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Role of Collagen Scaffold in Adult Thermal Burns

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Abstract

The role of biological scaffold in the treatment of wounds has been widely used owing to its role in reduction of incidence of contracture and also improving the outcome in terms of wound bed preparation and post trauma scarring. Plenty of evidence is available regarding the same in literature. Here, in our study, we are evaluating the efficacy of use of a collagen scaffold in the treatment of thermal burns.

Keyword: Collagen scaffold; Thermal burns; Wound bed.

INTRODUCTION

Burns are among the most devastating of all injuries, with the spectrum of outcomesoutcomes spanning from physical impairments and disabilities to emotional and mental consequences.[1] Majority of burns are caused by thermal energy including scalding and fires, and minority being caused by exposure to chemicals, electricity, ultraviolet radiation, and ionising radiation. Globally, fire-related burns are responsible for about 265,000 deaths annually[1]. Over 90% of fatal fire-related burns occur in developing or low and middle-income countries (LMICs) with South-East Asia alone accounting for over half of these fire-related deaths.[1]

History goes to 2000 years ago when surgeons already used collagen-based materials as skin or intestine to close wounds and for reconstructive surgery. However, only the past 50 years brought a more frequent use of collagen as medical product because technologies of intensive cleaning and sterilisation procedures were developed.[4] Applications among others are wound closure, treatment of burns, haemostasis, hernia repair, repair of bone and cartilage defects, as well as various dental applications including guided bone repair.[3,4,5]

In tissues collagen is the scaffold material which provides an optimal environment for physiologically highly active cells and cellular components. Therefore, recent developments focus on the decellularisation of organ parts or whole organs, maintaining the tissue architecture followed by recellularization to overcome the high need of organs for organ transplantation. Important progress is also expected by using collagen based bioinks which can be combined with live cells and

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which are formed into 3D structures.[3-5] Despite the hypothetical possibility of anaphylaxis and immune related responses to collagen, the aim of our study is to evaluate the effectiveness of collagen scaffold in the treatment of thermal burns for wound bed preparation and its outcomes.

MATERIALS AND METHODS

This study was conducted in tertiary care centre in department of plastic surgery after getting the department ethical committee approval. Informed consent was obtained for examination and clinical photography. The subject was 23 years old female with history of thermal burns which included second degree deep and superficial burns of 20% body surface area involving bilateral lower limbs (Fig. 1). Patient presented to our casualty with burns history for further management. Appropriate treatment was start and serial dressings with collagen scaffold was usedin three setting, three days apart for wound bed preparation. Post wound bed preparation skin grafting was done.

Fig. 1: Pre collagen scaffold application.

Fig. 2: Collagen scaffold application

RESULTS

After application of serial dressings with collagen scaffold, in our study, we were able to reduce time taken for healing of burns area and prevent contracture and scaring to some extent. (Fig. 3). Scaffold helped in the wound bed preparation and aided early skin grafting.

No adverse local or systemic effect noted with use of collagen scaffold.

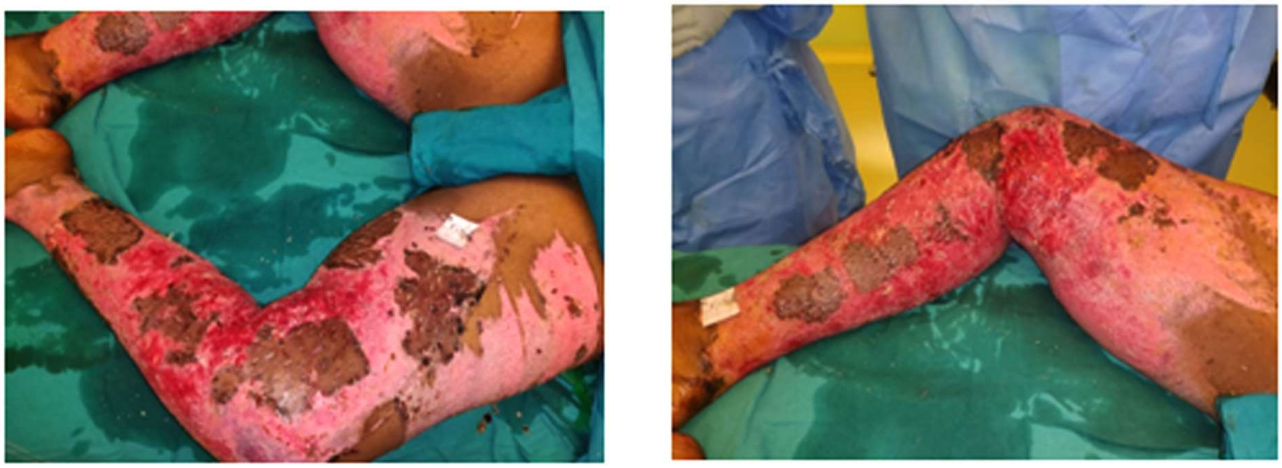

Fig. 3: Skin grafting post three sitting of collagen scaffold application for wound bed preparation.

DISCUSSION

Burn injuries are very common and afflict approximately 1% of the population yearly. They are a source of heavy medical burden to medical systems worldwide. Morbidity and mortality are decided by factors like: total body surface area (TBSA) involved, the anatomical location, depth of burn,, the age of the subject, prior medical history involvement of other systems (especially airway injury).[6]

Biological scaffold, here collagen scaffold, is a structure that serves as a substrate and guide for tissue repair and regeneration. Currently, biological scaffolds have become an important tool inregenerative medicine. Along with structural support, they also have found to have inherent properties that promote cellular proliferation and differentiation.[5] Mechanism by which it acts isproviding a support matching the original extracellular material in terms of its mechanical properties. They also promote specific cellular lineage regeneration and differentiation by using the principle of durotaxis.[8] Scaffold use has proven to inhibit wound contraction and itssequelae which include scarring. They help in the preparation of wound bed. The disadvantages encountered are related to the fact that these biologic materials are typically allogeneic or xenogeneic in origin and are derived from tissues such as small intestine, urinary bladder, dermis, and pericardium of lower mammals.

The innate and acquired host immune response to these biological scaffolds has been largely unexplored. However, pertaining to our study, no adverse effects were encountered and the results obtains were at par with our expectation.

CONCLUSION

We have foundthat collagen scaffold has been very useful in management of thermal wounds for wound bed preparation but requires large scale randomised trials for large scale application to explore the potential of the same in thermal burns.

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