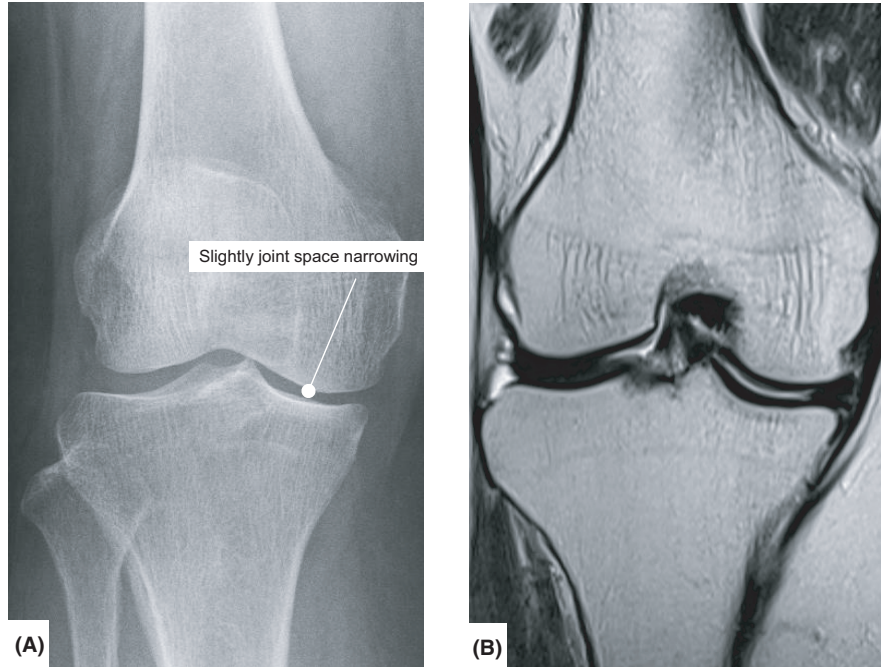
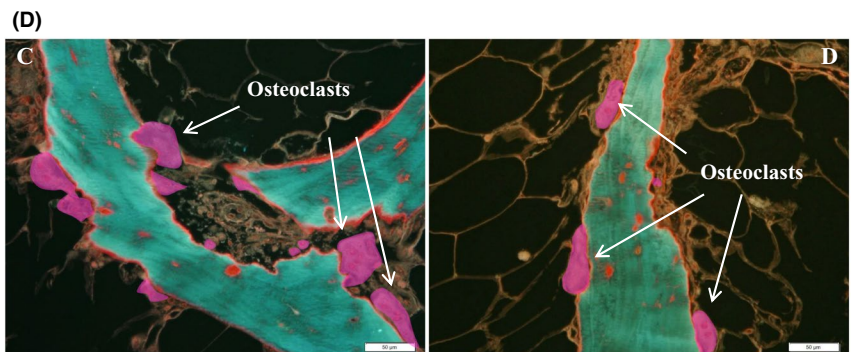
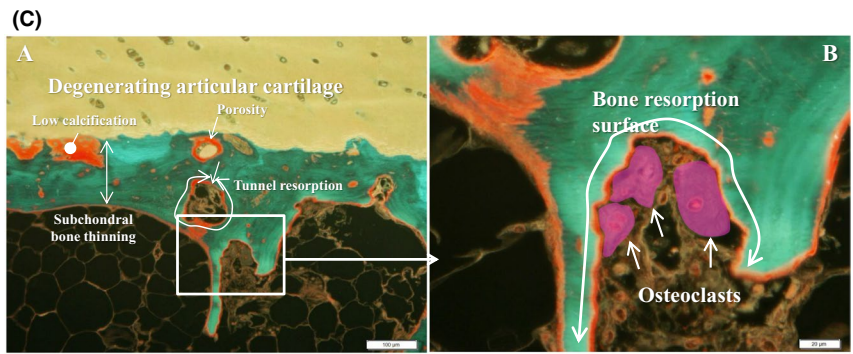
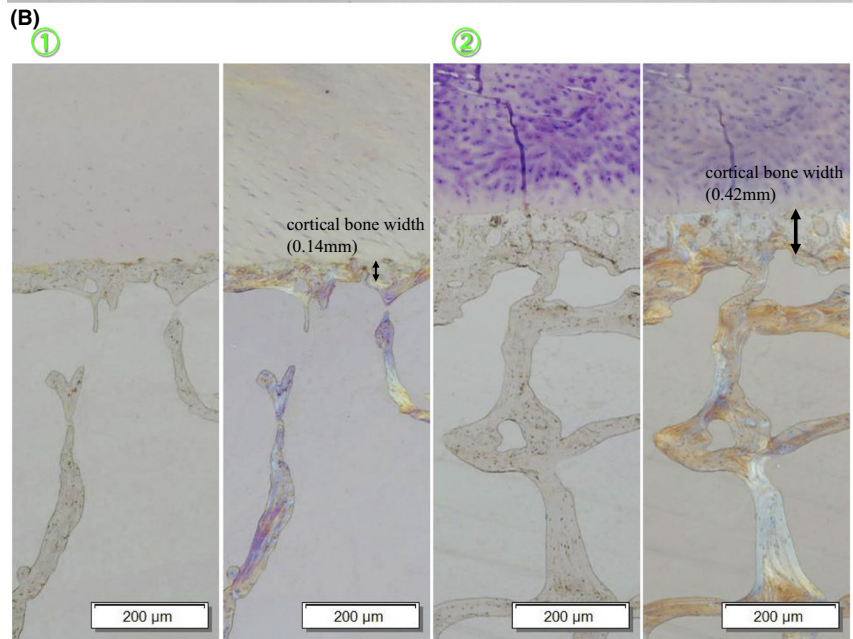
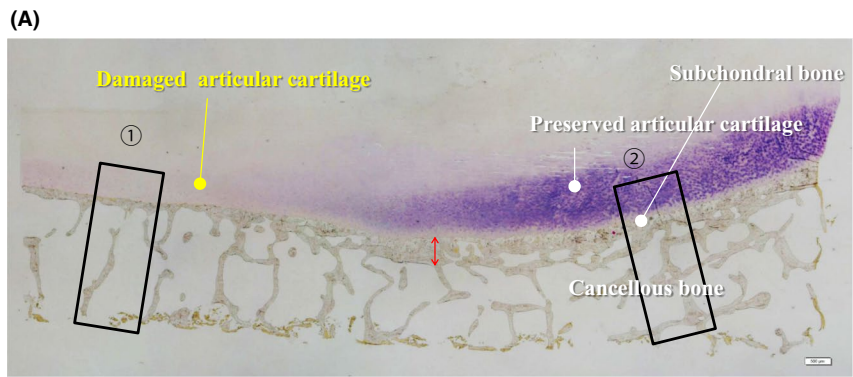


**Clinical Images: Injury to the articular cartilage affects growth of subchondral bone in a patient with osteoarthritis**

The patient, a 77-year-old woman, was admitted to our hospital for surgery on the right knee. She had undergone left total knee arthroplasty (TKA) for osteoarthritis of the knee joint 3 years prior because conservative treatment had failed to relieve the pain. She had a history of hypertension and asthma. On admission, she was 148 cm tall and weighed 60 kg. Body mass index was 27.39. She had never exercised and had been obese for the past 20 years. At admission, laboratory values were as follows: C-reactive protein, 0.31 mg/dl; rheumatoid factor, 1 U/ml (reference value <10 U/ml); anticyclic citrullinated peptide antibody, less than 0.5 U/ml (reference value <4.5 U/ml); and matrix metalloproteinase-3, 76.7 ng/ml (reference value 17–60 ng/ml). Dual energy x-ray absorptiometry of the lumbar spine showed a T score of  $-1.7$ . Radiography showed slight narrowing of the joint space between the femur and the tibia (Figure 1A), and magnetic resonance imaging showed joint effusion (Figure 1B) on the T2-weighted view. Right TKA was performed, and a surgical specimen of the tibia was analyzed histomorphometrically by Villanueva staining of undecalcified sections. The articular cartilage was divided into two types: areas where articular cartilage was relatively well preserved, and areas where it was damaged (Figure 2A). In the former areas, the cortical bone width (0.42 mm) of the subchondral bone was preserved, and the continuity between the cortical and cancellous bone was seen; vertical laminae were seen along the load axis. In the latter areas, the cortical bone width (0.14 mm) of the subchondral bone and the bony ridge (Figure 2B) were thinner than in the former areas, and the continuity between the cortical and cancellous bone was broken. Massive osteoclastic bone resorption was seen on the surface of the cortical bone (Figure 2C) and the cancellous bone (Figure 2D). Osteoarthritis of the knee is a disease characterized by damage to both cartilage and subchondral bone and has a higher prevalence in elderly women with obesity. However, there is still insufficient consensus as to whether damage or growth of the cartilage or subchondral bone occurs first and the other is the result. By examining the bone tissue of this case in detail, we would like to propose the following concept: Articular cartilage has a cushioning effect that promotes the growth of the subchondral bone. Damaged articular cartilage loses its cushioning effect, and the subchondral bone becomes fragile and unable to support the body weight under vertical loads, resulting in pain.

*We thank Akemi Ito of the Ito Bone Histomorphometry Institute for performing histomorphometric analysis.*



Masaki Hatano, MD   
Izuru Kitajima, MD  
Seizo Yamamoto, MD  
Masaki Nakamura, MD, PhD  
Kazuya Isawa, MD  
Tatsuya Suwabe, MD, PhD  
Junichi Hoshino, MD, PhD  
Naoki Sawa, MD  
Yoshifumi Ubara, MD, PhD  
*Toranomon Hospital*  
*Tokyo, Japan*