

Figure 1 – The FE model of the foot and ankle able to simulate UBB. The configuration and the boundary conditions shown are for the simulation of a pendulum experiment.

III. INITIAL FINDINGS

The response of the FE model of the foot and ankle was compared against static compressive (Figure 2a), pendulum (Figure 2b), and drop tests (Figure 2c) on cadaveric limbs. The outcome verified the ability of the model to simulate accurately various axial loading scenarios.

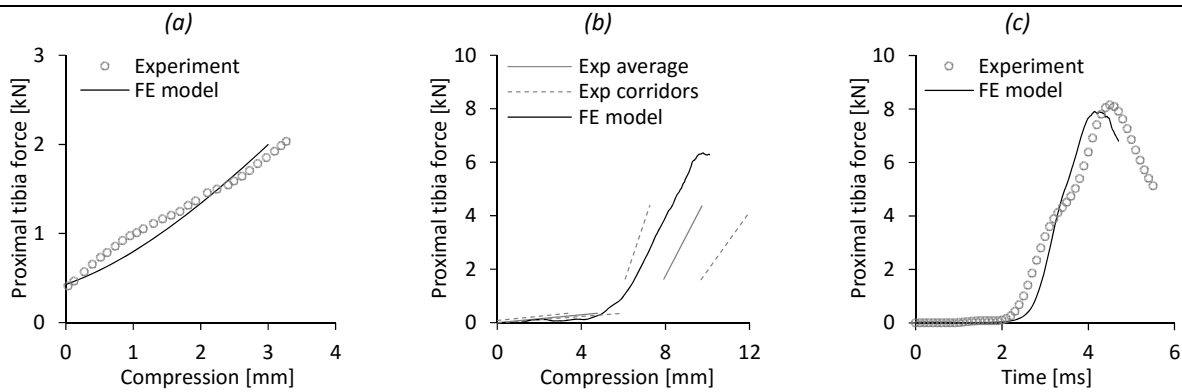


Figure 2 – (a) Comparison between the stiffness of the foot and ankle recorded in a static compression test on a cadaveric specimen [6] and predicted by the FE model. (b) The response of proximal tibia force against ankle joint compression predicted by the model for a pendulum test (5.7 kg pendulum weight and 4.5 m/s velocity at impact) is within the experimental corridors derived for pendulum strikes of various masses (3.3-12.3 kg) and velocities at impact (4-5 m/s) on cadaveric lower limbs [7]. (c) Comparison between the force-time response of the model and that of a cadaveric specimen on which a 34.2 kg mass was dropped from a height of 1.4 m [8].

IV. DISCUSSION

The response of a subject-specific FE model of the foot and ankle that was developed to simulate UBB compares well with data from experiments replicating axial loading scenarios of various severities. After examining further the validity of the numerical response by performing sensitivity analyses, the model can be used to examine the load pathway from the plantar foot to the proximal tibia and identify areas that are prone to injury in case of UBB but also test the efficacy of existing and new mitigation strategies.

V. REFERENCES

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