Background: Cartilage damage which leads to the end disease known as osteoarthritis, is a leading cause of morbidity in the aging population. It is characterized by the progressive loss of articular cartilage and subchondral bone lesions.

Objective: To compare the subchondral architecture of osteoarthritis and normal articular cartilages in different regions using high-resolution peripheral quantitative computed tomography (HR-pQCT).

Methods: The proximal tibial was resected as a single osteochondral unit during total knee replacement surgery. The X-ray films before and after surgeries were analysed. Cartilage degenerative regions were assessed using the modified 3-graded Outerbridge classification. Grade A: normal; Grade B: (i) softening and swelling of the cartilage, or (ii) fragmentation and fissuring of an area that does not reach the subchondral bone. Grade C: erosion of cartilage down to bone. Ten osteoarthritic osteochondral units and three normal osteochondral units from the Bone Bank (NOCERAL) were scanned with HR-pQCT. The density of bone volumes of the subchondral bone plates and the trabecular subchondral bones were measured. Scanning Electron Microscope (SEM) was used to observe and measure the microstructure of cartilage interface.

Results: Based on the density of bone volume analysis, the grade B lesion of osteochondral units (716+62 mg HA/cm3) was not shown significantly different with normal osteochondral units (725+13 mg HA/cm3). However, the grade C lesion of osteochondral units has the highest bone volume (862+63 mg HA/cm3) which showed significantly higher than the grade B and normal osteochondral units. Furthermore, cartilage degeneration was detected by SEM where the observation of deformed cellular lacunae in the cartilage.

Conclusion: The bone remodelling has evidently changed the morphology of subchondral bone found in osteoarthritis patients suggested that bony bed level must have a role in the progression of the cartilage degeneration.