cosmetic outcomes. Local and distant skin flaps and free tissue transfer are often used to cover these defects which is necessary to avoid delayed wound healing and also reduces pain and risk for complications such as osteomyelitis.[3] However, patients with complex defects are often not good candidates for surgical procedures due to the severity of the wound, advanced patient age, and additional health conditions that may decelerate the normal wound healing process. In these instances, alternative nonsurgical advanced therapies should be considered.

The use of human placental membrane (HPM) for wound treatment has been cited in the literature for over a century. HPM is comprised of growth factors and cytokines, an extracellular matrix, and endogenous cells, including mesenchymal stem cells, making it an ideal biological wound dressing. Previous studies have demonstrated that HPM is anti-inflammatory, antimicrobial, antifibrotic, and angiogenic.[4] HPM is easily contouring to any wound geometry and provides a protective, breathable barrier that helps maintain a moist wound environment while preventing contamination. Today, with the advancement in tissue preservation methods, placental membranes can be processed and utilized as a "point-of-care" product. One such product is cryopreserved placental membrane containing viable cells (vCPM).

vCPM has been shown to retain all the components and properties of fresh placental tissue and has shown positive

Osiris Therapeutics, Inc is now operating as a subsidiary of Smith & Nephew.

clinical outcomes in the management of a variety of wound types.[5-10] Specifically, vCPM has been evaluated in a retrospective and prospective studies in the treatment of two complex wound studies. Both studies demonstrated rapid granulation over exposed deep structures like bone and/or tendon, and had a high proportion of patients achieve complete wound closure with vCPM applications adjunct to standard of care (SOC).[9,10] Here, we present a case in which vCPM was used in the nonsurgical management of a complex scalp defect resulting from a carcinoma excision.

2 | CASE REPORT

An 84-year-old male with a medical history of diabetes mellitus, hypertension, hyperlipidemia, and a previous scalp and face MMS surgery within the year presented to the otolaryngology clinic for evaluation of a scalp lesion. The patient reported a progressive enlargement of the scalp lesion over 2 months following the MMS. At the time of evaluation, there was a 2 × 2 cm exophytic lesion with central ulceration on the left parietal scalp. A biopsy performed at the time of this initial evaluation confirmed the presence of invasive squamous cell carcinoma in the setting of severe solar elastosis.

Surgical extirpation was performed, creating a 5 × 7 cm defect (35 cm^2) that extended down to the level of the galea. Margins were checked to ensure removal of the carcinoma. Reconstructive options were discussed with the patient, including: healing by secondary intention, skin grafting, rotation advancement flaps, and the use of vCPM (Grafix PRIME®; Osiris Therapeutics, Inc). The patient's preference to not undergo general anesthesia limited the possibility of pursuing repair options such as, autologous skin grafting or advancement flaps and further, the size of the wound was too large for repair to be performed in the office. Based on these considerations, the physician elected to use vCPM.

vCPM is aseptically processed from donated human placental tissue following rigorous quality assurance standards. vCPM is a minimally manipulated tissue allograft indicated for use as a cover for acute and chronic wounds without restriction to etiology or location. vCPM naturally conforms to complex anatomies and may be used over exposed structures such as bone and tendon.[11]

Twenty-three days after the tumor excision, reconstruction of the defect was undertaken. At the time, the defect was beginning to show signs of granulation but still measured approximately 5 × 7 cm (35 cm^2) (Figure 1A). Prior to the first application of vCPM, the area was infiltrated with local anesthetic, and the wound base was sharply debrided. vCPM was placed on the wound in direct contact with the galea. To thaw vCPM, the cryobag was removed from the heat-sealed pouch and placed into room temperature sterile saline. Once thawed, the graft was removed from the pouch and placed into a second sterile basin with saline to rinse. After rinsing, the graft was removed from the plastic backing and placed onto the wound. The 5 × 5 cm vCPM graft was covered by Adaptic® (Systagenix) nonadherent dressing secured with Steri-Strips (3M™), followed by sterile gauze over the site. The patient was instructed to keep dressings dry and intact, but no further wound care was required.

The patient returned to the clinic on day 7 after the first vCPM application. The previously placed dressings were removed, and a second 5 × 5 cm vCPM graft was placed on the now fully granulated wound (Figure 1B). No additional grafts were required based on wound appearance.

The patient returned on day 14, at which time the defect had reduced to approximately 3 × 5 cm (15 cm^2) and substantial re-epithelialization was noted. Based on the appearance of the wound, a third application was not deemed necessary.

At the day 21 follow-up, the patient's wound had completely closed with minimal scarring (Figure 1C). Six months following treatment, the wound remained closed with continued improvement in the hyperemia (Figure 1D). The patient experienced no complications and was very pleased with the outcome.

3 | DISCUSSION

The results from this case suggest that vCPM may provide an alternative solution for management of large chronic scalp wounds with exposed structures. In this case, the patient achieved complete wound closure in 21 days post-vCPM application.

Two commonly used reconstructive methods for scalp wounds postexcision are flaps and skin grafts. Split-thickness skin grafts (STSG), specifically, are often used for large surgical defects and defects with a high risk of tumor recurrence when a wound cannot be closed by primary intention.[3] During the harvesting of a skin graft, its vascular supply is also separated. The success of skin grafts is dependent on the re-establishment of vascularity at the recipient site. Often, skin grafts do not survive when placed over exposed structures such as bone and tendon as a result of the poorly vascularized wound bed.[2]

Regional skin flaps and free tissue transfers are also frequently used to treat large surgical defects as they provide immediate coverage over exposed structures. These are single-stage treatment options that are not as heavily dependent on vascularity of the recipient site as skin grafts. These procedures, however, can be associated with significant donor-site morbidity and longer operative times making them not feasible for patients with significant comorbidities and advanced age that may not be suitable for surgery.[3]

In recent years, skin substitutes have also been used in the treatment of complex wounds. A dermal regeneration template

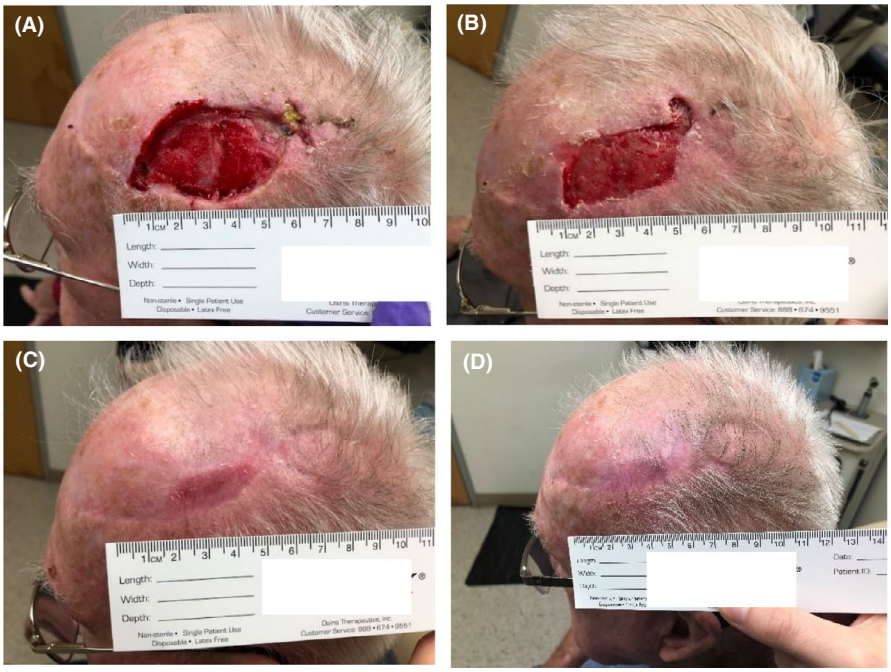

FIGURE 1 Wound progression starting at (A) first application of vCPM (day 0), (B) second application of vCPM (day 7) with granulation tissue formation, (C) complete closure (day 21), and (D) 6 mo postclosure

(DRT) (INTEGRA™, Integra LifeSciences Coporation) has specifically been used in complex scalp defects. A 2019 literature review looked at the outcomes of DRT in the reconstruction of full-thickness scalp defects from 15 previously published articles. Twelve of the 15 articles reported a graft take of greater than 90%.[12]

The majority of DRT cases, however, require a 2-staged surgical approach. The main goal of therapy with DRT application is to form a neodermis. Once the neodermis is present, the silicone later of the DRT is removed and an STSG can be applied to the wound. This typically occurs 21 days after DRT application but can vary based on wound bed response.[12] Though the outcomes based on limited published data are relatively positive, the 2-stage reconstruction does not make this a feasible treatment option for medically compromised patients.

vCPM, a newer commercial skin substitute, has also been used in the treatment acute and chronic wounds of various etiologies and severity. Frykberg et al evaluated the outcomes of vCPM plus SOC in the treatment of chronic, complex diabetic foot ulcers (DFUs).[9] Ninety-six percent of patients achieved the primary endpoint of 100% granulation, and 59% went on to achieve complete closure by the end of the 16-week treatment period. No vCPM-related adverse events (AEs) were reported during this study. Suzuki et al also evaluated the use on vCPM in the nonsurgical management of 12 complex wounds consisting of surgical dehiscence wounds, pressure ulcers, and chronic wounds. All wounds achieved granulation followed by complete wound closure in an average of 10 weeks.[10] Both of these studies showed positive outcomes with vCPM without the need to use other concomitant therapies such as negative pressure wound therapy (NPWT) or hyperbaric oxygen (HBO), nor were any additional surgical procedures required.

vCPM comes in various different sizes to accommodate wounds as they progress toward closure. The cost of a 5 × 5 cm vCPM graft, the size that was used in this case, is $3,000. The cost of a similarly sized 5.1 × 5.1 cm meshed DRT, which is the smallest size offered, is around $3500. Additionally, application of DRT typically takes place in the operating room (OR) and requires a two-stage surgical approach which drives up the cost of treatment. vCPM, on the other hand, can be applied in the outpatient setting without the need for multiple surgical procedures. This suggests a potential cost benefit to using vCPM vs DRT.

Rapid and durable wound closure was achieved with the use of vCPM as an adjunct to SOC in the management of a large complex wound with exposed bone in an elderly patient with multiple comorbidities. The outcome of this case study, along with previously published data, supports vCPM use for the management of complex wounds in patients with multiple comorbidities who are poor candidates for surgical procedures.

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CONFLICT OF INTEREST

MCS is currently an employee of Osiris. TT is a former employee of Osiris.

AUTHOR CONTRIBUTIONS

TAF: involved in conception and design of this case report, collection and assembly of case, critical revision of the article

for important intellectual content and final approval of the article. TT: involved in assembly of case, drafting of the article, in critical revision of the article for important intellectual content. MCS: involved in drafting of the article and critical revision of the article for important intellectual content.

PATIENT CONSENT

The patient gave consent in writing for data concerning this case to be submitted for publication.

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