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Cementless Total Hip Arthroplasty With a High Hip Center for Hartofilakidis Type B Developmental Dysplasia of the Hip: Results of Midterm Follow-Up



Min Chen, MD, Zheng-Liang Luo, MD, Ke-Rong Wu, MD, Xiao-Qi Zhang, MD, Xiao-Dong Ling, MD, Xi-Fu Shang, MD*

Department of Orthopaedics, Affiliated Provincial Hospital of Anhui Medical University, Hefei, Anhui Province, China

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ABSTRACT

Background: Acetabular reconstruction in adults with Hartofilakidis type B developmental dysplasia of the hip is a major technical challenge. The purpose of this retrospective study was to evaluate hip function and radiographic outcomes regarding high hip center at midterm follow-up.

Methods: From January 1, 2007 to December 31, 2009, 37 patients who had Hartofilakidis type B developmental dysplasia of the hip underwent a primary total hip arthroplasty using a high hip center technique. Functional, radiographic, and survivorship outcomes were evaluated.

Results: Of the 37 patients, 31 patients (83.8%) were available for the mean follow-up of 6.1 years (range, 1.5–7.6 years). Thirty-one cementless cups were located at an average vertical distance of 38.1 ± 3.3 mm and at a mean horizontal distance of 35.5 ± 3.4 mm. The mean ratio of the height of the hip center was 2.4% (range, 2.0%–2.9%). The Harris Hip Scores were improved from 50.3 points (range, 38–63 points) preoperatively to 92.3 points (range, 85–100 points) at the final follow-up ($P < .001$). Four patients continued to present with Trendelenburg gait pattern at the last follow-up. With use of revision for any reason and aseptic loosening as the end point, the 5-year survival rates were 90.3% (95% CI, 79.9%–100%) and 93.3% (95% CI, 84.3%–100%), respectively.

Conclusions: The high hip center technique in conjunction with a cementless acetabular component seems to be a valuable alternative to achieve satisfactory midterm outcomes for Hartofilakidis type B developmental dysplasia of the hip.

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Developmental dysplasia of the hip (DDH) remains a common cause of secondary osteoarthritis of the hip. Based on the relationship between the femoral head and the acetabulum and the connection between the true and false acetabulum, the classification system of Hartofilakidis et al [1,2] described the anatomic abnormalities in DDH: dysplasia (type A), low dislocation (type B), and high dislocation (type C). The anatomic abnormalities of Hartofilakidis type B DDH are that the femoral head articulates with a false acetabulum which partially covers the true acetabulum to a varying degree compared with a normal hip (Fig. 1A,B). Complete absence of a superolateral rim and a segmental deficiency of anterior and posterior walls are observed during surgery.

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* Reprint requests: Xi-Fu Shang, MD, Department of Orthopaedics, Affiliated Provincial Hospital of Anhui Medical University, No. 17 Lujiang Road, Hefei 230000, Anhui Province, China.

A deficient acetabulum leads to difficult to achieve adequate coverage of the acetabular component at the true site during total hip arthroplasty (THA; Fig. 1C). Therefore, acetabular reconstruction in adults with Hartofilakidis type B DDH continues to present a major technical challenge.

Reconstruction of an anatomic rotation center of the hip with autogenous bulk structural bone grafting [3,4] or acetabular medial wall osteotomy [5] at the site of the true acetabulum is the ideal option for patients with severe hip dysplasia. Nevertheless, 29% of the acetabulum with bulk femoral head autografts required rerevision by an average of 16.5 years [6]. Superior placement of acetabular component is particularly useful if a cementless acetabular implant is going to be used for the reconstruction in this difficult group of patients. To optimize host bone-implant contact, the acetabular component is placed at high but not lateral hip center where host bone is superior to the true acetabulum (Fig. 1D). This technique with the advantages of reducing the requirement for structural bone grafts and shortening anesthetic and surgical time

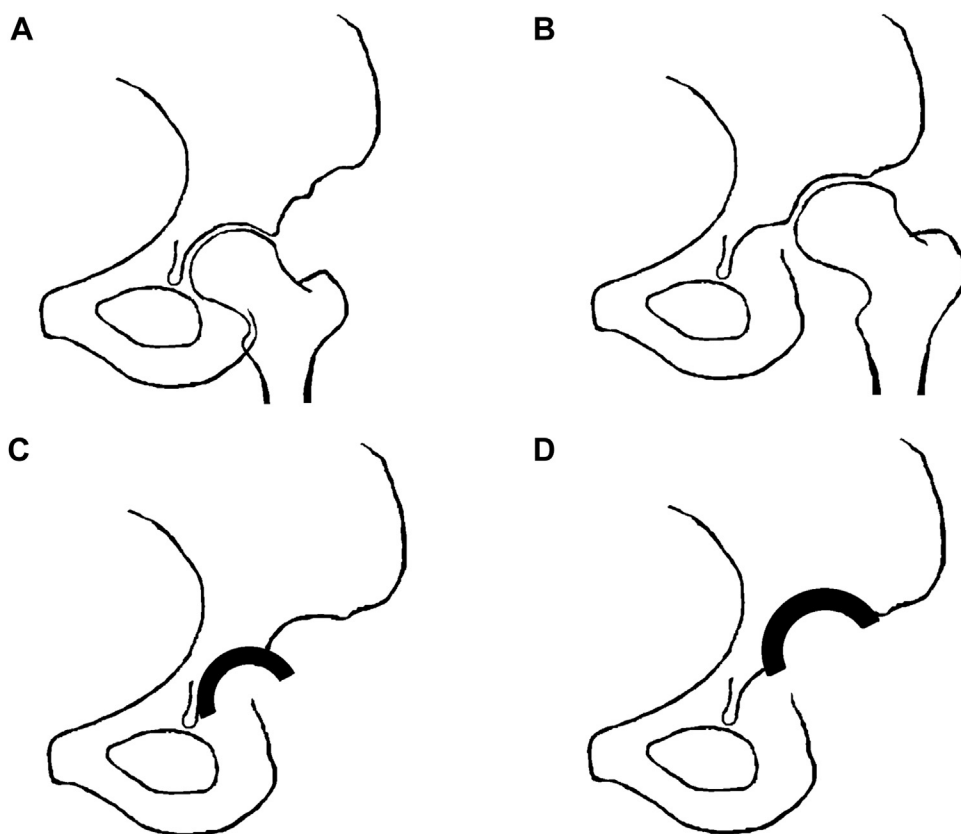


Fig. 1. Diagrams to show (A) a normal hip, (B) the anatomic abnormalities of Hartofilakidis type B developmental dysplasia of the hip (DDH) that the femoral head articulates with a false acetabulum, (C) acetabular component placed at the true site with inadequate coverage, and (D) acetabular cup placed at a high hip center to achieve adequate coverage without autogenous bulk structural bone grafting.

may be accepted as a valuable alternative [7–10]. However, some studies have demonstrated that a high hip center leads to a high rate of aseptic loosening, dislocation, and leg-length discrepancy [11,12].

The purpose of the present study was to evaluate the Kaplan-Meier survival rate [13], hip function, and radiographic results of cementless THAs with a high hip center technique for Hartofilakidis type B DDH at the midterm follow-up.

Materials and Methods

From January 1, 2007 to December 31, 2009, 112 primary cementless THAs were performed for severe osteoarthritis secondary to DDH at our hospital in 94 consecutive patients. Among them, 42 hips were diagnosed as low dislocation of the hip according to the classification of Hartofilakidis et al [1]. Nineteen patients (45%) with low dislocation of one hip and unaffected normal side of the other hip underwent unilateral THA. Twenty-three patients (55%) who had low dislocation of one hip and either dysplasia or high dislocation of the other hip were treated with staged bilateral THA. However, only Hartofilakidis type B DDH was included in the study. The operations were all performed by a single senior orthopedic surgeon. The indications for THA were severe pain and/or considerable difficulty with walking and performing daily activities. The Ranawat triangle (Fig. 2) was drawn on a postoperative radiograph of the pelvis to define the correct position of the anatomic hip center [14]. The position of the acetabular component was considered to be at a high hip center if the center of rotation of the hip joint was higher than the midpoint of the hypotenuse of the Ranawat triangle. Of the 42 hips, there had been 5

hips with anatomic reconstruction of center of rotation of the hip before May 2007. Thus, 37 hips in 37 patients were identified with a nonanatomic high hip center for reconstruction of the acetabulum.

After obtaining approval from the ethical committee of the hospital, we performed this study. Informed consent was obtained from all participants. All patient data were recorded prospectively and reviewed retrospectively. Two patients (2 hips) had died of causes unrelated to the procedure before last follow-up. These 2 patients' hip joints were painless without a revision procedure until their deaths. One patient (1 hip) refused to participate in this follow-up study for clinical examination because of medical disease unrelated to the hip disease. Three patients (3 hips) were lost to follow-up because of moving away or changing their telephone number. Thus, complete clinical outcomes and radiographic data were available for 31 patients (31 hips) at the time of the final follow-up (Fig. 3). None of them had received any previous treatment. Table 1 summarizes the demographic characteristics of the study group, as well as bearing type and limb-length discrepancy before surgery. The mean follow-up time was 6.1 years (range, 1.5–7.6 years) after the primary THA.

Operative Technique

All procedures were performed under general anesthesia with patients in supine position by a single senior surgeon. A posterolateral approach without greater trochanter osteotomy was used for all patients. The fascia was divided in line with the skin incision over the center of the greater trochanter, and the gluteus maximus was bluntly split in the direction of its fibers. The short external rotators were divided as close to their insertion on the femur as possible. The

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