

## Author's Accepted Manuscript

Biomechanical Investigation of the Effect of Extracorporeal Irradiation on Resected Human Bone

S. Chauhan, M. Kanamarlapudi, S. Rastogi, SA. Khan, A. Prasad



PII: S1751-6161(16)30342-3  
DOI: <http://dx.doi.org/10.1016/j.jmbbm.2016.09.032>  
Reference: JMBBM2089

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

Received date: 8 July 2016  
Revised date: 9 September 2016  
Accepted date: 27 September 2016

Cite this article as: S. Chauhan, M. Kanamarlapudi, S. Rastogi, SA. Khan and A Prasad, Biomechanical Investigation of the Effect of Extracorporeal Irradiation on Resected Human Bone, *Journal of the Mechanical Behavior of Biomedical Materials*, <http://dx.doi.org/10.1016/j.jmbbm.2016.09.032>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

**Biomechanical Investigation of the Effect of Extracorporeal Irradiation on Resected Human Bone**

S Chauhan<sup>a\*</sup>, M Kanamarlapudi<sup>b</sup>, MS S Rastogi<sup>b</sup> MD, SA Khan<sup>b</sup> MD, A Prasad<sup>a,c\*\*</sup>

<sup>a</sup>Applied Mechanics, Indian Institute of Technology, Delhi, India

<sup>b</sup>Orthopedics, All India Institute of Medical Sciences, New Delhi, India

<sup>c</sup>Mechanical Engineering, South Dakota State University

\*sakshi.chauhan@am.iitd.ac.in

\*\*Anamika.Prasad@sdstate.edu

**Abstract**

Extra Corporeal irradiation and Reimplantation Therapy (ECRT) is an established biological reconstruction technique of limb salvage surgery for malignant bone tumor. Several studies have focused on clinical outcome of the procedure, but biomechanical changes post ECRT procedure are not well established. The present study investigates changes in strength, deformation, and composition of cortical bone obtained post en block resection from five patients suffering from ECRT, and the results are verified against age-match control specimen from cadaver. For pre-irradiated sample, average indentation modulus varied from 11.1 GPa to 15.8 GPa, and hardness from 0.36 GPa to 0.48 GPa. Post 50Gy irradiation, we observed an overall increase in deformation, viscous response, and energy dissipation across all samples, together with reduction in indentation modulus and hardness. These changes in strength and deformation were found to be consistent with compositional investigations via Raman spectroscopy, where mineralization and amount of calcium content was found to be decreased. The study thus quantifies the effect of extra corporeal irradiation on bone mechanical and compositional response, which in turn can provide clinicians much needed insight into the mechanism of bone healing and repair post ECRT to guide follow-up care and recovery.

Download English Version:

<https://daneshyari.com/en/article/7207639>

Download Persian Version:

<https://daneshyari.com/article/7207639>

[Daneshyari.com](https://daneshyari.com)