RESULTS OF PELVIC OSTEOTOMY IN ARTHRITIS SECONDARY TO HIP DYSPLASIA: CLINICAL EVALUATION AND GAIT ANALYSIS

*Bellabarba, C; +*Kuo, K; *Hurwitz, D; *Alexander, M
+*Rush Medical College, Chicago, Illinois. 1725 W. Harrison St., Suite 1063, Chicago, IL 60612, 312-243-4244, Fax: 312-243-8925, kennank@aol.com

Introduction: Both the Chiari medial displacement osteotomy (CMDO) and triple innominate osteotomy (TIO) have been described as effective treatments for arthritis of the hip secondary to developmental dysplasia. Success of these operations is presumably based on decreased joint contact forces. This occurs theoretically through increased coverage of the femoral head, and through a decrease in joint reaction force caused by alterations in hip biomechanics and the position of the weight-bearing axis. The purpose of this study is to review the results of pelvic osteotomy in adults with DDH, emphasizing their effect on objective gait analysis. We are aware of no such prior report.

Methods: Between October of 1993 and March of 1996, twelve adults with an average age of thirty-one years were treated with pelvic osteotomy for arthritis secondary to developmental dysplasia of the hip (DDH), and followed prospectively for a minimum of two years (range: 24 to 62 months). Eight patients were treated with the TIO, and four with the CMDO. Gait analysis was performed preoperatively and a minimum of one year postoperatively. Radiographic examination consisted of pre- and post-operative measurement of the center-edge angle of Wiberg (CEA), acetabular angle of Sharp (AAS), and center-head distance (CHD) on AP radiographs of the pelvis, AP and lateral radiographs of the affected hip, and CT scans with three-dimensional reconstruction. Clinical results were evaluated by comparing pre-and postoperative Harris hip scores, including a questionnaire concerning activity level and satisfaction with treatment.

Results: Studying the group as a whole, the most notable influences of the pelvic osteotomy on gait were a 24 percent decrease in both the hip and knee adduction moments, and a 46 percent increase in external rotation of the affected lower extremity. As would be anticipated from the greater medial displacement of the weight-bearing axis inherent to that procedure, patients undergoing CMDO had a greater decrease in hip (43 percent) and knee (57 percent) adduction moment than did patients undergoing the TIO (18 percent hip, 16 percent knee). Also consistent with the external rotation of the acetabulum during the procedure, patients undergoing TIO had a considerably greater increase in external rotation of the lower limb (51 percent) than did patients undergoing the CMDO (34 percent). Hip and knee adduction moments increased in only two patients, both of whom had undergone TIO. In each of these two cases, postoperative measurement of the CHD revealed slight lateralization of the acetabulum. Functional hip range of motion during gait was increased by 15 percent overall with no difference between the CMDO and TIO groups, with the majority attributable to increased hip extension.

On average, the CEA increased from 7 degrees (range: -4 to 16 degrees) preoperatively to 37 degrees (range: 22 to 53 degrees). The average preoperative AAS decreased from 48 degrees (range: 36 to 54 degrees) to 28 degrees (range: 18 to 43 degrees). Shenton’s line was disrupted in ten of twelve patients, and was restored postoperatively in nine.

Harris hip scores improved from 55 (range: 44 to 71) preoperatively to 82 (range: 58 to 100) one year postoperatively. The score further improved to 91 (range: 58 to 100) two years postoperatively, with the majority of improvement after the first year occurring in the CMDO group. Two patients (17 percent) reported being unsatisfied with clinical results, and two additional patients were pleased with results but remained dependent on analgesic medications.

Conclusions: We conclude that the triple innominate and Chiari osteotomies have the anticipated influences on gait, namely a decrease in hip and knee adduction moments that is more pronounced after Chiari osteotomy, and an increase in external rotation of the lower extremity that is more pronounced after triple innominate osteotomy. This decrease in hip adduction moment is a manifestation of the decreased joint reaction force, which may contribute to the effectiveness of these operations. Radiographic findings appear to correlate with gait parameters. The amount of the medial acetabular displacement may influence the degree to which the adduction moments are dampened, however, the small cohort size precluded statistical analysis.