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MECHANICAL BEHAVIOUR OF SOFT BIOLOGICAL TISSUES AFTER DEATH

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Introduction:

The death phenomenon alters significantly the physiology of the body. Immediately after death, a complex biochemical process takes place, altering significantly the cadavers' body and leading ultimately to tissue liquefaction [1]. A well known consequence of this biological process is *Rigor mortis* which occurs in all muscular tissues and organs, as well as the skeletal muscle and is characterized by body stiffening.
An accurate, quantitative evaluation of *Rigor mortis* could become a significant tool for forensic purposes, since any existing correlation between the time elapsed since death (Hpm - Hours *post mortem*) must be established with precision to have proof value in a courtroom.
The present work uses experimental data on the time varying deformation of human cadaveric tissues under compression to study the constitutive laws governing the mechanical behaviour of human cadaveric tissues.

Methods:

To investigate the mechanical behaviour of the cadaveric soft tissues with time it was used an adapted Harpenden skinfold calliper the Adipsmeter, and a software application, LipoSoft, for monitoring, measuring and recording subcutaneous fat tissue [2]. The mea-

surements took place at the North Branch of National Institute of Legal Medicine, I.P. (INML) in agreement with a procedure approved by the ethics committee of that institution.
The muscle groups investigated were the sternocleidomastoid, trapezius, biceps brachii, gastrocnemius and quadriceps femoris. The measurements were performed every hour during four hours (in some cases during five hours) starting from the first measurement. The population, 18 corpses - 6 female and 12 male. The *post mortem* interval considered was 2 - 13 Hpm. The experimental data consisted on a measure of the deformation of the skinfold for each muscle group with time, using the relation,

$$\varepsilon_t = \frac{l_t - l_0}{l_0} \tag{1}$$

where l_0 is the initial skinfold thickness when Adipsmeter pressure was applied and l_t is the skinfold thickness when Adipsmeter pressure was applied at Hpm t.

Results and Conclusions:

It was possible to establish a statistically significant correlation between the deformations imposed by the Adipsmeter (ε_t) and the time *post mortem* (Hpm) for several of the analysed muscle groups tested.
These experimental results may be used to add a time changing component to existing constitutive laws, such as hyperelastic Strain Energy Functions (SEFs) suitable to model the non linear mechanical behaviour of biological soft tissues.

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