# CHAPTER Ⅲ PURPOSE

The main purpose of this doctoral thesis is to investigate the effect of long-term different physical exercises on vBMD, geometric properties and strength indexes of matured bone by using pQCT.

It was reported that the ability of bone to adapt to mechanical loading was much greater in the growing than in the matured bone and exercise after maturity had smaller effect (67). Further, the accumulation of bone mass due to physical exercise had occurred during the growth spurt (86), and the same phenomenon has been observed in other human studies, giving evidence that, compared with their mature counterparts, growing bones were more responsive to the changing of their mass and geometry as a result of mechanical loading (32,87). **The first study of this thesis** focuses on the interaction between the effect of physical exercise and age of the subjects. Effects of physical exercise on bone are assessed with the tennis players who began their training after bone maturation.

Since adaptation of bone to physical exercise also depends on the nature of the exercise, the purpose of **the second study in this thesis** is to evaluate the effect of different types of long-term exercises on vBMD, geometric properties and the bone

strength indexes, comparing jumpers as a weight bearing activity group, swimmers as a non- weight bearing activity group, and non-athletic controls by using pQCT.

Peripheral QCT is capable to re-construct three dimensional image of bone, however, analytical procedure of previous studies were rather poor. For example, geometric parameters of the training bone (cortical thickness, periosteal area, endocortical area) were generally calculated assuming cylindrical configuration of the bone, which does not reflect the true shape of bone. To understand the geometric bone adaptation to mechanical loading due to exercise, therefore, these geometric indexes should be evaluated in relation to a direction of mechanical load correctly. In addition, pQCT has the advantage to analyze the bone geometric parameters, and then to calculate the developmental variations in bone strength indexes [polar moment of inertia (PMI), section modulus (SM) and strength strain index (SSI)] (81). In **the third part of this thesis**, the bone geometric indexes and bone strength indexes (PMI, SM and SSI) will be estimated along various directions of a bone adapted to physical exercise.