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Residual Stress Fields in Soft Tissues

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The main task in this work is to identify the residual stresses and strains for an elastic body, and from that identification estimate the stresses and strains in a loaded configuration. The theory is built on the existence of local stress free reference configurations which do not necessarily give a compatible domain. The residual strains are defined by the tangent map between this stress free configuration and a stressed unloaded compatible configuration. The residual stress plays an important roll in soft tissue mechanics, because it reduces the stress gradients in the tissue. The residual strains can be identified as the solution of a minimization problem. As a closing example, we used this theory on a human aorta. The identification was solved as a least square problem were the minimization was done over the difference between the calculated and measured luminal pressure. The results indicate that the theory agrees with other studies made on human arteries.

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