

Anatomic placement of the acetabulum improves the survival rate in patients with Crowe type-II dysplasia undergoing total hip arthroplasty

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Comment on: Watts CD, Abdel MP, Hanssen AD, *et al.* Anatomic Hip Center Decreases Aseptic Loosening Rates After Total Hip Arthroplasty with Cement in Patients with Crowe Type-II Dysplasia: A Concise Follow-up Report at a Mean of Thirty-six Years. *J Bone Joint Surg Am* 2016;98:910-5.

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Total hip replacement in patients with developmental dysplasia of the hip (DDH) is a difficult, technical procedure for surgeons to perform because of the potential risks for these patients to have severe abnormalities in their bones and soft tissues (1,2). The procedure is more demanding and is associated with a higher rate of complication compared to total hip arthroplasty (THA) for the treatment of primary degenerative osteoarthritis of the hip (3). In general, the accepted practice is that placement of the acetabulum in the anatomic location is more advantageous biomechanically and may lead to higher prosthetic survival rates in these patients (4-6). Some of the most experienced hip surgeons agree that the optimum location for the center of rotation of a THA is the anatomic position. Therefore, recent literatures suggest placing the acetabular component in the anatomic hip-center for different types of DDH. Several techniques have been used to reconstruct the acetabulum during THA in DDH patients, including augmentation with bone grafting with cemented or noncemented acetabular component (7-9) or using high hip centre (10,11) when there is no better choice. Yet, there still remain some controversies as to whether a high hip center, particularly without bone graft, is the best option for patients with severe hip dysplasia.

The article by Watts *et al.* (12) is an important review of the practice of THA treatment of DDH. This article was based on a previous study by Pagnano *et al.* (13)

who reported the 2- to 22-year results of 145 total hip arthroplasties with cement performed from 1969 to 1980 in 117 patients with Crowe type-II dysplasia. Watts's *et al.* purpose of the study was to update the long-term effects of a non-anatomic hip center on component loosening and aseptic revision. Their present findings noted that hips with an anatomic hip center had significantly lower rates of acetabular loosening and aseptic revision in Crowe type-II dysplasia. The acetabular loosening after 30 years was less likely when the hip center had been placed within the true acetabular region (TAR) (14), <15 mm superior to the approximate femoral head center (AFHC), <35 mm superior to the interteardrop line (ITL), or within zone 1 as described by Pagnano *et al.* (13). Similarly, cup revision due to aseptic loosening was less likely when the hip center had been placed <35 mm superior to the ITL, with a cumulative incidence of 25% versus 39% after 30 years.

The position of the acetabular component is an important parameter affecting long-term fixation of both the cup and the stem when cement is used. It is probably due to the increase in forces across the hip joint produced by major alterations in the positioning of the cup. The detrimental effects of a non-anatomical positioning of the cup, as demonstrated in this study, are particularly relevant to cemented femoral or acetabular components. Increased rates of loosening and aseptic revision of both the acetabular and the femoral component have been associated with an

initial positioning of the acetabular cup outside of the TAR. Identification of the true center of rotation of the hip by extrapolation from that of the contralateral hip often is not possible because of distortion due to previous operative procedures or bilateral DDH. Methods of measurement and classification that have been used to determine the center of the hip joint under these circumstances have been based on the absolute distance from the radiographic teardrop (14). The TAR is defined as the area enclosed by an isosceles triangle, with the height and width equal to 20% of the height of the pelvis. The inferomedial corner of the TAR is 5 millimeters lateral to the intersection of the Kohler line with the radiographic teardrop. The mid-point of the triangle's hypotenuse is defined as the AFHC and represents the normal center of rotation of the hip.

Some studies suggest that the lack of an association between the hip-center-height and loosening of the acetabular component resulted in lateral displacement is a detrimental factor. Contrastingly, superior non-anatomical placement without lateral displacement is acceptable. Horizontal displacement of the acetabular component was found to be an adverse factor and isolated superior displacement was considered unrelated to loosening of the acetabular component (7-9,15).

Anatomic placement of the acetabulum is biomechanically advantageous and increases the survival rate in these patients. Unbeknownst, reattachment of the gluteal muscles during this procedure provides faster and better functional recovery, and similarly, the bone stock is also protected, making revision surgery much easier. The anatomic location for acetabular component placement in severe dysplasia has been proposed by multiple authors as the optimal location for cup positioning after having demonstrated higher rates of acetabular loosening with nonanatomic placement.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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