MEDWIN PUBLISHERS
Committed to create value for Researchers

Journal of Embryology & Stem Cell Research
ISSN: 2640-2637

Skin Substitutes. Can these be combined? (Review)

Prezzavento G*

Chief of Plastic and Reconstructive Surgery Service, Hospital Aleman, Buenos Aires, Argentina

***Corresponding author:** Prezzavento Gustavo, Chief of Plastic and Reconstructive Surgery Service, Hospital Aleman, Buenos Aires, Argentina, Tel: 4821-3588; Email: prezzavento.gustavo@gmail.com

Mini Review

Volume 2 Issue 1

Received Date: February 26, 2018

Published Date: March 06, 2018

DOI: 10.23880/jes-16000104

Mini Review

Skin substitutes were developed as an alternative to skin grafts, especially for trauma patients, during the 1980´s.The understanding of the skin components has served as a basis for the development of numerous cutaneous substitutes. A true "skin substitute" would act like an autologous skin graft in adhering to the wound bed while providing the physiological and mechanical functions of normal skin.

Wound healing is a dynamic process whereby cells, growth factors (GFs), and the extracellular matrix (ECM) interact to restore the architecture of damaged tissue. Trauma wounds can be difficult to treat due to the increased presence of inflammatory cells that degrade the ECM, Growth Factors (GF), and cells that are necessary for wound healing to occur.

The healing of traumatic wounds requires the restoration of multiple factors that normally work in concert to repair the damaged skin barrier. Skin substitutes have shown great promise for use providing cells, soluble mediators, and extracellular matrix materials needed to stimulate healing. Based on this knowledge, we examine different approaches to repair extensive trauma injuries with matrices and scaffolds. These advances will undoubtedly improve quality of healing.

Over the past 30 years, skin substitutes products have been successfully applied in the treatment of wounds. Therefore, it is suggested that not only one material meets all the requirements for a skin substitute. This review aims to be a valuable directory for researchers in the field to find the optimal combination of materials based on their specific application.

In the last two decades, tissue-engineered skin constructs have shown great promise in the treatment of various skin-related disorders such as deep burns and wounds. The different methods for skin replacement and repair have improved to more complex double-layered cutaneous tissue engineered skin substitutes. These matrices provide cells, GF, and other key elements that act as a scaffold and promote reepithelialisation and revascularization of the wound bed.

The cadaver skin or homograft, was for the first time included in Protocols in the year 1981 in Philadelphia, United States. The processing of skin bank allows obtaining a substitute; however, the potential of this substitute depends on how it is processed and if it can be used in a transitory or definitive tissue. The dermal homografts acellular, as described by Takami, originated from cadaver skin and required a previous treatment to remove cells and achieve the acellular tissue decreasing the probability of graft rejection. This treatment consists of the ablation of the skin in cadaver, its processing and subsequent irradiation with gamma rays to destroy the immunogenic potential of tissue.

Artificial skin (Integra) has become the treatment of choice in extensive, full-thickness trauma injuries. The longest follow-up of the healing process in burn sites covered with the Integra Bilayer Matrix Wound Dressing onto the wound. The artificial skin developed by Burke and Yannas consists of a three-dimensional heterologous dermal structure formed by bovine collagen type I and Glycosaminoglycans (Condoitín-6-sulfate) of shark cartilage coated with a sheet of temporary silicone that makes a temporary epidermis. This substitute type, incorporated the concept of heterologous matrices to

form a neodermis or new extracellular matrix with the combination between irradiated skin bank and bilayer matrix Integra, cosmetic and functional results were satisfactory. Histological analysis performed showed a double-layered skin composition with changes in the fibrous component of the dermis.

Vacuum therapy (VAC) improves wound handling through two main mechanisms. After the initial injury an inflammatory process is generated from the damaged tissue initiating a vicious cycle with increased interstitial edema and pressure with cell death and necrosis. With the vacuum therapy a sub atmospheric environment is created by acting on the interstitial level eliminating edema, inflammatory mediators and bacteria. In addition, VAC promotes mitogenesis and granulation tissue. Negative pressure wound therapy can provide a moist healing environment while removing unwanted exudates from the wound bed and can effectively promote adherence of grafts to the recipient wound base.

The uses of skin substitutes added to the vacuum therapy have been incorporated into the "modified ladder of Reconstruction".

At the Plastic and Reconstructive Surgery Service of the Deutsch Hospital, we studied the combination of skin substitutes to evaluate the attachment, "filling", functional and esthetical result in patients with severe trauma in lower limbs. The patients presented lesions of third-degree. The average extension corresponded to 30%.

The combination of early escharectomy, placement of irradiated cadaver skin and subsequently artificial skin; uses at all stages vacuum system in the same hospitalization.

After escharectomy to fascia of the areas involved in lower limbs of patients, we covered the areas with irradiated cadavers skin. Along the week that the cadaver skin is placed, we observed the epidermolysis and vascularization of the homologous dermis. Subsequently, on the dermis homologous vascularized, we applied artificial skin (Integra) and then used a thin autograft placing it on the double neodermis. At all stages, vacuum system was used. High percentage of attachment of homograft was 95% and 94% for the heterologous matrix with fine auto graft. With a year of follow-up both the functional and aesthetic results were satisfactory without evidence of pathological scar.

Due to the combination of skin substitutes in the same patient, it was possible to observe less hypertrophic scars, better articular function and contributing to the volume, by decreasing the "step" after the escharectomy. The concept we have developed is not only "for rebuilding", but also for providing the patient with a better functional and aesthetic result of the area repaired with the least number of surgeries. Biotechnological development allows us to use the products developed, but also in certain patients to "combine" these substitutes and obtain a better evolution of the wounds.

The combined use of cadaver skin and artificial skin are not exhaustively studied. They improve the aesthetic and functional results in post-traumatic reconstructive surgery, achieving an ad-integrum recovery of the affected areas with improvement of the quality of patient's lives.

Copyright© Prezzavento G.