



Investigation in Fibula Effects on Stress Distribution in Tibiofemoral Joint

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The fibula is a valuable source of bone graft, but because the fibula has a role in lower extremity function, it is important to determine whether partial removal results in dysfunction or other problems. The main question addressed in this paper is "Does fibula participates in stress distribution of tibiofemoral joint?" According to consultation with orthopedic surgical team who are exclusively expert in knee surgery, tibiofemoral joint stress distribution might have been affected by fibula removal. A three-dimensional FE model of the healthy human knee that included distal femur, tibia, fibula and all the relevant menisci and articular cartilages, is presented. Bones were considered to be rigid, articular cartilage and menisci linearly elastic, isotropic and homogeneous. Compressive loadings were applied to the tibiofemoral joint in full extension in various magnitudes (up to 2800N) and normalized according to subject's weight. The results showed that fibula removal increases the maximum stresses in lateral tibial cartilage, lateral femoral cartilage and medial femoral cartilage, it also reduces the maximum stress in medial tibial cartilage. Also removing the fibula would be led to shift the place of maximum stress on the medial tibial cartilage, lateral tibial cartilage and lateral femoral cartilage, posterior.