Editorial review: *Equalisation of leg lengths in total hip arthroplasty for patients with Crowe type-IV developmental dysplasia of the hip*

James R. Berstock[1], Peter A. Torrie[2], Michael R. Whitehouse[1]

[1]Musculoskeletal Research Unit, Learning & Research Building (Level 1), Bristol Medical School, Translational Health Sciences, Southmead Hospital, Bristol, UK; [2]Department of Spinal Surgery, Gloucester Royal Hospital, Gloucester, Gloucestershire, UK

Correspondence to: James R. Berstock. Musculoskeletal Research Unit, Learning & Research Building (Level 1), Bristol Medical School, Translational Health Sciences, Southmead Hospital, Bristol BS10 5NB, UK. Email: james.berstock@bristol.ac.uk.

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Reconstruction of the dysplastic hip presents many well documented challenges. On the pelvic side a pseudoacetabulum may obscure normal landmarks. Once the true acetabulum is identified, the acetabular component may be placed in soft, previously unloaded bone which is often retroverted and simultaneously superiorly deficient, leading to compromised component-host bone contact and concerns regarding primary stability. Excessive medialisation or structural augmentation may therefore be required to achieve adequate coverage and stability. Reduced acetabular volume often necessitates the use of a small acetabular component necessitating the use of small bearing sizes.

On the femoral side, correction of the high hip centre may result in traction injury to profunda femoris or the sciatic nerve (1,2), and may necessitate prophylactic subtrochanteric osteotomy and additional soft tissue releases of the adductor, abductor, gluteus maximus, iliopsoas and rectus femoris musculature. There is a risk of femoral fracture due to the narrow femoral canal and underdeveloped medial calcar flare, and a mismatch between diaphyseal and metaphyseal canal diameter may preclude standard metaphyseal fitting components. Excessive proximal femoral anteversion may mislead femoral component orientation (3,4), and the resultant posteriorly located greater trochanter combined with corrected acetabular component position may result in impingement or instability. Excessive femoral bowing may lead to anterior cortex penetration, particularly in poor quality bone, and consideration must be given to the reduced femoral offset, and high neck-shaft angles which are typical of in developmental dysplasia of the hip (5). For these reasons, modular cementless femoral components have become the surgical preference (6).

Li and colleagues (7) report on the role of pelvic obliquity and spinal deformity in the correction of leg length discrepancy. Whilst the challenges listed above gain considerable attention in the literature, the role of spinal deformity in the reconstruction of the DDH hip does not. The authors have devised a logical, algorithmic and reproducible approach for objectively describing the potentially confounding relationship between coronal plane spinal deformity and longstanding hip dislocation. They should be commended for adhering to the primary orthopaedic tenet of 'the joint above and below', with the hip-spine interrelationship infrequently being addressed. As such, this paper highlights the necessity for orthopaedic surgeons to be mindful beyond the intricacies and boundaries of their own sub-specialty.

Li and colleagues measure pre-operative leg lengths using standing radiographs taking into consideration bony (tip of greater trochanter to the centre of the ankle),

anatomical (difference between lesser trochanter height), and functional (height of shoe raise required to restore the feeling of normal length) discrepancies. Li and colleagues then build on the Crowe classification (8), using valuable modifiers which consider the presence of contralateral hip dysplasia, pelvic obliquity with a compensated spinal curve, or pelvic obliquity with fixed spinal decompensation. Each has a direct impact for planning the restoration of leg lengths during arthroplasty. Li and colleagues offer reconstructive strategies based on the previous assessment and classification. Essentially if there is no, or a correctible spinal deformity (assessed on the AP lateral flexion views), leg lengths are equalised anatomically. If the spine deformity is fixed, then equalisation of the functional leg length is performed. Bilateral cases follow the same rule, with restoration of the hip centre on the first side and equalisation of either anatomical or functional leg length discrepancy depending on the presence of fixed spinal deformity as for unilateral cases.

The importance of the complex relationship between the hip and the spine is well recognised (9), however very little of the DDH reconstruction literature discusses the importance of the spine. Failure to appreciate fixed spinal deformity when performing arthroplasty of the hip has been associated with high rates of dislocation, particularly following spinal fusion (10).

Li's approach to the radiological assessment of the spine and its' flexibility is unorthodox, in that standing (weight-bearing and loaded) spinal radiographs are today almost universally accepted as standard in the assessment of spinal coronal and sagittal alignment. Although uncertainty remains with regard to the influence concomitant back pain plays on radiological spinal alignment. Intraoperative spinal traction films utilised in the assessment of the spinal deformity, for adolescent idiopathic scoliosis, have purported to this.

The experience Li and colleagues present over a 5-year period from the Sixth People's Hospital, Shanghai is impressive compared with even the largest volume European centres. Decreased genetic predisposition and the success of European screening programmes may account for the variation in case volume and severity.

The focus of spine deformity surgery considers primarily whether the curve is progressive and whether it is globally balanced within both the coronal and sagittal planes. A significant component of this assessment includes curve flexibility and the patients' post-operative capacity for compensation to achieve clinical and radiologically satisfactory global balance. Restoration of LLD distal to a balanced fixed compensatory spinal curve will clearly have a detrimental effect on the patients' global coronal alignment with potentially disastrous clinical outcomes, which can only be compensated proximally in the upper spine or distally at the knee or ankle. Furthermore, in Li's series spinal sagittal balance and its complex multifactorial relationship with the coronal plane has not been considered, nor the resultant effects that restoration of LLD may produce. The implication for acetabular component anteversion is well documented (9,11,12), and similar considerations with regard to the hip-spine relationship as addressed with the coronal plane, are merited in the sagittal plane. For complex reconstructive cases where significant correction of leg lengths will have an impact on the spine, we recommend a careful multidisciplinary approach with pre-operative planning performed by both hip and spinal specialists working in concert.

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Footnote

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

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