A polycentric hydraulic hip joint increases prosthetic gait biomechanics and functional capabilities for hip disarticulation amputees compared to the current standard of care R. Jenkins, CPO; Bionic Prosthetics and Orthotics; rljenkins716@gmail.com

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Evidence Table

	Ludwigs, 2013 ²	Ludwigs, 2010 ³	Gailledrat, 2013 ⁵
Population	13 subjects, 2 hemipelvectomy and 11 hip disarticulations, mean age = 44, mean years wearing a prosthesis = 18, 10 male patients and 3 female, MFCL potential between K2-K3	Six unilateral, hip disarticulation amputees, experienced prosthetic users	Three hip disarticulation amputees, age 33-37, two male and one female
Study Design	Crossover randomized controlled trial	Crossover randomized controlled trial	Crossover control trial
Intervention	Helix 3D hip joint with C-Leg and ESR foot	Helix 3D hip joint	Helix 3D hip joint
Comparison	Current prosthesis with monocentric hip joint (including 7E7, Littig hip, and 3R30 joints)	Same socket and distal components, changed to 7E7 hip joint	Current prosthesis with Canadian socket and 7E7 hip joint
Methodology	Patients were given a new prosthesis with a Helix Hip Joint, C-Leg, and ESR foot. After a mean acclimation period of 11 weeks, the timed clinical assessments on stairs and ramps, 10-m walk test, and mobility questionaries were completed with the new prosthesis and results were compared to outcomes with the current prosthesis.	Patients used one hip joint per day for two days of study in random order using their own sockets. Two force plates and six optoelectronic cameras with 23 reflective markers were used for kinetic and kinematic measurements. Patients were asked to ambulate at a self-selected walking speed through the gait lab.	Patients admitted for four consecutive days of training and adaptation to new prosthesis with Helix joint and C-Leg. Training included gait stairs and climbing. Outcome measures completed on day 4. The spatiotemporal parameters were measured using a GaitRite Walkway.
Outcomes	Locomotor Capabilities Index (LCI), functional assessments, dependence questionnaire, 10m walk test	Time distance parameters, pattern of the hip joint, knee joint, and pelvic tilt in the sagittal plane	Functional Independence Measure, satisfaction questionnaire, 2- minute walk test, gait pattern assessment using GaitRite Walkway
Key Findings	With Helix, total of LCI-5 improved from 46 to 55 (p=0.003). Advanced ambulation skills (p=.005) and activities considered difficult for hip disarticulation (p=.008) showed significant improvement with new prosthesis. Time required for walking down the ramp and staircase was reduced with the Helix joint system. Seven	The differences between the two hip joints for velocity and prosthetic and contralateral step length were insignificant. The 7E7 reaches maximum extension at 17% of the gait cycle, but Helix reaches at 46% of gait cycle. Hip flexion is initiated at 7E7 at 70% of gait cycle, but flexion with Helix is initiated immediately after	Satisfaction score and distance in the 2MWT increased for two patients and reduced for one with the Helix. One patient had improved gait parameters but the other two had deterioration of gait parameters with the Helix. All 3 patients decided to discontinue the use of the Helix long term, mostly because of comfort problems in the

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	subjects were able to increase their walking velocity.	maximum extension. Increased stance flexion of the knee is observed with Helix compared to 7E7. The maximum range of pelvic tilt is significantly (p=.028) increased with 7E7 when compared to the Helix.	socket. Two of the patients did not like the unexpected hip flexion experienced and found it difficult to adapt to the new component.
Study Limitations	All the contributors are from Ottobock which may present bias. Patients decided themselves when fully acclimated to new prosthesis. Patients received entire new system which may be hard to distinguish which benefits are coming from the hip joint itself.	Patients only had two days to acclimate to the new hip joint.	Did not control for original prosthesis design (two patients already had a C-Leg), limited patient population, reduced success from lack of socket comfort