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## EFFECT OF TOTAL HIP ARTHROPLASTY ON HIP RANGE OF MOTION AND ASSOCIATED MUSCLE FORCES

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**Summary:** Hip Osteoarthritis (HOA) is a common chronic joint condition responsible for significant pain and disability. Clinicians recommend total hip arthroplasty (THA) to relieve pain in patients with severe HOA. Walking generally improves after surgery, however, limited restoration of physical function may result after THA and the functional gains do not necessarily reach magnitudes equivalent to those in healthy control populations or correlate well with patient-reported measures of functional recovery post-surgery. Moreover, large deficit in gait speed, stride length, sagittal hip range of motion (ROM), coronal plane hip abduction, and negligible changes in transverse plane hip ROM, deficiency in single limb support time, are reported in patients post THA as compared to healthy controls. Additionally, when patient operated legs are compared to those of healthy subjects at 4 to 5 years post-surgery, reduced hip strength and ROM in flexion, extension, and abduction on operated leg were reported. HOA patients have also demonstrated significantly lower gluteus maximus muscle volume. Additionally, study by Grimaldi et al 2009 has reported variation in gluteus muscle cross-section due to HOA. Significantly lower muscle strength and muscle size in affected leg for HOA patients has been condensed by Loureiro et al. review 2013. The gluteus Medius and gluteus Maximus muscles assist in hip abduction/adduction, flexion/extension, and lateral rotation. Muscle activation and muscle physiological cross-section area both contribute to muscle force generation. The increase in muscle activation reported by Dwyer et al 2014, and the significantly lower muscle size in affected leg for hip OA patients as compared to controls, highlight the need to assess the muscle forces generated at pre- and post-surgery stage of THA. This study calculated hip joint angles in sagittal, coronal, and transverse planes, and predicted forces in the gluteus Medius and gluteus Maximus muscles using a full body musculoskeletal model available in AnyBody software repository (v 7.3.1, AMMR 2.3.1). Gait kinematic data for healthy, 17 right HOA and 13 left HOA subjects at pre- and 6 months post-surgery stage was adopted from the dataset published by Laroche et al. (year?). The model was scaled to patient weight and height and the kinematic motion data provided as an input. An inverse kinematics analysis predicted hip joint angles in 3 planes, and an inverse dynamic analysis combined with muscle recruitment algorithm computed muscle forces. As part of the preliminary investigation, patients with right HOA at pre-surgery stage have reported gluteus Medius muscle forces lower than controls on the affected side and higher on the contralateral side and vice versa for gluteus maximus muscle forces. Whereas left HOA patients have higher gluteus Medius and maximus muscle forces irrespective of the side. A significant variation was reported only in flexion-extension range of motion on the affected side when Wilcoxon signed-rank test was used and no significant variation was reported in the maximum muscle forces at gluteus Medius and Maximus muscles.