



some other studies even showing reduced BMD, so the relationship between BMD and fracture risk has not been elucidated enough. Recently it has been shown that the deterioration of bone quality such as microarchitecture, bone metabolic turnover, and collagen cross-link causes bone fragility in type 2 diabetes mellitus [6 16-19]. it is necessary to recognize that the deterioration of bone itself also increases the risk of fractures in diabetes mellitus.

Although diabetes mellitus and osteoporosis had previously been considered as quite different diseases in pathogenesis or their pathology, it has been shown that those two diseases have some common factors such as insulin, oxidative stress and advanced glycation end products (AGEs). So recently the relationship between diabetes mellitus and hip fracture has attracted attention. Many studies showing the effect of exercise therapy on postmenopausal or senile osteoporosis have been published up to now. However studies with respect to the effect of exercise therapy in preventing bone fragility in diabetes mellitus have seldom been reported. In this review article, we describe the changes of the bone in diabetes mellitus and the effect of exercise therapy on bone properties including BMD, bone quality and bone strength with our own

that higher HbA1c levels increase the risk of hip fracture in type 2 diabetes mellitus.

and diaphysis in the femur and also increased bone strength and suppressed the increase of fat mass in obese diabetic Zucker rats compared with being sedentary, whereas it had no effect on blood glucose or insulin concentrations. More recently, studies of exercise on bone mass, bone strength and so on have been shown in studies using diabetic animal models. Hinton et al. [58] have shown in a study using Otsuka Long-Evans Tokushima Fatty (OLETF) rats, obese type 2 diabetic animal models, that voluntary wheel running for 36 weeks was associated with increases in bone mass, bone strength, and bone mineral density (BMD) to both BMD of the femur and to increased structural and material properties of the femur compared to sedentary controls. Ortinau et al. [87] have also shown that voluntary wheel running was associated with improvements in glycemic control and preventing body fat accumulation, but also to tissue-level improvements in bone density and strength of the

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