



Accounting for muscle loads and subject-specific posture in a Finite Element model of the neck for orthopaedics applications

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Problematic



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Modelling the cervical spine for orthopaedics:

❑ To be able to quantify relevant parameters

1 → A detailed model

❑ To account for inter-individual variability

2 → A subject-specific approach

❑ To realistically estimate cervical spine loads

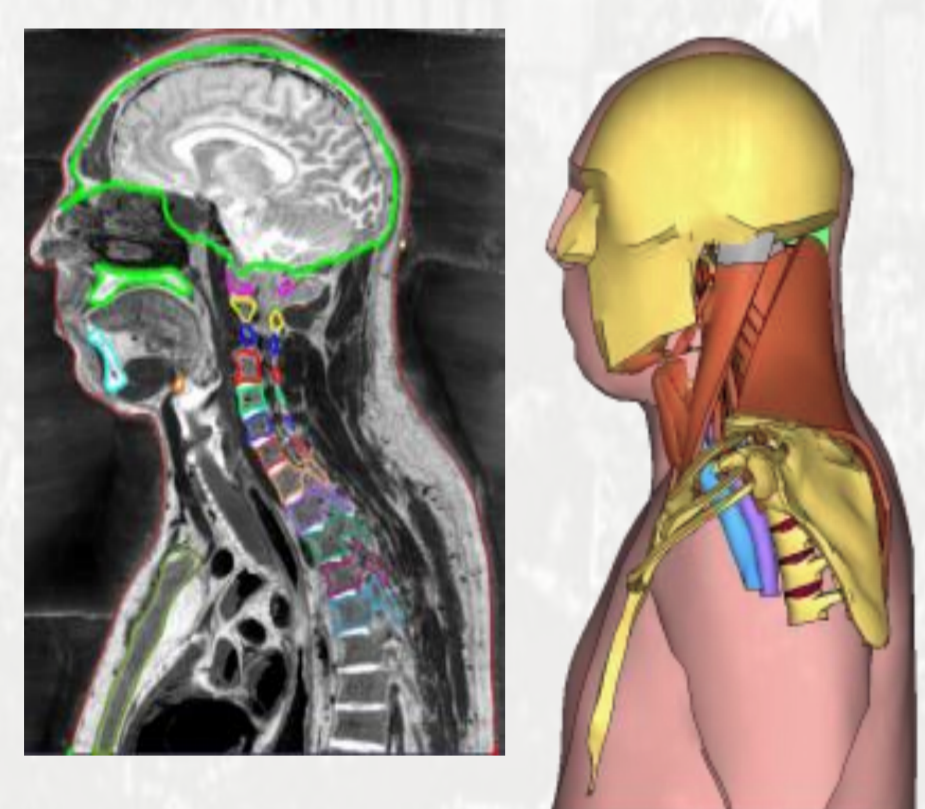
3 → A 3D muscle activation model

At stake

Fundamental → Gain a better understanding of the links between posture, dynamic stability and pathology

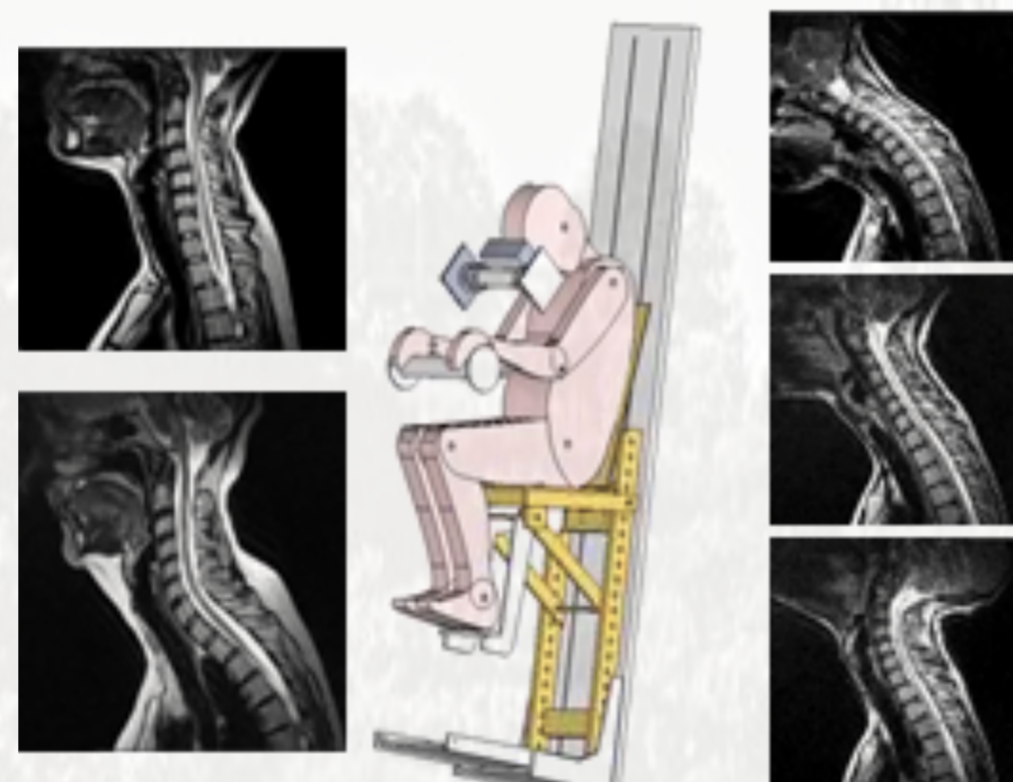
Applicative → Assist the medical device industry towards the *in-silico evaluation* and design of implants and prostheses

Methods



1

Development and validation of a **generic and detailed** Finite Element (FE) neck model



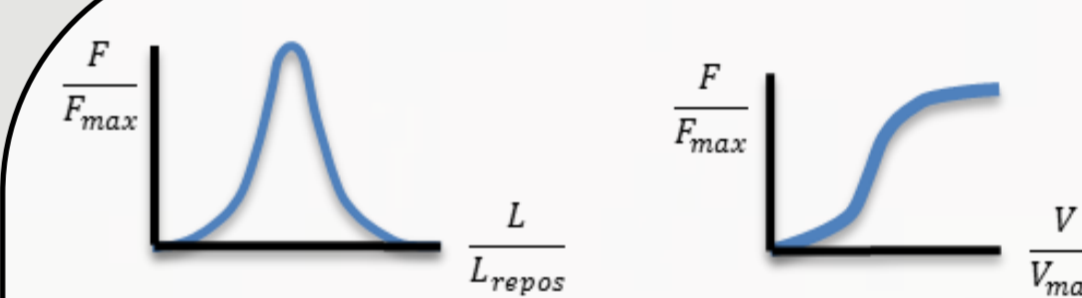
Creation of a **postural database** (10 volunteers, 8 postures)

Coll. Uni of Aberdeen / NHS Grampian

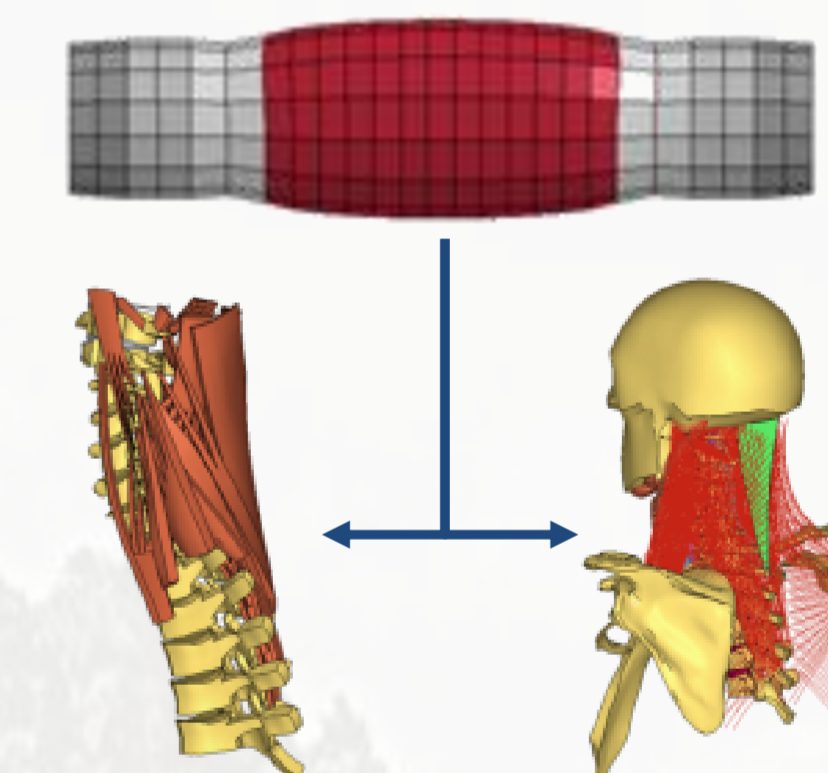


2

Adaptation of a **deformation toolbox to personalise** the FE model on MRI data

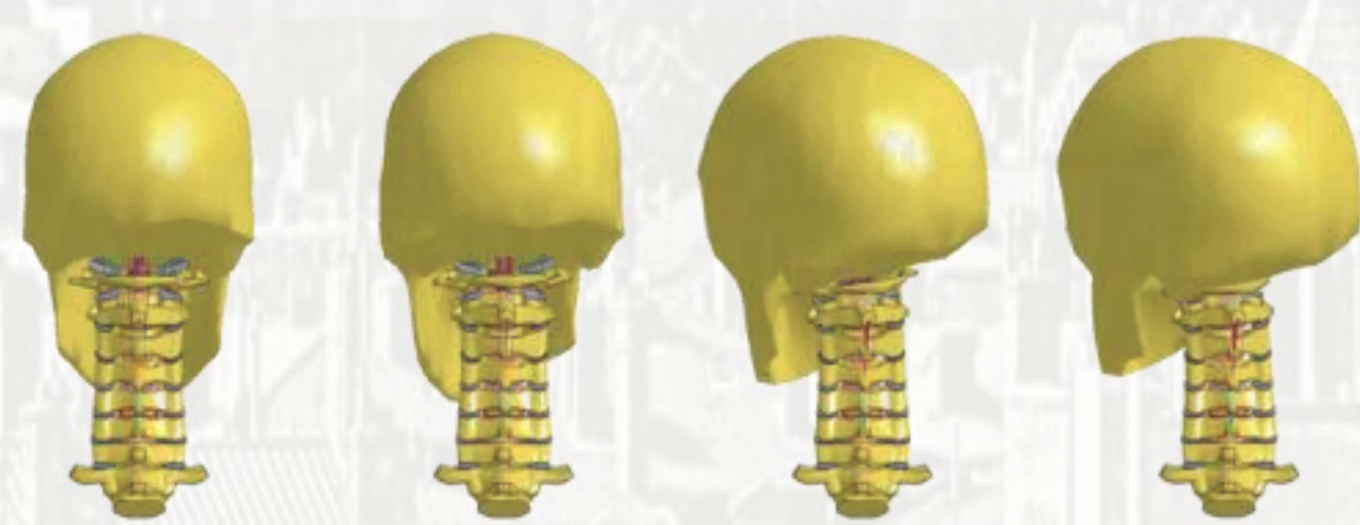


3



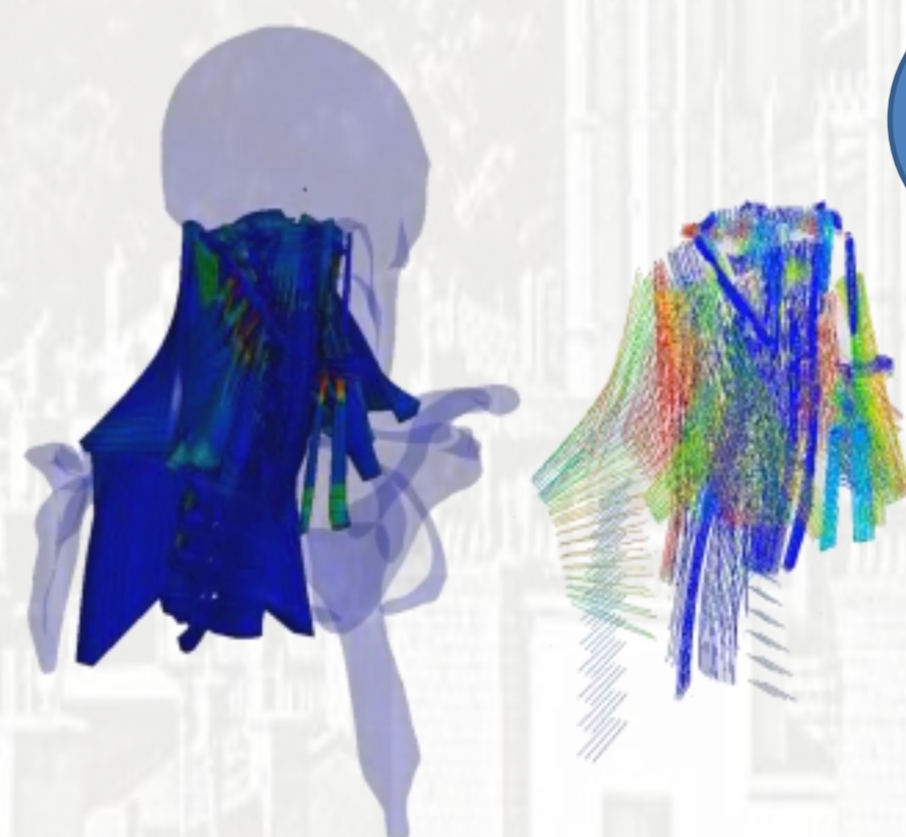
Development and transfer of an **active 3D muscle model** to the FE neck model

Results



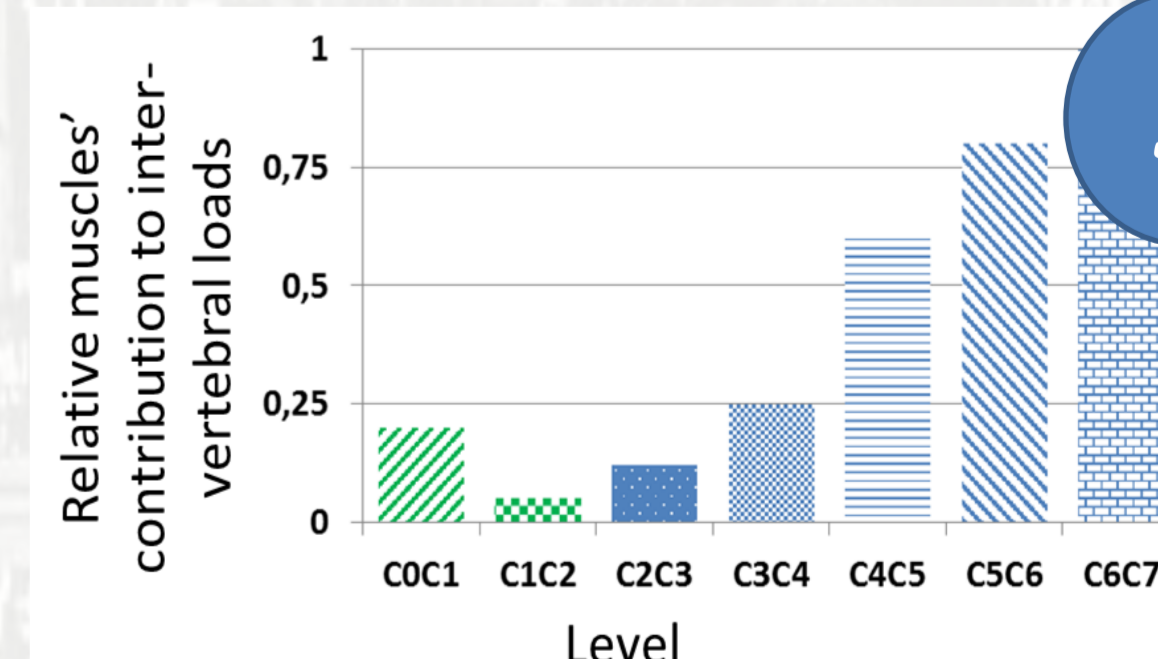
Ongoing **passive and active** neck muscle models **validation** at tissue/segment/full model level

1



Different **muscle recruitment strategies** are evaluated

3



First evaluation of the **contribution of muscle forces to spinal loads** during postural **tasks from the daily life**