

A Mechanical Model for Hip Reduction via Pavlik Harness in Newborns

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Abstract

Developmental Dysplasia of the Hip (DDH) refers to an abnormal hip condition in infants characterized by anomalous development of the hip joint, in which hip joint dislocation, misalignment, and musculoskeletal instability are present. Clinical reports and previous research show very low success rates for the Pavlik Harness for severe grades of hip dislocation. Statistically, it has been shown that for reduction rate for the International Hip Dysplasia Institute (IHDI) Grades I-III is 92% while only 2% for grade IV. DDH is found responsible for 29% of primary hip replacements in people up to 60 years of age. The primary goal of this project is to assist in the improvement of the success rate on non-surgical interventions for patients with DDH, as well as the ensuing consequences in adulthood. In order to experimentally verify the computational model of the hip reduction and abduction in severe cases of DDH, a mechanical bench-top model is to be designed, built and tested for the four grades of dislocation. This approach will be repeated for three patient-specific infant's musculoskeletal models, as to corroborate the use of this experimental bench-top design in the validation of the patient-specific computational model.