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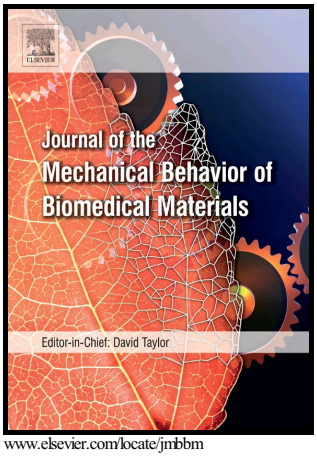

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PII: S1751-6161(16)30412-X
DOI: http://dx.doi.org/10.1016/j.jmbbm.2016.11.021
Reference: JMBBM2142

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 27 June 2016
Revised date: 26 November 2016
Accepted date: 29 November 2016

Cite this article as: Yaoke Wen, Cheng Xu, Yongxi Jin and R.C. Batra, Rifle bullet penetration into ballistic gelatin, *Journal of the Mechanical Behavior o Biomedical Materials,* http://dx.doi.org/10.1016/j.jmbbm.2016.11.021

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ABSTRACT

The penetration of a rifle bullet into a block of ballistic gelatin is experimentally and computationally studied for enhancing our understanding of the damage caused to human soft tissues. The gelatin is modeled as an isotropic and homogeneous elastic-plastic linearly strain-hardening material that obeys a polynomial equation of state. Effects of numerical uncertainties on penetration characteristics are found by repeating simulations with minute variations in the impact speed and the angle of attack. The temporary cavity formed in the gelatin and seen in pictures taken by two high speed cameras is found to compare well with the computed one. The computed time histories of the hydrostatic pressure at points situated 60 mm above the line of impact are found to have "two peaks", one due to the bullet impact and the other due to the bullet tumbling. Contours of the von Mises stress and of the effective plastic strain in the gelatin block imply that a very small region adjacent to the cavity surface is plastically deformed. The angle of attack is found to noticeably affect the penetration depth at the instant of the bullet tumbling through 90^{o}.

Keywords:

Ballistic gelatin, Temporary cavity, Rifle bullet, Penetration, Angle of attack