

Burn Treatment and Tissue Engineering of the Skin

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Abstract—when treating burn victims, skin grafts use undamaged cells or *ex vivo* cells to replace damaged cells while MEBO is an ointment used to treat damaged cells.

I. INTRODUCTION

THE treatment of burns has always been a difficult medical problem. Since WW1, treatment has consisted of excising the necrotic tissue and taking slices of healthy skin from other places on a patient's body (often the thighs), stretching it out and suturing it onto the burned region. If the skin grafts took, this method of burn treatment dramatically reduced deaths from infection and allowed burn victims to look a lot less disfigured. However, grafting does not come without its difficulties. Patients have to undergo years of therapy to help stretch their new grafted skin out to allow a full range of motion, and many patients still suffer from chronic pain. The goal of tissue engineered skin is to improve upon the current medical technology and treatment options for burn patients. As a whole, burn treatment programs seek to heal the wounds of a burn victim while managing their pain and improving their overall quality of life.

II. METHODS

There are a few different directions that tissue engineering research is taking burn treatment. One is improving techniques for skin grafting. On some patients 90% or more of their total body surface area is burnt, and grafting from their own undamaged flesh is not an option. Doctors have been able to grow sheets of human epidermal tissue *ex vivo* since the 1970's. This involves culturing a patient's healthy skin cells and growing them in a suspension of nutrient rich fluid. Current tissue engineering researchers are trying to improve upon this. As of now, these sheets of human epidermal cells are very thin and fragile. New techniques could use stem cells to build a denser array of epidermal tissue on top of a Gore-Tex or microfiber scaffold. These thicker layers of tissue could theoretically allow the patient to heal more completely quickly.

Another technique for burn treatment is the MEBO system developed by Professor Xu Rong Xiang in China. Moist Exposed Burn Ointment is part of Xiang's Moist Exposed Burn Treatment method. MEBT takes a different stance than the conventional burn treatment of excision and grafting. Instead of looking at the burn as a defective piece of the human body he considered the body as more of a whole system. With this idea the best way to heal the body is to simply provide the best possible circumstances for the body to heal and regenerate, something which was previously considered almost impossible because of the severe damage to tissue that burns can cause. MEBO is an ointment containing only natural ingredients. A layer of this ointment applied to an

open burn promotes the growth and reproduction of the healthy skin cells around the burn while liquefying and sloughing off the necrotic tissue. The ointment keeps the wound moist and in prime condition to heal naturally with minimal scarring.

III. RESULTS

MEBO is a proven natural product which, when treating various burns, accelerates healing, inhibits bacterial growth, has analgesic effects, and prevents scarring of wounds. The wounds heal between 2-7 days on average and can relieve pain in 10 minutes in most cases. There is no scar or color generated from the use of this treatment. It is practiced in over 20 countries and used by at least 20 million patients.

IV. DISCUSSION

The future of burn treatment and tissue engineering of the skin can be seen in the "skin gun" developed by Jörg C. Gerlach of the Stem Cell Systems GmbH in Berlin. The concept of the gun is very simple; a sample of the patient's skin cells are isolated and suspended in fluid similar to what is used to grow sheets of cultured skin. This fluid, now containing skin stem cells, is then atomized into a fine mist through the nozzle and sprayed directly onto the site of the burn. While the device is still in testing, it has shown great promise in successful trials with severe second degree burn patients.

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