Cell Yield and Viability of Spray-On Skin Suspensions in Various Age Groups

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Introduction

- RECELL® technology is used in burn surgery to create a spray-on skin solution which can be applied to burn wounds, using smaller donor sites than traditional split-thickness skin grafting (STSG).[1]
- RECELL® is also believed to improve scar outcome compared to traditional meshed STSG.[2,3]

Purpose

- Explore the relationship between patient age and percent cell viability of skin solution from RECELL® kit.

Methods

- Skin samples are taken from operating room and processed with RECELL® kit according to manufacturer instructions.
- Cells are stained with methylene blue viability assay (see **Figure 3**)
- Viable and nonviable cells are counted using hemocytometer (see **Figure 4**)
- Total cell viability counts (cells/mL) are calculated
- Percent viability of each spray-on skin suspension is determined

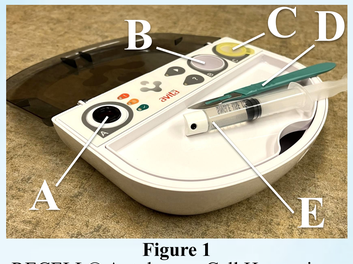


Figure 1
RECELL® Autologous Cell Harvesting Device:
A. Enzyme well
B. Buffer well
C. Cell suspension strainer
D. Scalpel for epidermal separation
E. Spray applicator

Figure 2
RECELL® spray applicator filled with skin suspension

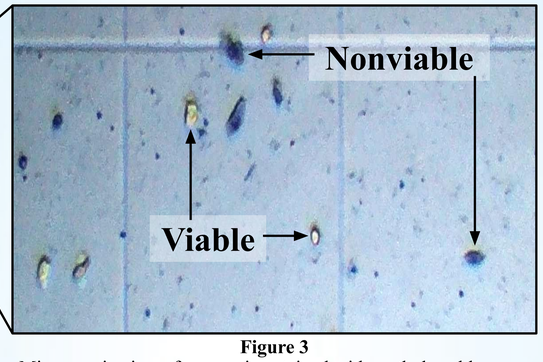


Figure 3
Microscopic view of suspension stained with methylene blue on a hemocytometer. Epidermal skin cells which appear blue are nonviable, and those which appear white are viable.

Methods

Calculating overall cell viability using hemocytometer data:

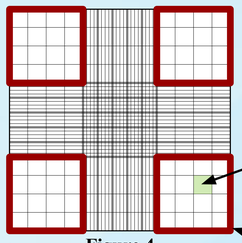


Figure 4
Hemocytometer grid layout.

$$Cell\ count = \frac{total\ \#\ cells\ counted}{4} \times 2 \times 10^4$$

Each grid square contains 10^{-4} mL

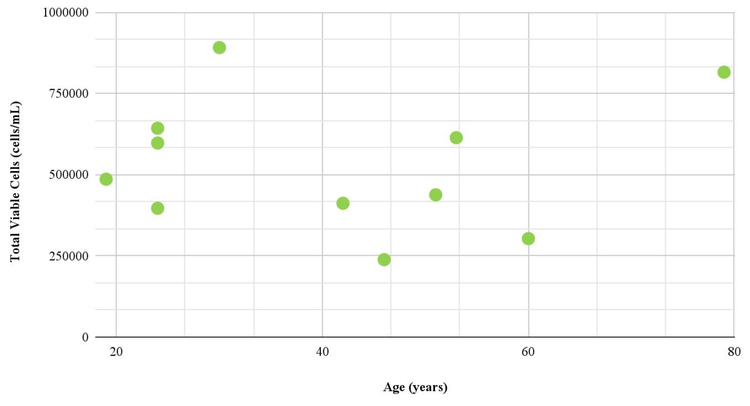
Dilution factor

Multiplication factor

Count areas highlighted in red

Results

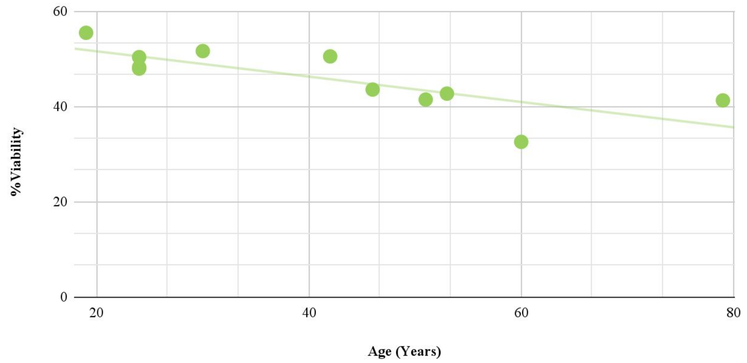
Figure 5: Total Viable Cells in Skin Cell Suspension as a Function of Age



- So far, 11 cases have been studied.
- Study will continue until 100 skin samples from different donors have been processed.
- Our findings indicate that there is no plausible relationship between age and the *overall number* of viable cells.
- The total number of cells harvested from a piece of skin is largely dependent on preparation technique, thoroughness, and experience.

Results

Figure 6: Patient Age Versus Average Percent Viability of Prepared Skin Cell Suspension



- However, the results thus far indicate that there is a negative correlation between patient age and and the *percentage* of cells which are viable in the spray-on skin suspension.
- There is a wide range of percent viability values observed so far, ranging from 32.5 % to 58.2 %.
- There is an important distinction between trends in the overall viable cell count vs. percent viability.

Discussion

- Results explain the clinical observation of slower healing of meshed skin grafts in elderly patients, which may be augmented with cell suspension treatment.[3]
- These results may be an important consideration in burn treatment.
- Patients of different age groups require different treatments to maximize their healing outcome.
- To account for the age trends in cell viability, providers should consider **applying a more dense coating of spray-on skin solution in older patients**, ensuring a sufficient quantity of viable epidermal cells cover the wound.

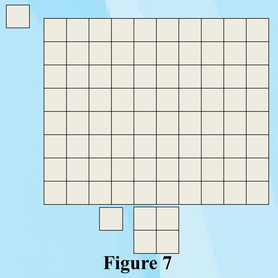


Figure 7
The expansion ratio of RECELL® is 1:80 (top) versus 1:4 in STSG (bottom)[4]

References:

1. Holmes JH. A Brief History of RECELL® and Its Current Indications. *J Burn Care Res*. 2023;44(Suppl_1):S48-S49. doi:10.1093/jbcr/irac121
2. Holmes JH, Molnar JA, Carter JE, et al. A Comparative Study of the ReCell® Device and Autologous Split-Thickness Meshed Skin Graft in the Treatment of Acute Burn Injuries. *J Burn Care Res*. 2018;39(5):694-702. doi:10.1093/jbcr/iry029
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