

**Cell–Seeded Skin Tissue Substitute: The Material Properties of Skin Tissue**

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**Abstract**

INTRODUCTION

Skin is the most abundant epithelial tissue in the body. It has higher tensile and compressive strength compared to most other epithelial tissues in the body and is frequently exposed to cyclic stress in various orientations. Current treatments for severely burnt skin involve the removal of skin tissue from a different area of the body—mostly the hips—to be used as skin graft. These graft do not include cells and therefore do not regenerate once implanted in situ. The rapid growth of cell culture over the past 20 years has given rise to the development of cell-seeded skin tissue as a substitute for the current burnt skin replacement process. In order to produce cell-seeded tissue to replace skin tissue, a good understanding of the material properties of the skin tissue is paramount.

METHODS

Ten full-thickness skin samples were obtained from the Foothills Medical Centre (Dr. V. Gabriel) and cut into approximately square samples with two edges, one (axis 1-3) parallel to the collagen fiber direction, and the other one perpendicular to it (axis 2-4). Specimens were tested biaxially using the Bose Planar Biaxial system—after preconditioning—with strain control and load control protocols reaching a maximum stretch of 40% on both axes.

RESULTS

Figure 1 shows representative stress–strain curves for an abdominal skin tissue specimen.

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**Fig 1: Abdominal skin tissue (40% strain control)—First Piola kirchhoff Stress and Green-Lagrange strain.**

DISCUSSION AND CONCLUSIONS

Skin showed anisotropy for all the tested specimen. We are currently imaging related tissues under a dual photon microscope to further understand the relationship between the anisotropy of the skin and collagen alignment. More protocols at different load ratios can be performed and the results used to develop mathematical constitutive models for skin and skin replacement.

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REFERENCES

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