

Retrospective Review of Outcomes of Total Hip Arthroplasty (THA) in Developmental Dysplasia of the Hip (DDH)

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INTRODUCTION:

Developmental dysplasia of the hip (DDH) is the leading cause of arthritis in young adults. This is a congenital condition which results in subluxation or dislocation of the hip joint due to instability. Total hip arthroplasty (THA) is the mainstay treatment option for debilitating end stage osteoarthritis. The primary purpose of this study is to report mid- to long-term outcomes of total hip arthroplasty for treatment of development dysplasia of the hip including survivorship, clinical, and radiological outcomes.

METHODS: A retrospective review of hip procedures at our institution was performed to identify patients which underwent THA for the treatment of DDH from January 2000 to January 2022. A minimum follow-up time of 2 years was required. Kaplan-Meier survival analysis with 95% CI was performed to evaluate overall survivorship with failure defined as revision due to failure of index surgery. A paired student's t-test and chi-square test were used to compare pre-operative and post-operative clinical and radiographic outcomes. A p-value of <0.01 was considered to be significant and all data analysis was conducted via SPSS 28 (SPSS Inc, Chicago IL, USA). Clinical and radiographic outcomes were recorded preoperatively and postoperatively via orthopaedic consult notes. Leg length discrepancy (LLD) was measured via anterior-posterior (AP) radiographs as the absolute difference bilaterally between a line perpendicular to the inter-teardrop line to the medial aspect of the lesser trochanter. Horizontal and vertical hip centre were also measured through AP radiographs. Horizontal hip centre (HHC) was measured as the distance between vertical pelvic axis and femoral midpoint. Vertical hip centre (VHC) was measured as the distance between the centre of the femoral head and the transischial tuberosity line. Femoral offset was measured as the distance between the midline of the femur to the midline of the pelvis (Figure 1).

RESULTS:

A total of 255 patients were included in our final review with a mean follow-up of 8.3 (SD 5.3) years. Among these patients, 214/255 (83.9%) were women, while 41/255 (16.1%) were men. The mean age at time of index surgery was 46.0 years (SD 14.1). The mean BMI was 28.3 kg/m². Kaplan-Meier all-cause survivorship was 93.4% (95% CI 90.3 – 96.5) at 5 years with 168 hips at risk, 92.5% (95% CI 89.0 – 95.6) at 10 years with 79 hips at risk, and 90.9% (95% CI 86.2 – 94.0) at 15 years with 47 hips at risk (Figure 2). Survivorship due to failure from dislocation was 98.4% (95% CI 96.8 – 100.0) at 5 years, 10, and 15 years, with 176, 79, and 47 hips at risk, respectively (Figure 3). The overall rate of revision to the index surgery due to failure was 18/255 (7.1%). These complications included pain (7), dislocation (4), aseptic loosening of the cup (3), periprosthetic fracture (2), and complete foot drop (1).

The mean LLD improved from a pre-operative value of 1.65 cm (SD 1.58) to a post-operative value of 0.75 cm (SD 0.84) (p<0.001). The mean HHC improved from a pre-operative value of 9.79 cm (SD 1.0) to a post-operative value of 8.49 cm (SD 0.82) (p<0.001). The mean VHC improved from a pre-operative value of 3.22 cm (SD 1.7) to a post-operative value of 1.88 cm (SD 0.73) (p<0.001). The mean femoral offset improved from a pre-operative value of 12.18 cm (SD 1.35) to a post-operative value of 11.65 cm (SD 1.05) (p<0.001). A sub-group analysis was also conducted to compare individuals with a pre-operative LLD < 2 cm compared to those with a LLD ≥ 2 cm. In the LLD<2cm group, the mean LLD improved from a pre-operative value of 0.81 cm (SD 0.54) to a post-operative value 0.56 cm (SD 0.56) (p<0.001), the mean femoral offset improved from a pre-operative value of 12.15 cm (SD 1.4) to a post-operative value of 11.69 cm (SD 1.1) (p<0.001). There were zero sciatic nerve injuries leading to foot drop in this population. In the LLD≥2cm group, the mean LLD improved from a pre-operative value of 3.7 cm (SD 1.4) to a post-operative value 1.17 cm (SD 1.13) (p<0.001), the mean femoral offset improved from a pre-operative value of 12.28 cm (SD 1.21) to a post-operative value of 11.54 cm (SD 0.93) (p<0.001). The rate of sciatic nerve injury leading to complete foot drop in this population was 2/56 (3.57%). The femoral offset was not significantly decreased in these 2 patients.

There was a significant increase in patients with a normal gait from 125/205 (61.0%) preoperatively to 197/236 (83.5%) postoperatively (p<0.001). Similarly, there was a significant decrease in patients with an antalgic gait from 96/196 (49.0%) preoperatively to 30/225 (13.3%) postoperatively (p<0.001). There was also a significant increase in patients ambulating independently from 41/196 (20.9%) preoperatively to 151/225 (67.1%) postoperatively (p<0.001).

DISCUSSION AND CONCLUSION: Our study suggests that total hip arthroplasty for the treatment of developmental dysplasia of the hip is a viable treatment option, with an acceptable complication rate. We found an overall excellent survivorship, and favourable clinical and radiographic outcomes. Future research should evaluate patient reported outcomes and long-term follow-up in larger patient cohorts.

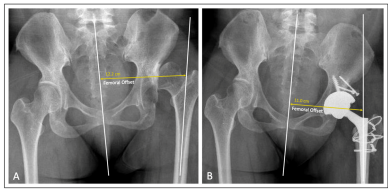


Figure 1. Pre- and postoperative anteroposterior (AP) pelvic radiographic measurements of a 41-year-old female patient with developmental dysplasia of the left hip. **A.** Pre-operative AP radiograph of a patient demonstrating a femoral offset (FO) of 12.2 cm. **B.** Post-operative AP radiograph of a patient demonstrating a reduced FO of 11.0 cm. To measure FO, two vertical lines were drawn through the pelvic and femoral midlines, respectively. The FO was measured as the distance between these lines on a horizontal plane through the center of rotation of the hip.

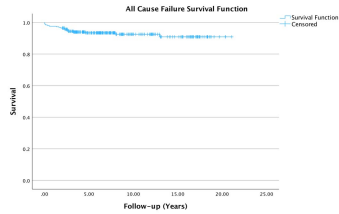


Figure 2. Kaplan Meier survivorship curve (95% confidence interval) of total hip arthroplasty for treatment of developmental dysplasia of the hip that failed due to any cause.

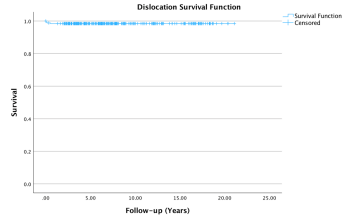


Figure 3. Kaplan Meier survivorship curve (95% confidence interval) of total hip arthroplasty for treatment of developmental dysplasia of the hip that failed due to dislocation.