بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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MONA MAGHRABY

Effect of platelet-rich fibrin on donor site of Split thickness skin graft in burn patients

Thesis

Submitted for partial fulfillment of master degree in plastic and maxillofacial surgery

By

Mina Rofaeel Sedky Senada
M.B., B.Ch.
Faculty of Medicine, Assuit University

Supervised by

Prof. Dr. Sameh El Taher Abd El Rahman
Professor of Plastic, Burn and Maxillofacial surgery
Faculty of Medicine – Ain Shams University

Prof. Dr. Mohamed Ahmed Amin Saleh
Professor of Plastic, Burn and Maxillofacial surgery
Faculty of Medicine, Ain Shams University

Prof. Dr. Ghada Galal Hamam
Professor of Histology and cell biology
Faculty of Medicine, Ain Shams University

Dr. Niveen Fathy Al – Mahmoudy
Ass prof .of Plastic, Burn and Maxillofacial Surgery
Faculty of Medicine, Ain Shams University

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Candidate

Mina Rofaeel Sedky Senada

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Abbr.		Full term
B cells	:	B lymphocytes
CGRP	:	Calcitonin gene-related peptide
ECM	:	Extracellular matrix
EGF	:	Epidermal growth factor
EMT	:	Epithelial-mesenchymal transition
H&E	:	Hematoxylin and Eosin
HGF	:	Hepatocyte growth factor
HIF1	:	Hypoxia inducible factor-1
IL-1	:	Interleukin-1
MSC	:	Mesenchymal stem cell
PDGF	:	Platelet-derived growth factor
PRF	:	Platelet rich fibrin
PRP	:	Platelet-rich plasma
SP	:	Substance P
STSGs	:	Split thickness skin grafts
SVF	:	Stromal vascular fraction
T cells	:	T lymphocytes
TGF-β	:	Transforming growth factor beta
TPRA1	:	Transient potential receptor ankyrin 1
TPRV1	:	Transient potential receptor vanilloid 1
VEGF	:	vascular endothelial growth factor

INTRODUCTION

Skin grafting is one of the oldest and most common procedures in plastic surgery, and the treatment of skin donor sites has been an important issue for decades **(Golas et al., 2014).**

Split thickness skin grafts (STSGs) contain the entirety of the epidermis and a variable amount of dermis depending on the thickness of the harvested graft **(Danielsen et al., 2008)**. This procedure creates a wound in the donor site which usually takes between 14 and 21 days to spontaneously heal with relatively inconspicuous scarring **(Hotwani and Sharma, 2014)**. STSG donor sites can develop complications such as poor scar formation, with changes in skin color and texture **(Somani and Rai, 2017).**

Improved resuscitation and treatment for burn patients have led to an increased survival for patients with large, burned areas, which may involve most of the entire body surface. In some patients, it is necessary to harvest subsequent skin grafts from the same donor site, which is limited by skin quality and healing times; this process can consume a considerable amount of time and may increase the risk of bacterial contamination thereby, increasing the morbidity and mortality of these patients. Hence, it is important to reduce the time between grafting. Based on these characteristics, the foremost objectives of an adequate treatment

of the donor site include relieving pain, accelerating healing, and preventing infection **(Mecott-Rivera et al., 2018).**

Reported epithelialization times of STSG donor sites vary among studies, which is probably because of numerous unreported variables and factors affecting the healing rates. The reported mean time for epithelialization for a STSG donor site that is treated with paraffin impregnated gauze is 12.79days **(Singh et al., 2012).**

In general, moist dressings are more effective in reducing healing times and pain relief, making them the preferred choice for most cases **(Broughton et al., 2006).** Other more modern dressings, such as hydrocolloid, transparent film, and calcium alginate dressings, have demonstrated faster healing times **(Kamoun et al., 2017).**

Although modern dressings have shown substantial improvements, new potential treatments and technologies frequently emerge, one of the promising, but complicated areas of recent therapeutic development involve topical application of growth factors to enhance the normal healing process **(Zarei and Soleimaninejad, 2018)**.

Platelets contain large amounts of major growth factors, such as platelet-derived growth factor (PDGF), transforming growth factor (TGFβ) vascular endothelial growth factor (VEGF)

and insulin-like growth factor **(Danielsen et al., 2008).** These factors can stimulate cell proliferation, matrix formation, and angiogenesis.

Currently, two platelet concentrates are used: platelet-rich plasma (PRP) and platelet rich fibrin (PRF). Both PRP and PRF are sources of various growth factors, and they promote soft tissue healing **(Etulain, 2018).** Platelet-rich fibrin (PRF) is the second generation of platelet condensation, first introduced by Choukroun in 2001 **(Ehrenfest et al., 2010).**

PRF does not require the anticoagulant solution, in contrast to platelet-rich plasma (PRP) **(Giraldo et al., 2015).** Moreover, other benefits of PRF over PRP include slow polymerization and better improvement in PRF, cost-effectiveness, and easy preparation (**Vaheb et al., 2021).** Compared with PRP, PRF shows not only the ability to release higher concentrations of different growth factors, which results in more fibroblast migration, but also shows expression of platelet-derived growth factor, transforming growth factor-β, and collagen **(Demidova-Rice et al., 2012)**.

PRF has also fibrin characteristics with platelet distribution that is more similar to the body's response to the wound and bending macroscopic structures. The process involves a three-dimensional formation of fibrin matrix, which act as a scaffold for

platelet clot formation and gathering of growth factors which helps to localize growth factors to improve tissue regeneration **(Gassling et al., 2013).**

The use of PRF has several advantages such as increasing the activation of gene expression and protein production. In addition, differentiation factors also affect platelet activation. These factors regulate and stimulate the healing process and play an important role in cellular processes, such as mitogenesis, chemotaxis, differentiation, and metabolism **(Reksodiputro et al., 2018).**

To the best of our knowledge, this is the first study on the effect of using injectable PRF in wound care for the donor area of a skin graft in burn patients. PRF was used as a GEL for dressing in previous studies for donor site of STSG **(Danielsen et al., 2008; Vaheb et al., 2021).**

AIM OF THE WORK

To evaluate the effect of PRF in accelerating wound epithelization in the donor site after STSG harvesting.

WOUND HEALING

Skin is composed of epidermis which contains keratinocytes, melanocytes, dendritic cells, Langerhans cells and other immune cells, sensory axons, and the epidermal-dermal basement membrane **(Pasparakis et al., 2014).**

The dermis which has the skin appendages, mast cells, fibroblasts, antigen presenting dermal cells, resident and circulating immune cells. Additionally, the dermis includes the extracellular matrix complex that provides support to intercellular connections, cellular movement, and regulates cytokine and growth factors' functions **(Rousselle et al., 2019).**

Among all these structures, the epidermis is the part being restored during the reepithelialization process. Other components of the skin such as the dermis and skin appendages also have important supporting roles in the reepithelialization process as they provide nutritional and mechanical support and supply progenitor cells for the restoration of the epidermis **(Rittié, 2016)**.

Skin grafting is a component of the reconstructive ladder designed to close defects in both acute and chronic, burn and traumatic wounds **(Janis et al., 2011).**

A partial-thickness or split-thickness skin graft **(STSG)** involves excision of the epidermis and varying thicknesses of