

3D Thin-Layer Structure Only Models for Coronary Atherosclerotic Plaques

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Abstract: In this study, a 3D thin-layer structure only model (TLS model) was proposed to perform mechanical analysis for human atherosclerotic plaques. Comparing to fluid structure only (FSI) models, TLS model is computationally inexpensive and much easier for potential clinical implementation. The results of plaque wall stress (PWS) between TLS models and FSI models were compared. The obtained results indicated that there was no significant difference of maximum PWS values between TLS models to FSI models (187.36 vs 190.36, $p=0.179$). The average PWS for each slice from TLS models were slightly less than the values from FSI models (91.64 vs. 98.48, $p<0.05$). The results showed that 3D thin layer structure only model may be used as a good approximation to 3D FSI models to perform stress/strain analysis for atherosclerotic plaques with clinical implementation potential. Prospective and large-scale studies are needed to further validate our results.