Gait Studies of Robotic Total Hip Arthroplasty Versus Conventional Jig-Based Arthroplasty: Results of A Prospective Randomised Controlled Trial

Dia Eldean Giebaly[1], Babar Kayani[1], Andreas Fontalis[1], Jenni Tahmassebi[1], Amy Maslivec[2], Matthew Banger[2], Fares S Haddad[1]
[1]University College London Hospital, London, United Kingdom, UK [2]Imperial College London, London, United Kingdom, UK.
Email of Presenting Author: dia.giebaly@doctors.org.uk

INTRODUCTION: There is growing utilisation of robotic arm assisted hip arthroplasty worldwide. Existing comparative studies between conventional total hip arthroplasty (CO THA) and robotic-arm assisted THA (RO THA) have primarily been conducted on cadaveric specimens or involved retrospective clinical trials, resulting in a scarcity of data on functional outcomes, gait, radiological results, and complications. This is the first randomised study to present a comparison of gait and functional outcomes between conventional THA and robotic THA. The primary objective of this study is to explore the potential existence of gait differences between RO THA and CO THA.

METHODS: This study is a single centre, prospective randomised controlled trial encompassing 30 patients with symptomatic hip osteoarthritis undergoing conventional THA and 30 patients undergoing robotic THA. Mean differences (MDs) and standardized mean differences (SMDs) were calculated for spatiotemporal, kinematic, and kinetic gait variables following a minimum of 12 months follow-up. Gait was assessed at normal walking speed and increased incrementally until the maximum walking speed was attained. Additionally, normal walking was evaluated during uphill and downhill ambulation.

RESULTS SECTION: There were no differences in baseline demographics or preoperative radiological characteristics between the two groups including spinopelvic mobility. Gait studies were performed at mean follow up at 27.8 months. No statistically significant differences were identified between the two groups at low walking speed. However, the robotic THA group achieved a higher speed compared to the conventional THA group. Additionally, patients in the robotic THA group tolerated more weight on the operated side at high walking speed.

DISCUSSION: Patients who underwent robotic THA were able to bear more weight on the operated side at high walking speed. However, at a fixed walking speed and with an increasing incline, there were no statistically significant differences between the two groups. A limitation of this study was the absence of pre-operative gait analysis. Nonetheless, postoperative differences in gait were evident between the robotic and conventional groups.

SIGNIFICANCE/CLINICAL RELEVANCE: Robotic assisted surgery in total hip arthroplasty improves outcomes of gait performed under increased physical demand and preserved a more normal weight acceptance compared with conventional THA patients.