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DYNAMIC COMPRESSIVE MECHANICAL PROPERTIES OF CANCELLOUS BONE FROM HUMAN LUMBAR SPINE

Abstract

Human lumbar spine is vulnerable and often experiences injury in common instances of impact-related trauma. However, the properties of cancellous bone from human lumber vertebra under impact loading remains unclear. The purpose of the present study was to investigate the high strain rate effects on the mechanical properties of human lumber vertebra cancellous bone using the SHPB method, provide new experimental bases for predicting the dynamic mechanical behavior under high strain rates. In this study, the microstructures of cancellous bone was detected by environment scanning electron microscope (ESEM). And the regular quasi-static mechanical experiments were conducted on a standard material testing machine. With the help of split Hopkinson pressure bar (SHPB), the dynamic responses of cancellous bone were observed. The ESEM results shown that the microstructure of concellous bone from L1 to L5 fragments are similar, they should has the same dynamic mechanical characterization. In comparison with other porous composites, concellous bone exhibits brittle characteristics under quasi-static compressive condition. SHPB experiments shown that the compressive strength and strain rate sensitivity increased with the increasing strain rates and without experience the compaction course. These results of concellous bone under high strain rate are useful to guide the establishing of the medical tolerance or evolution criterion to impact-related trauma.