Abstracts

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GLUCOCORTICOID BIDIRECTIONALLY REGULATE THE DIFFERENTIATION OF BONE MARROW STROMAL CELLS
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Osteoporosis is a systemic metabolic disease which is characterized by a decrease in bone mass as well as a deterioration of the bone architecture. It leads to an increase in bone fragility and risk of a fracture. Glucocorticoid is widely used for their unsurpassed anti-inflammatory and immunomodulatory effects. However, excess glucocorticoid will result in osteoporosis, one of the secondary osteoporosis. Bone marrow stromal cells (MSCs) have the potential of multi-directional differentiation, from which adipocytes and osteoblasts are originated. Within the bone marrow, the differentiation into adipocytes or osteoblasts is competitively balanced. Glucocorticoids are widely used in clinic for their unsurpassed anti-inflammatory and immunomodulatory effects. However, it has been reported that excessive glucocorticoids could cause the outbreak of osteoporosis. In a certain range, glucocorticoids promote the osteogenic differentiation and adipogenic differentiation. Combination of glucocorticoids with many different factors can up-regulate or down-regulate osteogenic differentiation. This review summarized the two-way regulation to the BMSCs differentiation by glucocorticoid, further investigations on which factors can glucocorticoid combine to promote the maximized osteogenic differentiation.

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3D MICROARCHITECTURE QUANTIFICATION OF BONE REGENERATION DURING BONE-TENDON JUNCTION HEALING BY SR-μCT
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Objective: The aim of this study was to quantitatively evaluate microarchitecture of newly formed trabecular bone during healing process of bone-tendon junction (BTJ), and to explore the feasibility of application of synchrotron radiation micro computed tomography (SR-μCT) in 3D visualization of BTJ.

Methods: Six skeletal mature female New Zealand rabbits with partial patellectomy were used to establish a BTJ injury model, three patella-patellar tendon complexes were harvested at postoperative week 6 and 14, respectively, while three specimens were obtained in normal rabbits without surgery. Specimens were dehydrated followed by cut specimens along the sagittal. The X-ray phase contrast imaging experiments and image process were performed at X-ray imaging and biomedical application beamline (BL13W1) of Shanghai Synchrotron Radiation Facility in China. The projection images were captured by CCD detector with a 0.74 μm resolution. The 3D visualization images of BTJ were acquired and two region of interest (ROI) of newly formed trabecular bone in BTJ of each sample were analyzed.

Results: Due to the high resolution and sensibility of SR-μCT, the four layer structure of BTJ was distinguished with high resolution, such as bone, calcified fibrocartilage, uncalcified fibrocartilage, and tendon (Fig 1). Compared with normal trabecular bone, the new trabecular bone showed significantly lower BV/TV, Tb.Sp and Tb.Th, and significantly higher Tb.N at postoperative week 6. While at week 14, the BV/TV and Tb.N of the new trabecular bone were significantly lower than that of normal trabecular bone, the Tb.Sp and Tb.Th were significantly higher in the new trabecular bone. The BV/TV, Tb.Sp and Tb.Th were found to increase from week 6 to week 14, while the Tb.N decreased from week 6 to week 14 (Fig 2). The changes of these parameters reflect the remodeling of new trabecular bone during healing process.

Conclusion: The newly formed trabecular bone of BTJ gradually remodeling during the healing process and the SR-μCT can be applied for 3D visualization and quantitatively evaluating the microarchitecture of new bone in BTJ healing.

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