Case Report
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# MANAGEMENT OF SECONDARY OSTEOARTHRITIS WITH PROXIMAL FEMORAL DEFORMITY DUE TO PREVIOUS COXITIS HIP: A CASE REPORT

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## ABSTRACT

Most proximal femoral deformities encountered during hip arthroplasty are secondary to degenerative processes, previous osteotomy, or fracture and could be a challenged for surgeons. Femoral deformity may be angular, rotational, or one of bone diameter or length. Fully understanding the anatomy of the deformity is the first element in deciding how to best treat the deformity during Total Hip Arthroplasty (THA). Presentation of Case with female 31 years old complaint of pain on her left hip with restricted motion, with a Leg Length Discrepancy (LLD) of 2 cm and a history of operation due to left hip infection when she was a baby. THA was performed with carefully evaluating the abductor muscle to maintain hip stability. Postoperatively the patient has an equal leg length, with less pain on the hip, a good ROM, and able to walk dependently using a cane. Slight tightness on the abductor and adductor muscle was noted postoperatively and the patient undergone physiotherapy. Multiple important factor must be considered before considering THA in patients with proximal femoral deformity, including abductor function, osseous anatomy, hip stability and LLD. One must be careful of correction of LLD greater than 3 cm because possible effect on abductor strength, hip stability and sciatic nerve function. In this case, we demonstrated that a successful THA can be achieved despite altered anatomy due to secondary developmental changes. In the setting of sufficient abductor strength and bony stock amenable to implant fixation, THA is a viable option for management and careful preoperative planning helps predict prosthesis requirements and technical challenges.

Keywords: Osteoarthritis; Proximal Femoral Deformities; Total Hip Arthroplasty; Abductor Muscle.



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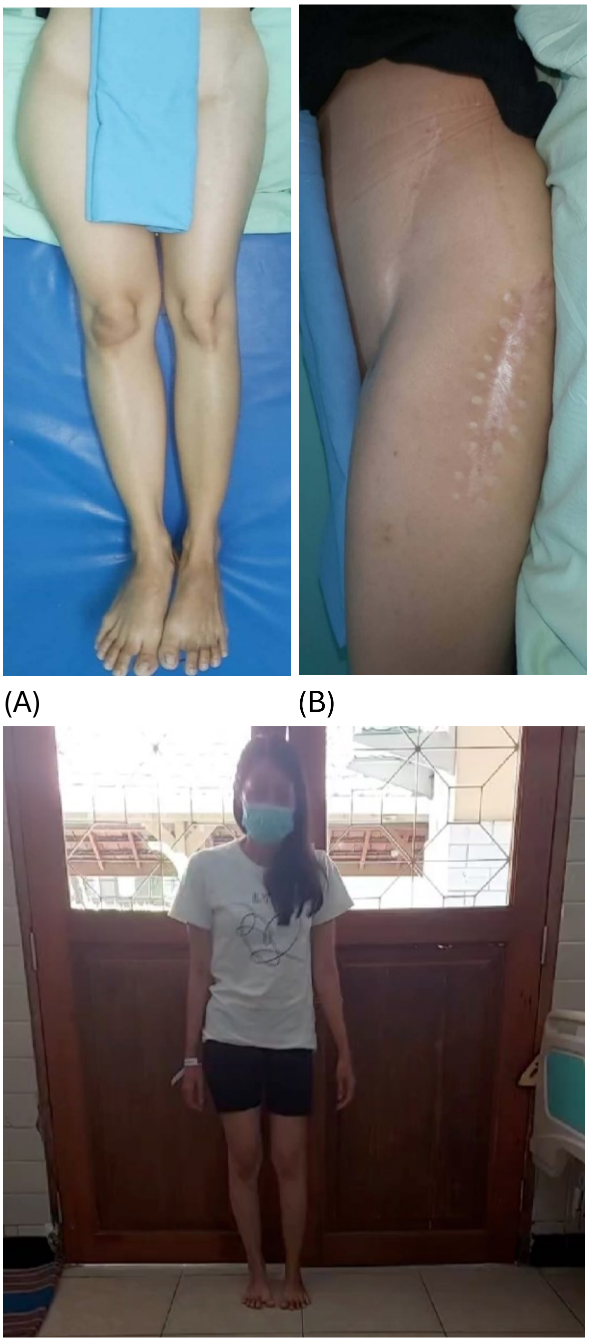
## INTRODUCTION

Osteoarthritis (OA) is one of the most common disease of our era. It is not simply a loss of articular cartilage leading to joint pain but is increasingly being shown to be a disorder of the "joint organ", affecting the cartilage along with the underlying bone, surrounding muscles and ligaments. The hip is an enarthrosis (ball and socket joint) and a major weight bearing joint. It is exposed to static and dynamic forces during standing, walking and running (1). Most proximal femoral deformities encountered during hip arthroplasty are secondary to degenerative processes, previous osteotomy, or fracture. Anatomic deformities level includes greater trochanteric, femoral neck, metaphyseal, and diaphyseal level deformities. Deformities at each level may be angular, rotational or translational, abnormal bone size, or a combination. Careful preoperative planning helps predict prosthesis requirements and technical challenges (2).

## PRESENTATION OF CASE

The patient Ms. T has complained about pain in her left hip with restricted motion on it. This patient had history of infection on her left hip when she was a baby. In July 1998 she had an operation on the hip and after that she cannot walk normally. Since 2018 she felt pain in the hip with restriction of motion. From physical examination (Figure 1.), scar was noted from previous operation. No tenderness and pressure pain were found, but there's a leg length discrepancy (LLD) of 2 cm and a limping gait. The range of motion (ROM) of the hip flexion 0-900, full extension, abduction 0-50, adduction 0-100, external rotation 0-50, and no internal rotation. Functional Harris Hip Score (HHS) was 53/100 which indicated a poor functional outcome. An X-ray and CT-scan of the pelvic and femur was performed (Figure 2, 3, and 4.), laboratory findings are normal.



(A) (B)

(C)

**Figure 1.** Clinical appearance of the patient, (A) Anterior view, (B) Lateral view, (C) Limping gait was noticed during walking.

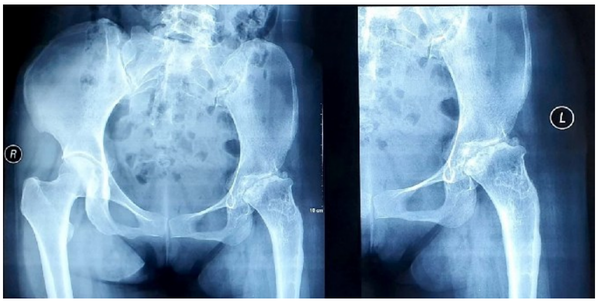


**Figure 2.** Xray Pelvis.

**Figure 3.** Xray Femur AP and Lateral.

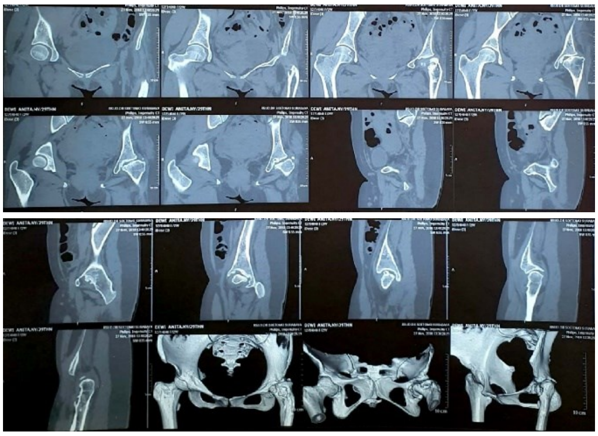
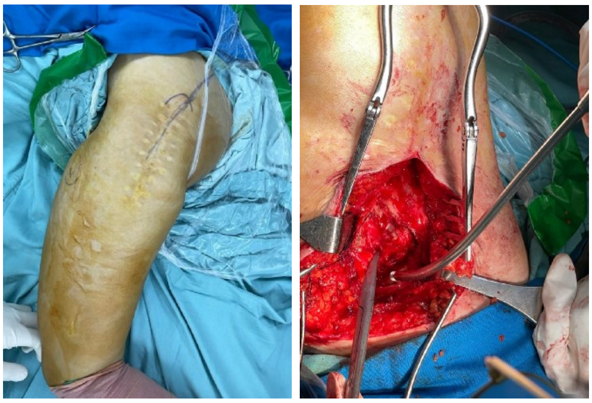


Figure 4. CT-Scan of the Hip.

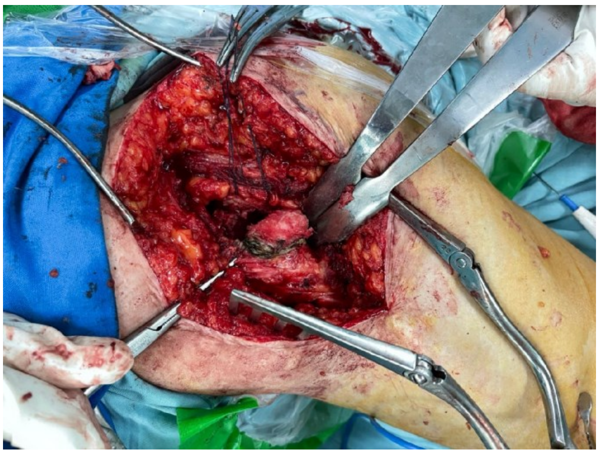
The operation was done in a lateral decubitus position with a posterior approach of the hip joint (Figure 5A). Then the gluteus maximus muscle was split, making identification of the gluteus medius muscle, then identification of the short external fixators (piriformis, gemelli, and obturator muscle, Figure 5B) and marked it with a suture. Last identification of the capsule, open the capsule and with same procedure marked it with a suture.



(A) (B)

**Figure 5.** Operative procedure; (A) Position and landmark incision, (B) Identification of the Short External Fixator Muscle and Gluteus Medius.

After the capsule was opened, try to dislocate the destroyed femoral head with irregular size and loss of spherical shape of the head. We acquired difficulty to identify the head neck junction with the irregular shape of the greater trochanter, no lesser trochanter, and very shallow acetabular. Femoral neck osteotomy was performed at 3 - 4 cm from the femoral head (Figure 6A.). Then find soft tissue tightness especially in the anterior part of the capsule, perform release of the fibrotic tissue and the capsule in the anterior part.



(A)

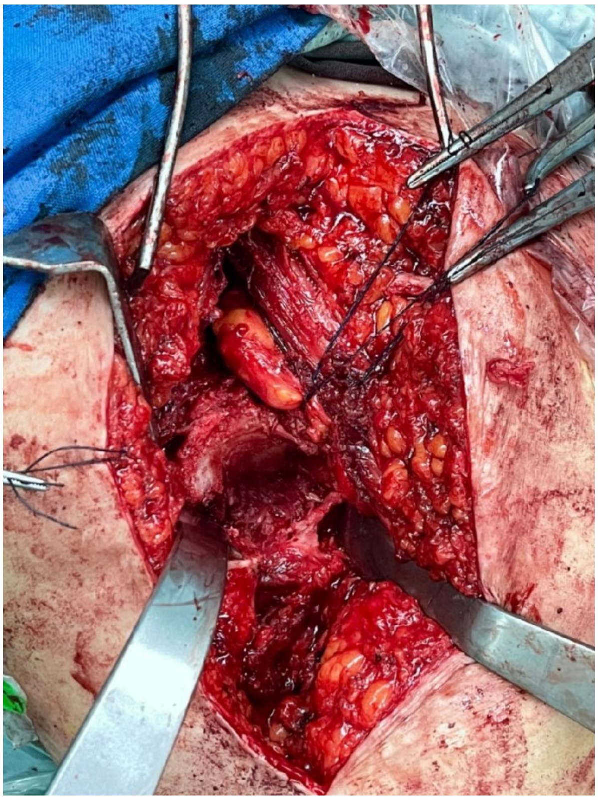
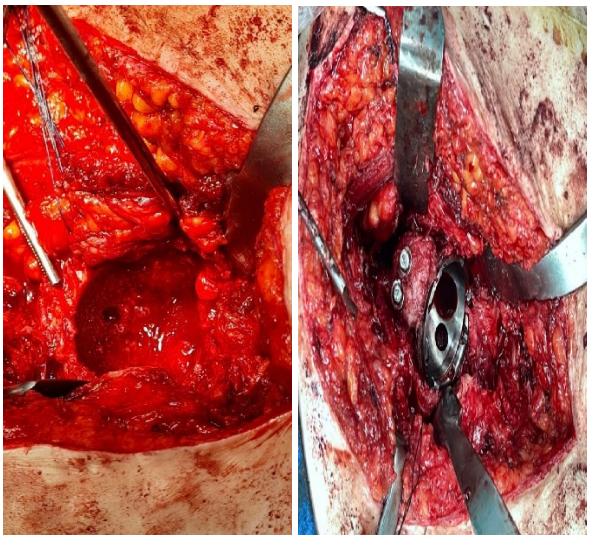


**Figure 6.** (A) Marked and osteotomy of the femoral neck, (B) Exposed acetabulum. Make the acetabular preparation by reaming it with the smallest size of acetabular reamer, size 38 was used in this procedure.

Acetabuloplasty was done with medialization of the acetabulum with the position of the reamer perpendicular to the hip. After gaining a good depth (identify the remain bone stock of the acetabulum with depth gauge and C-arm guiding), make position of the reamer in abduction of 450 and anteversion of 15-200. Ream until the acetabular cup size is 44 (Figure 7A). Cementless acetabular component was used with polyethylene linier and 2 screws. Identify cup area of less coverage with the post acetabulum and bone graft was used on the posterior part from the femoral head cutting (Figure 7B). It is important to confirm the position of the acetabular with the present of the transverse acetabular ligament (TAL).



(A) (B)

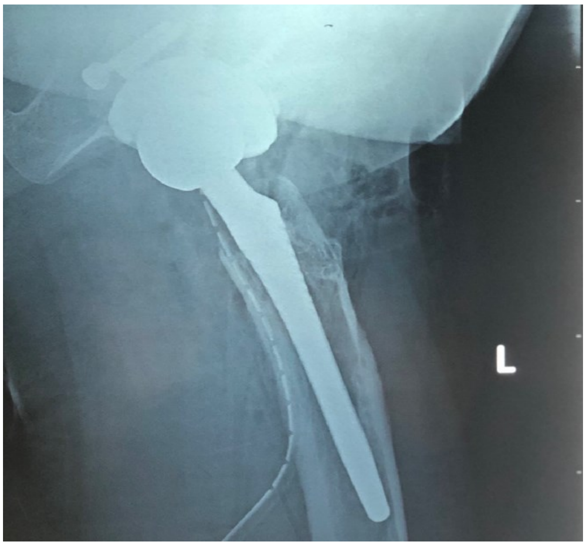
Figure 7. (A) Reamed the acetabulum, (B) Acetabular cup position and bone graft. Next part is femoral preparation with protection of the abductor muscle and insertion of the muscle.

Identify the femoral canal, performed reaming with lateralization of the reamer (Figure 8A), and confirmed the position with C-arm guidance (Reamed the femoral canal with size of 6). Measure the length of the femoral canal and femoral offset. Decide to put femoral stem (Figura 8B) cementless with size 6 and short femoral neck off-set (the smallest size that the company has) and metal head size of 28. Reposition the hip and check the stability and tightness of the soft tissue (Figure 9A). We found that there is a tightness in adductor muscle and the hip flexor muscle (rectus muscle), tenotomy of the muscle was performed. After closure, try to restore the capsule and the short external rotator to its position (Figure 9B).

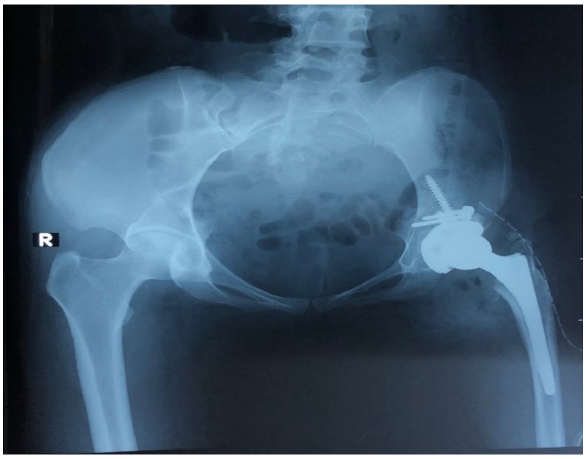
**Figure 8.** (A) Reamed femoral canal, (B) Position of femoral stem.

**Figure 9.** (A) Position of the stem after repositioning, (B) Image of the cup position.

**Figure 10.** The clinical appearance after the operation showed equal leg length.




(A)




(B)

**Figure 11**. Post-operative X-Ray of the (A) Pelvic and (B) Left Hip.

## DISCUSSION

OA is characterized by loss of structural integrity of cartilage lining the articular surface. Articulating surfaces of the hip joint are lined by hyaline cartilage. This comprises of clusters of chondrocytes embedded in a large amount of extracellular matrix. The matrix is composed of proteoglycans of which aggrecan is the most abundant followed by type II collagen fibers. Destructive processes lead to swelling, decreased shock absorbing properties (compliance), softening, fracturing, fibrillation, ulceration and ultimately erosion of the cartilage with exposure of the subchondral bone (eburnation). A healing response does occur during which type-3 collagen is laid down. This is however non-compliant and forms fibrocartilage which is devoid of the compliance and shock absorbing properties of type-2 (hyaline cartilage).

From this point onwards in the disease process, forces are transmitted to the subchondral bone leading to increased bone turnover with sclerosis and the formation of cysts and osteophytes. The bone overlying the cysts or areas of avascular necrosis might collapse causing flattening of the femoral head—a characteristic appearance in advanced OA (1). Secondary OA is due to a known predisposing factor which might include any of those listed above or one of the following:

- Previous trauma
- Mechanical incongruity of the joint due to a congenital malalignment or previous trauma to the joint surface
- Previous inflammatory joint disease e.g., septic arthritis/bone disease e.g., Paget's disease
- Blood dyscrasias e.g., haemophilia with recurrent hemarthrosis
- Neuropathic joint disease
- Previous repeated steroid injections
- Endocrinopathies e.g. Cushing's disease, haemochromatosis.

Marked femoral deformities, although uncommon, are not rare in patients who require total hip arthroplasty and occur for many reasons. These include developmental abnormalities, metabolic disease processes, previous fracture, and previous osteotomy. There are few studies about the generic subject of total hip arthroplasty in patients with femoral deformity, although results of total hip arthroplasty in patients with specific diagnoses often associated with the femoral deformity have been published (2).

Femoral deformities pose many technical challenges for the surgeon. Deformities can make exposure difficult, can increase the risk of femoral fracture or perforation, and can lead to implant malposition (Figure 10.). Deformities may, in some cases, compromise implant fixation. Hip instability caused by bony impingement or implant malposition may occur in hips with femoral deformity. Finally, deformity can alter hip biomechanics, thereby causing problems with abductor power and limp (2).

When deformity of the femur is recognized, careful preoperative planning is valuable to assess how the deformity will affect the planned procedure. The deformity may affect choice of exposure. Some deformities make canal preparation more difficult. Translational deformities especially in the sagittal plane leave the femur at risk for perforation. Intraoperative fluoroscopy or radiographs may aid in safe canal preparation and reduce the risk of femoral perforation. Deformities influence the choice of implant geometry and choice of implant fixation. Patients with certain deformities will require special implants and occasionally may need custom implants (2,3).

The triple goals of managing proximal femoral deformity during THA are to optimize hip biomechanics for good function of the arthroplasty and hip stability by choosing the best implant position, size, and design; gain reliable and durable implant fixation by optimizing the same three parameters; and minimize the risk of complications by choosing techniques that protect key structures such as the abductors, greater trochanter, and femoral canal integrity. Not infrequently, the surgeon may need to make compromises between these three goals. For example, the surgeon may choose an implant that has a very high chance of durable fixation but only partially reproduces hip biomechanics (4).

The indications for THA in the presence of femoral deformity are very similar to those for any THA. The patient must have a combination of sufficient pain and/or disability related to the hip joint, in combination with sufficient radiographic joint damage, to justify the operation. The more severe the proximal deformity and the more complex the anticipated reconstruction, the greater the potential risk of complications or suboptimal outcome of the procedure. The surgeon should try to give the patient a realistic idea of what functional level may be achieved in the setting of the deformity and in consideration of the constellation of factors that influence outcome such as muscle quality and acetabular bone deformity (5).

The usual contraindications to any THA apply, such as the presence of active local or distant infection, or insufficient symptoms to justify level of risk. Furthermore, in these sometimes very complex cases (as noted above), surgery may not be indicated if the integrated risk of a serious complication seems prohibitively high compared to realistic and likely benefit. The main etiologies of proximal femoral deformity are posttraumatic, postsurgical, developmental dysplasia, developmental following an insult to growth (such as Legg-Calve-Perthes disease or childhood sepsis), metabolic bone disease, and genetic abnormalities. Many of these etiologies have typical bone deformity patterns of both the acetabulum and femur and specific considerations that are important for THA (Figure 11A). Anatomic classification of femoral deformity includes deformity of the greater trochanter, femoral neck, intertrochanteric area, subtrochanteric area, and femoral diaphysis. In each area, deformity may be angular, rotational, or one of bone diameter or length. Fully understanding the anatomy of deformity is the first element in deciding how best to treat the deformity during THA (5-6).

Clinical results of total hip arthroplasty are compromised if femoral deformity leads to 1) poorer pain relief; 2) poorer hip mechanics and limp; 3) poorer implant durability. Treatment of the patient with a femoral deformity requires judgment. Efforts to normalize hip anatomy with osteotomy or special implants are esthetically appealing and major residual, uncorrected deformities may have adverse biomechanical consequences. Younger, more active patients may be better treated by more complete and anatomic reconstruction at the time of the primary total hip arthroplasty. Improved implants and improved operative techniques hopefully will improve the surgeon's ability to treat these complex problems successfully and with a minimum of complications (2,3,7).

There are a few case series of THA performed in the presence of proximal femoral deformity. Mortazavi et al reported on 58 THAs in hips with proximal femoral deformity treated from 1998-2006. All hips except 2 were treated with cementless protheses. In 21 (23%) hips, osteotomy was required to properly fit the cementless stem in the femur. At the time of latest follow up (4 years on average), functional score showed significantly improvement. Radiographically, all femoral components showed stable bone ingrowth except 2 hips (3,5%) with stable fibrous ingrowth and 1 hip (2%) with loosening. The mechanical failure rate was 9 % (5 hips) (5,8,9).

In this case we demonstrated that a successful hip replacement can be achieved despite altered anatomy secondary to developmental changes. Clearly the abductor and external rotator muscle were atrophic, scarred, and weak. Stability of the hip is important in determining management (Figure 11B). Careful evaluation of abductor muscle is necessary, intraoperatively we must protect the abductor muscle. Leg length is another important consideration in management of proximal femoral deformity, one must be careful of correction of leg length greater than 3 cm because of possible effect on abductor strength, hip stability and sciatic nerve function (10). In our case, LLD is 2 cm and postoperatively the patient has an equal leg length with no deficit in nerve function. Also, less pain in the hip and good range motion of the hip. Patients may undergo physiotherapy for abductor and short external muscle stretching.

## CONCLUSIONS

Multiple important factor must be considered before considering THA in a patient with proximal femoral deformity, including abductor function, osseous anatomy, hip stability and LLD. In the setting of sufficient abductor strength and bony stock amenable to implant fixation, THA has been demonstrated to be a viable option for management. Careful preoperative planning helps predict prosthesis requirements and technical challenges.

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