



Case report

A RARE CASE OF EXTERNAL EAR SKIN PLASTY WITH XENOGENIC BOVINE COLLAGEN MEMBRANE AND PLATELET-RICH PLASMA

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ABSTRACT

This case report highlights the successful management of a skin defect on the ear concha using a xenogenic bovine collagen membrane and platelet-rich plasma (PRP) following the excision of basosquamous carcinoma in an 89-year-old male patient. The collagen membrane, softened in saline, was precisely adapted to the defect and secured to the underlying cartilage. PRP was prepared using a double-spin centrifugation method and applied to enhance tissue regeneration. Histopathology confirmed complete excision of the carcinoma. Postoperative follow-up revealed excellent integration of the membrane, no complications, and no recurrence over one year. The case demonstrated the synergistic benefits of bovine collagen membranes and autologous PRP in restoring small post-operative skin defects, underscoring the potential for expanded applications in dermatologic surgery. Further research is recommended to assess the efficacy in larger defects and refine protocols for broader clinical use.

Keywords: collagen membrane, basocellular carcinoma, basosquamous carcinoma, skin plasty, skin defect, autologous platelet concentrates, platelet-rich plasma,

BACKGROUND

In recent years, barrier membranes and autologous platelet concentrates (APCs) have been increasingly used both in maxillofacial surgery and in head and neck surgery on a daily basis.

The use of barrier membranes is an effective way of treating acquired skin defects. They protect the wound from infection, reduce pain sensations, and stimulate cell migration and proliferation [1]. They are produced from various biomaterials such as autogenous soft tissue grafts, synthetic materials (polymers), and natural materials such as chitosan and collagen [2].

Collagen is the most abundant protein in vertebrates and is involved in the structure of skin, ligaments, tendons, and bones. As a biomaterial, it is biocompatible, bioactive, and has low immunogenicity, which makes it extremely suitable for tissue engineering and regenerative medicine - including in the form of membranes to cover skin defects [4].

Autologous platelet concentrates (APCs) are a group of regenerative products prepared from autologous blood that contain concentrated bioactive factors [4]. They are divided into four groups according to their composition: platelet-rich plasma (P-PRP - pure platelet-rich plasma), leukocyte and platelet-rich plasma (L-PRP - leukocyte and platelet-rich plasma), platelet-rich fibrin (P-PRF - pure platelet-rich fibrin), leukocyte and platelet-rich fibrin (L-PRF - leukocyte and platelet-rich fibrin) [5].

PRP is an increased concentration of autologous platelets in a small volume of plasma as a result of blood

centrifugation. The clinical application of PRP accelerates healing processes and improves hemostasis in bone and soft tissue defects [6].

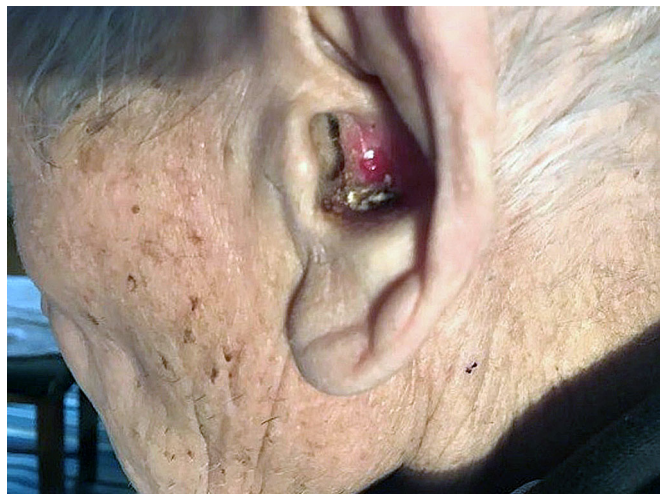
The aim of this case report is to present a clinical case of successful restoration of a skin defect on the concha of the ear after the excision of a basosquamous carcinoma in a male patient by the application of bovine collagen membrane and the application of P-PRP.

CASE DESCRIPTION

This case report discusses an 89-year-old Bulgarian patient who, in late 2021, sought treatment from a maxillofacial surgeon at a specialized outpatient clinic in Varna, Bulgaria, due to a skin tumor on the left ear that had developed approximately 18 months earlier and bled easily upon contact.

The clinical examination identified a painless, slightly elevated skin lesion in the concha of the left ear. The lesion had a red-brown hue, measured approximately 1.5 cm in diameter, and was partially covered with brown-black crusts (Fig. 1). An incisional biopsy was performed, and the results confirmed that the lesion was a basosquamous carcinoma.

Fig. 1. Preoperative photograph of the concha of the left ear involved in the tumor process



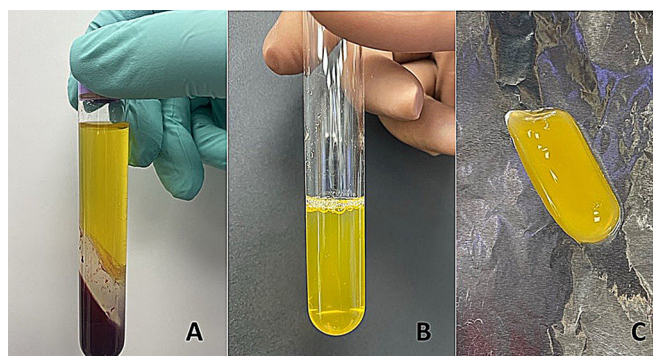
In January 2022, under local infiltration anesthesia with a mixture of Lidocaine and adrenaline (1:100,000 for hemostasis), the skin tumor was excised with clear margins, extending to the ear cartilage. The specimen was then sent for histological analysis (Fig. 2).

Fig. 2. Intraoperative photograph of the skin defect of the concha of the left ear, the acquired skin defect after the excision of the tumor formation.



Intraoperatively, 8 milliliters of venous blood were obtained from the patient's ipsilateral cubital vein via venipuncture. The blood was transferred to a vacutainer containing a separating gel and then centrifuged using a double-spin method with a laboratory centrifuge (EBA20, HettichLab, Germany). The first spin was at 3500 rpm for 10 minutes, followed by a second spin at 1900 rpm for 5 minutes. The resulting "buffy coat" (rich in platelets) and a portion of the plasma (3 ml in total) were combined with 1 ml of calcium gluconate. The PRP gel was activated and formed within 20 minutes (Fig. 3) [7].

Fig. 3. PRP preparation: (A) after the first centrifugation, (B) after the second centrifugation, and (C) activated PRP-gel



The skin defect on the concha of the left ear, following the surgical procedure, was treated using a bovine collagen membrane measuring 30x20x0.7 mm (Salvecoll®, Italy). The membrane, initially rigid, was pre-soaked in sterile 0.9% saline at room temperature for five minutes to soften it. A piece matching the size and shape of the skin defect was then cut and carefully fitted to the underlying cartilage of the left ear. The membrane was secured in place with non-resorbable polyfilament sutures (Fig. 4).

Fig. 4. Intraoperative photograph of the management of the skin defect of the left ear concha using collagen bovine membrane.



Histopathology examination revealed a tumor of mixed basal cell and squamous cell differentiation signed out as basosquamous carcinoma (Fig. 5, 6).

Fig. 5. Tumor nest of atypical basaloid cells with limited peripheral palisading and desmoplastic stroma. (H&E, 20x)

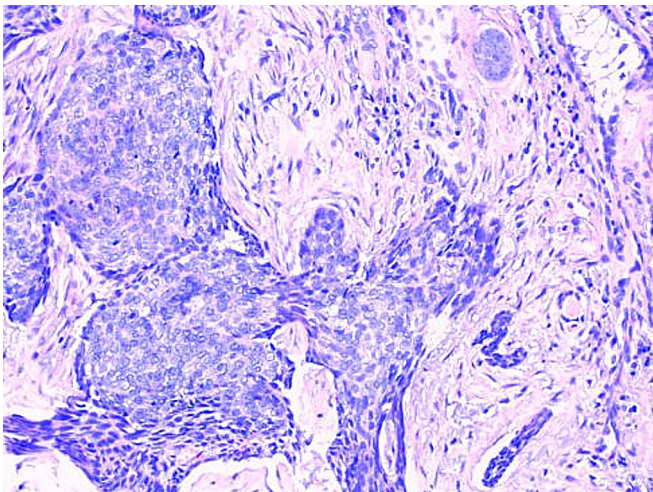
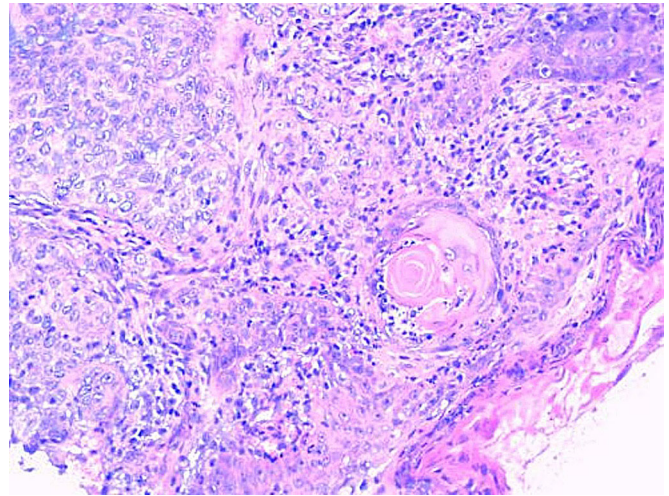


Fig. 6. Focus on tumor areas with higher-grade nuclear characteristics and focus on keratinization. (H&E, 10x)



The postoperative period was uneventful, with no significant complaints from the patient. The sutures were removed on the seventh day after surgery, by which time the membrane had fully integrated with the surrounding skin. A one-year follow-up showed no complications, complaints, or signs of recurrence.

DISCUSSION

Primary reconstruction is the preferred approach for treating full-thickness skin wounds. Various techniques are available for this purpose, including skin grafts for partial thickness wounds, local tissue flaps, and microvascular anastomosis for free skin grafts. To minimize donor site complications, such as limited tissue volume and postoperative morbidity, alternative strategies like the use of dermal substitutes have been proposed. The primary structural components of the dermal matrix are type I and type III collagen. Collagen matrices, designed for regenerative medicine, encourage controlled fibroblast migration into the wound site, reduce tissue shrinkage, and minimize scar formation [9]. Numerous studies in both human and animal subjects have demonstrated the successful application of collagen matrices for regenerative purposes [8, 9, 10].

Collagen membranes are resorbable (with a resorption rate that aligns with tissue growth), porous, and bioactive materials, which successfully support cell growth and promote wound healing [2, 3]. The most commonly used collagen membranes are derived from bovine, equine, and porcine origin, with marine-derived products also gaining popularity in recent years [9].

While positive outcomes from collagen membrane application have been reported, the lack of standardization in their production—due to varying derivatives, extraction methods, and chemical fixatives—complicates the comparison of published results [2]. The precise mechanisms by which collagen membranes facilitate skin wound healing are not fully understood. Some studies suggest that these membranes act as a barrier against infection, attract fibroblasts to the wound area, stimulate epithelialization, and modulate the inflammatory response [11].

Recently, autologous platelet concentrates (APCs) have become increasingly popular in oral and maxillofacial surgery due to their ability to deliver bioactive molecules directly to injured tissues, optimizing the conditions for regeneration [12]. APCs contain growth factors, matrix proteins (such as thrombospondin-1, fibronectin, and vitronectin), glycosaminoglycans (e.g., heparin and hyaluronic acid), and regulatory cytokines that enhance tissue regeneration potential [11]. Platelets release alpha granules upon activation, which stimulate cell migration. These granules release growth factors, including transforming growth factor- β , insulin-like growth factor, fibroblast growth factor, epidermal growth factor, tumor necrosis factor- β 1, platelet-derived growth factor, vascular endothelial growth factor, and human recombinant growth factor, among others [13, 14].

Growth factors released by platelets support wound healing through all stages of inflammation, proliferation, and remodeling [15, 16]. The objective of plasma therapy is to accelerate tissue regeneration, promote angiogenesis,

minimize fibrosis, and restore normal tissue structure and function. Several studies have reported excellent outcomes from using platelet-rich plasma (PRP) in skin defect management [17, 18]. The high success rate of PRP in skin grafts is likely due to its hemostatic, adhesive, antibacterial, and regenerative properties. PRP administration helps reduce hematomas at the recipient site, improve graft adhesion, and promote angiogenesis [18].

Recent studies have also highlighted the successful use of collagen products, autologous platelet concentrates, and their combinations in managing skin and mucosal defects, including those resulting from tumor resections [8, 19].

This clinical case demonstrates the successful use of these tissue-regenerative materials in treating small postoperative skin defects (up to 2 cm). Further research is needed to assess their effectiveness in larger defects and to provide a better understanding of the advantages and limitations of these methods.

CONCLUSION

The combined application of bovine collagen membranes and platelet-rich plasma demonstrates successful regeneration of a postoperative skin defect in the external ear with excellent integration and healing outcomes. These materials have been widely used for tissue regeneration in different medical fields and have demonstrated promising results. Further research is warranted to validate their efficacy for larger skin defects and explore their broader applications in dermatologic surgery.

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