

Title: Finite element studies of the mechanical behaviour of the diaphragm in normal and pathological cases

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Abstract: The diaphragm is a muscular membrane separating the abdominal and thoracic cavities, and its motion is directly linked to respiration. In this study, using data from a 59-year-old female cadaver obtained from the Visible Human Project, the diaphragm is reconstructed and, from the corresponding solid object, a shell finite element mesh is generated and used in several analyses performed with the ABAQUS 6.7 software. These analyses consider the direction of the muscle fibres and the incompressibility of the tissue. The constitutive model for the isotropic strain energy as well as the passive and active strain energy stored in the fibres is adapted from Humphrey's model for cardiac muscles. Furthermore, numerical results for the diaphragmatic floor under pressure and active contraction in normal and pathological cases are presented.

Author Keywords: Diaphragm; Active Behaviour; Amyotrophic Lateral Sclerosis; Right Phrenic Nerve Lesion; Shell Finite Elements

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