

A Biomechanical Comparison of fresh-frozen and Thiel embalmed feet: Opening innovative opportunities for the study of human foot anatomy

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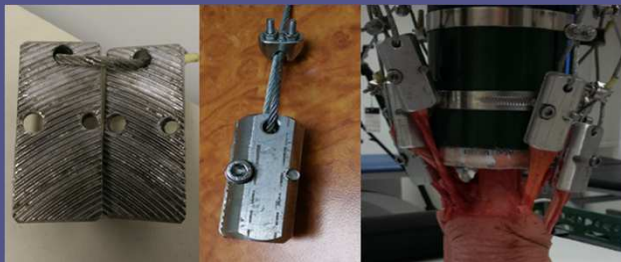
1. Introduction

In-vitro biomechanical testing of the human foot often involves the use of fresh-frozen cadaveric specimens which are subjected to a series of experiments in the loaded/unloaded state in order to investigate various interventions which would otherwise be detrimental to human subjects, since these have the closest attributes similar to actual living human tissue. The Thiel method of embalming maintains soft tissue consistency similar to that of living tissue, however its suitability for biomechanical testing is unknown.

There have been no studies investigating the kinematic and kinetic behaviour of the embalmed foot as a whole structure, nor have these been compared to the behaviour of fresh-frozen specimens.

Aim:

the aim of this study was to determine whether Thiel-embalmed foot specimens exhibit similar kinematic and kinetic biomechanical properties to fresh frozen specimens.

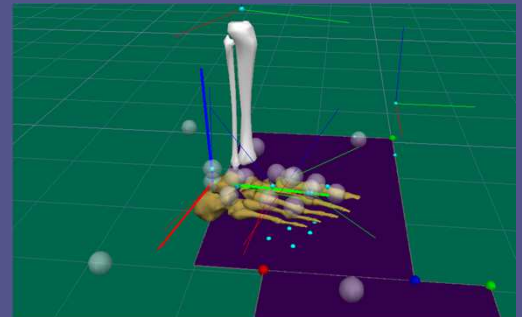


2. Methods

Three cadavers had a limb amputated and fresh frozen, the other preserved by Thiel's embalming. Each foot underwent a series of tests whilst undergoing plantarflexion and dorsiflexion, in an unloaded state, under a load of 10kg and 20kg. Leardini foot model was used to obtain segment kinematics with a 6 camera Vicon optoelectronic motion capture system, together with simultaneous capture of foot pressure mapping.

3. Results

No statistically significant differences were detected between all fresh-frozen and Thiel embalmed samples pairs, for all samples, for both kinematics and kinetics.



4. Conclusion

Similar kinematic and kinetic properties between fresh-frozen and Thiel embalmed foot specimens, which enable these specimens to be interchanged due to the latter specimens' advantage of delayed decomposition. This will open innovative opportunities for the utilization of these specimens in applications related to the investigation of dynamic foot function, both in research and education.

These findings will open new opportunities since Thiel embalmed foot samples will enable researchers to devote more time to their experiments.

Some Possible Applications include:

- ❖ Dynamic demonstration of gait for educational purposes
- ❖ Effect of selecting tendon dysfunction on foot function
- ❖ Investigation of effect of surgical intervention on foot function
- ❖ Design of cadaveric gait simulators for both biomechanical investigation and educational purposes
- ❖ Enabling proper research to be performed, without undue hurry which could have a detrimental effect on results

Acknowledgements:

Special thanks to **Robert Needham** for his invaluable help in Visual3D modelling