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Total Hip Arthroplasty with Sub-Trochanteric Femoral Shortening Osteotomy for Post-Infective Hip Dysplasia-A Case Report

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Abstract | **Case Report**

Total hip arthroplasty is a surgical option for patients with symptomatic arthritis secondary to severe hip dysplasia. These cases are associated with difficulty in identifying the true acetabulum and achieving stable fixation of the acetabular component is challenging. On the femoral side, femurs in dysplastic hip have increased anteversion, shorter femoral necks and reduced intramedullary canal size. The outcome of total hip arthroplasty in these patients improves with restoration of the anatomical centre of the hip. But restoration of the hip centre in a dysplastic hip can lead to excessive limb lengthening and traction nerve injury. So, additional femoral shortening is necessary to allow hip reduction and to avoid excessive limb lengthening. Sub-trochanteric femoral shortening osteotomy is therefore a viable option and can be extremely useful in addressing the limb length discrepancy, facilitate reduction, equalize limb lengths, and protect the sciatic nerve. We report a case of post-infective dysplasia of hip where sub-trochanteric femoral shortening osteotomy was done along with total hip arthroplasty.

Keywords: Total hip arthroplasty, Subtrochanteric shortening osteotomy, High hip dislocation, Childhood pyogenic infection, hip dysplasia.

INTRODUCTION

High hip dislocation with dysplasia is a debilitating sequela of neglected pyogenic arthritis of the hip in childhood (Zhao *et al.*, 2020). Total hip arthroplasty is a feasible treatment for severely dysplastic hips in adults (Ahmed *et al*., 2015; Greber *et al*., 2017). In such patients, the native acetabulum is hypoplastic and preparing the true acetabulum and achieving stable fixation of the acetabular component becomes difficult. On the femoral side, there is increased anteversion, shorter neck and decreased size of the intramedullary canal. The soft tissues cover around the hip joint becomes contracted because of chronic dislocation. The restoration of the anatomical hip centre is bio-mechanically important and improves the outcome in these patients (Ahmed *et al*., 2015; Greber *et al*., 2017; Zhao *et al*., 2020) In restoring the center of rotation of the hip, the limb may be excessively lengthened(> 4 centimeters) leading to risk of neurological traction injury of the sciatic nerve (Krych *et al*., 2010). Subtrochanteric shortening osteotomy is a viable option for restoring the anatomic hip centre which can aid in reduction, equalize limb lengths, and protect the sciatic nerve. It allows shortening and correction of rotational abnormalities along with preservation of the proximal femoral metaphysis which increases the rotational stability for the implant. By rotating the femoral fragments, sub-trochanteric osteotomy also corrects proximal femoral anteversion. This leads to the greater trochanter and the abductors being positioned in an anatomical position restoring the abductor lever arm which results in reduction of pain and instability with improvement of the patient's limp. Here we present a case of a 54 years old male with post-infective severely dysplastic high riding hip which was managed using total hip replacement with sub-trochanteric femoral shortening osteotomy (Greber *et al.*, 2017; Krych *et al*., 2010).

CASE REPORT

A 54 years old male presented with pain in the right hip and low back region which was insidious in onset, gradually increasing, which aggravated with ambulation and partially relieved with rest and medications. The patient also gave a history of septic arthritis of the right hip joint in infancy, which was managed conservatively back then, following which the

patient developed shortening of the ipsilateral lower limb and a painless limp for which the patient has been on assisted ambulation with crutches since childhood. On examination, the patient had an assisted antalgic gait with tenderness over the anterior hip point. The right hip is grossly ankylosed and movements in all planes are restricted with less than 10 degrees of flexion, 0 degrees of extension, and less than 5 degrees of abduction and adduction with zero degrees of rotation both in knee flexion and extension. The right lower limb, on measurement, exhibited a true shortening of four centimetres. Trendelenburg sign was positive. The modified Harris Hip score was 23.29. Radiological examination included antero-posterior view with both the hips and lateral view which showed absence of femoral head and neck in the right hip, flattened severely under-developed acetabulum and superior migration of the greater trochanter. The findings were consistent with type IV of Choi classification of paediatric septic hip sequela and was graded as Crowe type IV dysplasia.

Figure 1: X-ray of the pelvis with both hips antero-posterior view with severely dysplastic hip, flattened acetabulum and high riding trochanter

The patient was planned for a total hip arthroplasty after all routine investigations were found to be within normal limits. Informed and written consent was taken from the patient regarding the procedure and to include him in our study. A sub-trochanteric osteotomy was planned to compensate for limb lengthening and prevent sciatic nerve injury. During surgery, the patient was placed in lateral decubitus position. The hip joint was exposed using the modified Hardinge approach. The proximal femur was delivered and the poorly-defined neck was osteotomized. Femoral canal was prepared using broach and sequential reaming was done. The reaming was done to a greater length than the length of the shortening. A transverse sub-trochanteric shortening osteotomy was performed next by splitting the vastus lateralis, about eight centimetres from the greater trochanter. The proximal femoral fragment was then translated anteriorly to better visualise the true acetabulum, identified by the transverse acetabular ligament. The proximal fragment was rotated on its abductor pedicle to maintain the blood supply to the proximal fragment to aid in union. The true Acetabulum was reconstructed by sequential reaming up to depth of forty-three millimetres and cemented cup of size forty was used. We would have preferred an uncemented cup with screw fixation but a cemented cup was used due to non-availability of an uncemented cup of the required size. Bony defect in the superior-lateral margin of the true acetabulum was detected which was reconstructed using iliac crest bone graft. The trochanter was brought down by about two inches by gentle traction after releasing the shortened anterior hip capsule, tight fascial bands within the abductor muscles and psoas tendon. Distal Fitting Solution Stem (© JOHNSON & JOHNSON DEPUY REVISION SYSTEM) was used and proximal segment brought down to the distal fragment and the entire construct was stabilized using cerclage cables.

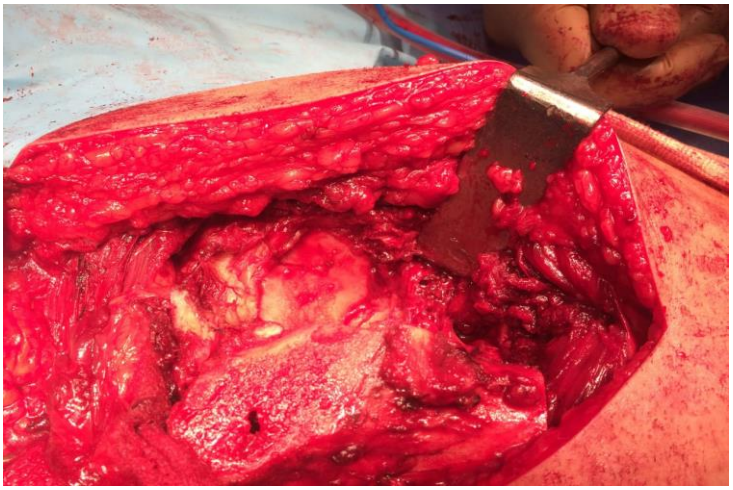

Figure 2: Intra-operative view showing femoral shaft with osteotomized femoral neck and poorly developed acetabulum

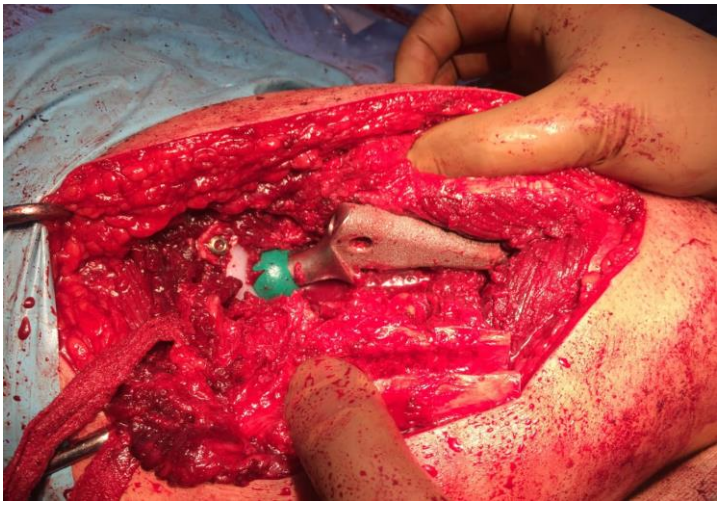

Figure 3: Intra-operative view showing the reconstructed acetabulum with acetabular defect corrected with bone graft fixed with screws along with osteotomized femoral shaft and uncemented stem

Post-operatively, non-weight bearing ambulation was started on second day. Partial weight bearing was allowed at 2 weeks. Full weight bearing with shoe raise was advised at 6 weeks. Post-operative Harris hip score at 2 weeks improved to 71.2.

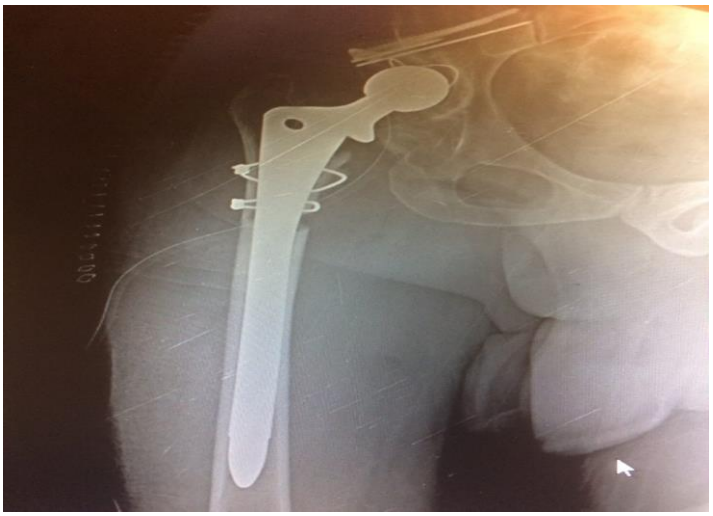

Figure 4: Post-operative x-ray of right hip antero-posterior view showing the THA prosthesis along with cerclage cables and bone graft fixed with screws

DISCUSSION

We performed a sub-trochanteric transverse femoral shortening osteotomy along with total hip arthroplasty in a 54 years old male patient with severe hip dysplasia secondary to childhood septic arthritis. Total hip arthroplasty is indicated for patients with dysplastic hip and high hip dislocation. A sub-trochanteric shortening osteotomy is indicated when a total hip arthroplasty might lead to unacceptable lengthening of the limb and cause traction injury to sciatic nerve (Krych *et al*., 2010). For patients with high hip dislocation after childhood pyogenic infection, only a few studies have reported cases with total hip replacement with sub-trochanteric shortening osteotomy (Zhao *et al.*, 2020). The challenge of total hip replacement in chronic dislocation depends on the severity of anatomic deformation, size of the femoral canal, rotational deformity of the proximal femur, capsular and ilio-psoas thickening, dysfunction of abductors, contracture of the hamstring, adductor and rectus femoris muscles, and contracture of the sciatic nerve (Greber *et al*., 2017; Krych *et al*., 2010). During acetabular preparation, over-reaming of the anterior and medial walls should be avoided. Rotational stability of the osteotomy site and achieving good bone-to-bone contact at the subtrochanteric osteotomy site is desirable to avoid non-union is important to avoid non-union. Final rotational alignment of the implants and bone fragments is essential to obtain optimal hip stability to minimize the risk of postoperative hip dislocation (Krych *et al*., 2010).

CONCLUSION

Total Hip Arthroplasty is treatment of choice for patients with symptomatic arthritis secondary to hip dysplasia which can be developmental or acquired. In restoring the center of hip rotation in cases with high dislocation of the hip and severe contracture of soft tissue, the leg may be lengthened by up to or more than 4 cm, leading to difficult reduction and major risk of neurologic traction injury. To address these difficulties during hip arthroplasty for severe dysplasia, subtrochanteric femoral shortening osteotomy is a viable option and can be extremely useful in addressing the limb length discrepancy.

Conflicts of interest: The authors declare no conflict of interest.

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