

Surface Tribology of Total Ankle Joint Replacement

인공발목관절의 표면 마모 특성

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Abstract : Total ankle replacement (TAR) is a visible option in the surgical treatment of degenerative or inflammatory diseases of ankle joint. It is attributed to the current TAR which has improvements in surgical technique, uncemented implant fixation and minimally constrained articulation. In the clinical result, they can show promised surgical result when compared to earlier attempts in TAR. However, TAR is still not as successful as total knee replacement (TKR) or total hip replacement (THR), it needs to be noted that there are limitations in concerning of long term performance of TAR, the high failure rate still associated with wear of the PE (polyethylene) component that has related with their material property and surface roughness. The aim of this study was to introduce the tribology characteristics of total ankle joint prosthesis with one of TDR model which was fabricated to try multi-axis wear test as a region of motion in ankle joint. The wear specimen of TDR was prepared with Ti-6Al-4V alloy and UHMWPE (ultra-high molecular weight polyethylene) for tibia-talus and bearing component, respectively. A wear test was carried out using a Force 5 (AMTI, Massachusetts, US) wear simulator which can be allowed to move in three axis to flexion-extension ($+3^\circ \sim -6^\circ$), internal-external axial rotation ($\pm 5^\circ$), as well as sinusoidal compressive load (1.6 kN, R=10). All tests were performed following standard ISO 14243, wear rate was calculated with weight loss of UHMWPE bearing while the specimen has tested at certain cycles. As based on the preliminary results, wear rate of UHMWPE bearing was 7.9×10^{-6} mg/cycles ($R^2=0.86$), calculated loss weight until 10^7 cycles was 79 mg, respectively. [Supported by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number HI15C2149)]