



CHAPTER II

2. REVIEW OF RELATED LITERATURE

There were many studies showing that QUS can provide information on bone density as well as on bone structure, which can not be detected by DXA. Some studies concluded that the hip DXA and heel QUS have similar capacities to discriminate the risk of a first hip fracture^{9,16}. Kim CH et al¹⁷ have concluded that Quantitative Ultrasound (QUS) of bone is a new radiation-free, low-cost method that measures both bone mass and bone quality. Moreover, the result shows that quantitative ultrasound measurement of the calcaneus could be a useful tool for epidemiological surveys of bone mass.

In addition, Lippuner K et al¹⁸ had found that the sensitivity and specificity for osteoporosis of Quantitative Ultrasound (QUS) at calcaneus are 90% and 64% respectively, and for the DXA are 90% and 67% respectively. Peretz A et al¹⁹ also concluded the results suggesting that low QUS measurements are associated with the presence of fractures in a way that was similar to DXA. Moreover, He YQ et al²⁰ reported that the calcaneal QUS variables, as measured by the Sahara Bone Sonometer device, can discriminate hip fracture risk as equal as DXA. Langton CM et al²¹ concluded that for the identification of subjects defined by WHO criteria for axial BMD, the performance of BMD and QUS calcaneal parameters were statistically comparable. Besides, according to the study of Kanis JA et al²². DXA at the forearm, spine and hip have the same predictive value for any fracture and, in this context, have equal validity.

On the other hand, there were many studies which show that QUS could not surrogate DXA, for example: Cetin A et al²³ showed that, although DXA and QUS parameters are significantly correlated, QUS parameters can not predict osteopenia as defined by DXA. In addition, the sensitivities and specificities of QUS parameters are not sufficiently high for QUS to be used as an alternative to DXA because they applied this study for both male and female subjects. Frost ML et al²⁴ found the correlation between QUS and BMD measurements were all significant, ranging from 0.53 to 0.72. And some of their other studies indicate that the current WHO criteria for the diagnosis of osteoporosis in postmenopausal women can not be applied to calcaneal QUS measurements. In 2001, Frost ML et al²⁵ also demonstrated the combination of axial BMD and calcaneal QUS

measurements did not significantly improve fracture discrimination when compared with either method alone. Pocock NA, et al²⁶ reported that the use of QUS for the estimation of BMD, or in a "standalone" model, can not be recommended at the current time. The model of QUS as "prescreening" modality may be acceptable assuming adequate education of clinicians and patients of its limitations, particularly the risk of false negatives.

In Thailand, the peak bone mineral density of Thai women is different from western women. There were many studies mentioning about the prevalence of osteoporosis and peak bone mass of normal Thai women such as a study from Limpaphayom KK et al²⁷ explaining that the age-specific prevalence of osteoporosis among Thai women rose progressively, with the increasing age to more than 50% after the age of 70 and the age-adjusted prevalence of osteoporosis also rose progressively. The age-adjusted prevalence of osteoporosis was 19.8% and 13.6% for lumbar spine (LS) and femoral neck (FN), respectively²⁸. These values are markedly higher if BMD reference is relevant to women in USA. The age-adjusted prevalence of osteoporosis indicates the overall magnitude of that condition in the population or country. Taechakraichana N et al²⁹, found that Thai and American cut-off values of BMD for osteoporosis were compared to study the prevalence of osteoporosis. Using Thai's cutoff value, the results showed a lower prevalence of osteoporosis of both LS and FN (15.7% and 9.5%, respectively). For normal Thai women the peak bone mineral density of both spines and hips are at the age between 30 to 34-year-old and the mean value for LS and FN is 0.957 and 0.814 g/cm² respectively. The BMD of spine and hip will significantly decrease after the age of 35 and the loss is accelerated at age 50. Osteoporosis for LS and FN will be considered when BMD are below 0.682 and 0.569 g/cm² respectively³⁰.

According to the above mentioned literatures, QUS probably is the new bone mineral assessment with low cost that is important for economic reason since it is precise and may be used for screening osteoporosis instead of DXA. In present study, using a Western BMD reference can result in a misleadingly high prevalence of osteoporosis in the population of Asian countries because of the racial difference in bone attenuation from the other difference studies. Therefore, if we can determine the sensitivity and specificity of Quantitative Ultrasound (QUS) at calcaneus in Thai postmenopausal women, we can apply this method in primary care level and use it to define population at risk in Thailand.