INTRODUCTION
Rheumatoid arthritis (RA) and Osteoarthritis (OA) are now the most common types of joint disability. OA is associated with a low inflammation with progressive bone destruction, while RA causes a powerful chronic and systemic inflammatory disorder compared to OA. Many researchers have recently devoted for the structural analysis of bone in OA or RA, respectively. However, difference between OA and RA on a degree and a pattern of the alterations of the characteristics of both bone quality and quantity has not been sufficiently and longitudinally investigated. Thus, the aim of this study is to investigate quantitatively difference between OA and RA on a degree and a pattern of the alterations of the characteristics of both bone quality and quantity, by tracking longitudinally using micro-Computer Tomography (μ-CT).

METHODS
Eight week old twenty-one female Sprague Dawely rats were randomly divided into three groups as the control group (n=7), Osteoarthritis (OA) group (n=7) and Rheumatoid arthritis (RA) group (n=7). OA model was developed by injection of Mono-Iodoacetate (MIA) in to the knee joint cavity. RA animal model was developed using Collagen Induced Arthritis (CIA) method. The tibia joints of OA and RA animal models were scanned by in-vivo μ-CT (Skyscan 1076,SKYSCAN N.V., Belgium) at 0 week (before injection) and at 4 weeks (after injection). Trabecular bone on the tibial epiphysis was then analyzed mainly. For analyses of bone quality and quantity, bone mineral density (BMD), bone mineralization and structural parameters were measured to evaluate the longitudinal alterations of bone quality and quantity induced by OA and RA. Here, for structural parameters, bone volume (BV, mm³), bone volume fraction (BV/TV, %), trabecular thickness (Tb.Th, mm), trabecular number (Tb.N, 1/mm), trabecular separation (Th.Sp, mm) and trabecular pattern factor (Tb.Pf, 1/mm) of trabecular bone were measured. A paired T-test and a one way ANOVA test were performed to identify the difference between 0 and 4 weeks and among the groups, respectively.

RESULTS
The bone mineral distribution showed that the attenuation values in CON group were generally higher than those in OA and RA group at 4 weeks (Figs 1-2). The distributions of the high attenuation values were gradually increased in CON group over time, whereas those in RA and OA group were generally decreased over time (Figs 1-2). The alterations of the structural parameters were shown in Fig. 3. BMD of trabecular bone is significantly increased in CON group (+36.4%) compared with OA and RA group (+10.1% and -4.4%) (p < 0.05). Increasing rate of BV and BV/TV in CON group (+38.3%, 25.7%) were also significantly higher than those of OA and RA group (+19.2%, -0.3% and +7.7%, -8.8%) (p < 0.05). Tb.Th in CON and OA group (+29.1% and +24.0%) markedly increased than that in RA group (-3.5%) (p < 0.05). Decreasing rate of Tb.N was significantly higher in OA and RA group (-5.8% and 19.1%) than in CON group (-2.2%) (p < 0.05). Tb.Sp markedly decreased in CON and RA group (-9.7% and -9.1%) (p < 0.05). Increasing rate of Tb.Pf in CON and OA (+58.1% and +82.1%) group were significantly higher than that in RA group (p < 0.05).

DISCUSSION
The bone quality and quantity in OA and RA models was continuously reduced over time consistently. However, a degree and a pattern of the alterations of the bone quality and quantity in OA and RA models were significantly different each other (p < 0.05). RA induced decrease of BMD and structural features on the overall region and callus on the boundary area, resulting in enlarged the total volume of the bone, whereas OA induced localized decrease of BMD and structural features within the damaged area and no callus on the boundary area, resulting in no change of the total volume of the bone. These results indicate that the bone strength characteristics in RA may be different from those in OA. It is, therefore, judged that a strategy for prevention/treatment of a fracture risk for OA and RA should be different. To our knowledge, this study may prove valuable as the first approach to track longitudinally a degree and a pattern of the alterations of the characteristics of the bone quality and quantity simultaneously and investigate quantitatively the differences between OA and RA.

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