AbstractID: 7527 Title: Micro-CT imaging and quantitative characterization of bone morphogenetic protein regulated differentiation of mesenhcymal stem cells

Purpose:
Osteosarcoma (OS) is the most common primary bone tumor. So far, there has been only poor understanding about its molecular biology largely due to the difficulty of direct characterization of OS evolution. However, it has recently been discovered that bone morphogenetic protein (BMP) regulated differentiation of mesenchymal stem cells (MSCs) closely resembles the differentiation of OS cells. Therefore, we developed and used a micro-computed tomography (micro-CT) system for imaging and quantitatively characterizing BMP regulated MSCs differentiation in mice, which can potentially lead to more substantial understanding of human OS development.

Method and Materials:
We have developed a laboratory cone-beam micro-CT imaging system, which consists of a micro-focal X-ray source, a rotary stage with mouse holder, and a CsI-coupled CMOS detector. Reconstruction can be accomplished with either Feldkamp-Davis-Kress (FDK) algorithm or the PI-line-based backprojection filtration (BPF) algorithm that was developed in our laboratory. The reconstructed images are volume-rendered with VolView 2.0 (Kitware Inc., Clifton Park, NY) for visualization. An IDL program is developed for automatically extracting and characterizing transplanted boney structure volume within a user-specified region-of-interest (ROI).

Results:
About 40 mice were scanned with the micro-CT imaging system. From each of them, both reconstructed images and volume-rendered images were obtained for quantitatively assessment. Within user-specified ROI, the volumes of the boney structure formed by BMP regulated MSCs differentiation were automatically calculated.

Conclusion:
Our micro-CT system provides a powerful tool for imaging and quantitative characterization of BMP regulated MSCs differentiation in mice model, which is potentially helpful in achieving further understanding of human osteosarcoma development.

Conflict of Interest (only if applicable):