DOI: 10.7860/JCDR/2015/10109.5363

Bipolar Hemiarthroplasty for Primary Abductor Deficiency with Femoral Neck Fracture

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Keywords: Abductor tendon, Bipolar arthroplasty, Hip joint

A 75-year-old male patient presented to the emergency department with complaints of pain in left hip since two days. There was history of trivial fall at home with trauma to left hip region. Patient was not able to bear weight on involved leg after fall. The patient was a known diabetic and hypertensive since 10 y. There was a history of surgery done on the left hip, 7 y back, for a deep abscess with involvement of bone (?? osteomyelitis). After the surgery when the patient was mobilized he noticed a limp while walking. He described it as lurch to the affected side. The limp was present even to the day when patient had trauma.

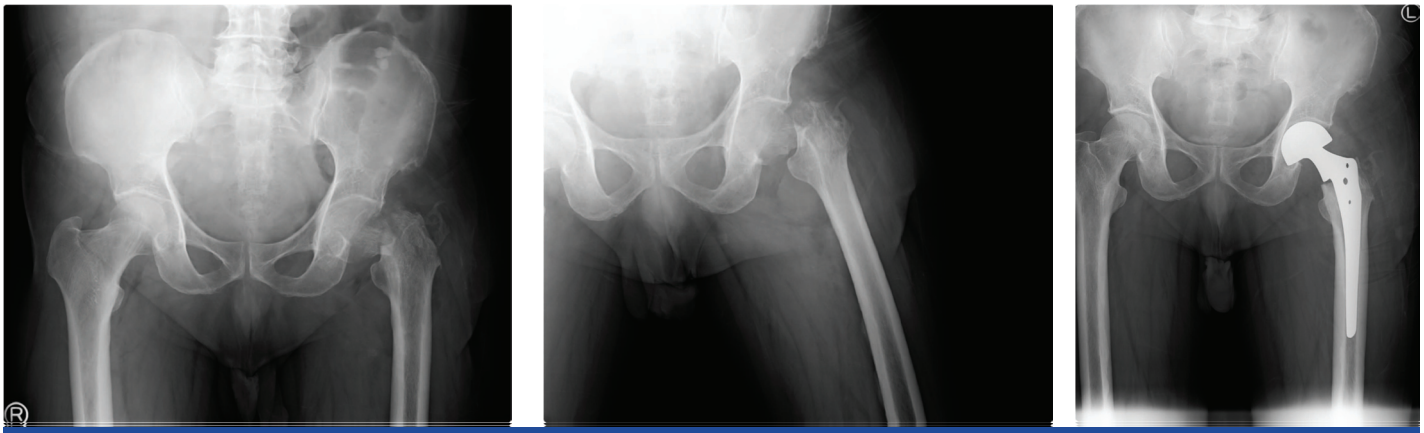
On examination the limb was lying in an attitude of flexion and external rotation. Scar of previous surgery was noted. There was trans- trochanteric tenderness. There was no local rise of temperature. The trochanter was overriding and irregular. All the movements, active and passive, had painful restriction. True supra-thochanteric shortening of 2 cm was noted.

On taking plain radiographs, AP of the pelvis and hip; cross table lateral of the left hip, a femoral neck fracture was noted on the left side (Garden type IV). The greater trochanter on left side was absent and calcifications could be noted in the abductor tendon insertion [Table/Fig-1&2]. There were no signs of osteophytes or osteolysis in hip joint. However the affected side was osteopenic as compared to the opposite side. No definitive signs of previous/ongoing infection could be noted on the plain radiographs. ESR and CRP were within normal limits as were other hematological investigations.

Considering the history and investigation results, the patient was posted for bipolar hemi-replacement arthroplasty. The patient was operated under spinal plus epidural anesthesia in right lateral position. Hip joint was approached through posterior approach. The greater trochanter was absent. The abductor tendon was attached at the sight of greater trochanter by fibrous tissue. We elevated the abductor tendon as a continuous sleeve with tendon of vastus lateralis. Then through routine approach the capsulotomy was done, fracture exposed and head dislocated out of acetabulum. Decision to use uncemented prosthesis was taken in accordance with intra-operative results of smear examination and frozen section, which were negative for infection. After taking proper neck cut a collared un-cemented prosthesis was inserted [Table/Fig-3]. After reduction was done we cleared the surface of attachment over greater trochanter of any soft tissues and made two drill holes through it. The sleeve of abductor tendon was fixed to the prosthesis through these two drill holes by non absorbable sutures. Wound was closed in layers over drain.

Postoperatively the patient was given epidural analgesia for two days. Static quadriceps and ankle movements were started on day of surgery. The patient was allowed to move in bed but weight bearing mobilization was started after ten days. The patient could walk full weight bearing with walker without any limp. The said patient is symptom free to date with Harris hip score of 90.

Abductor deficiency can be defined as “absence or compromise of the abductor-trochanteric complex” [1]. This included detachment of the gluteus medius tendon, nonunion or absence of the greater trochanter or severe heterotrophic ossification. It affects the strength and moment generating capacity of the muscles. The abductors are important during single legged stance phase of gait, as their contraction pulls rim of pelvis towards greater trochanter and prevents the contralateral side of pelvis from dropping. This is achieved by hip abductors; their insertion is fixed and the pull is exerted on their origin. When this mechanism fails Trendelenburg’s sign is positive. Higher volumetric polyethylene wear is associated with decreased abductor moment arms. Considering the high volumes of revision total hip replacements being operated today, we propose to classify abductor deficiency into primary and secondary type. Abductor deficiency after previous THR should be called secondary deficiency and when no previous replacement surgery has been done it should be referred to as primary deficiency. Gilberty & Bateman in 1974, reported use of bipolar prosthesis, the



[Table/Fig-1]: Antero-posterior view of pelvis with both hips showing fracture of the neck of femur with absent greater trochanter on the left side. Calcification noted at the site of abductor tendon insertion **[Table/Fig-2]:** Lateral view of the affected hip **[Table/Fig-3]:** Postoperative X-ray of the patient showing a well fixed prosthesis and equal limb lengths. Note the absent trochanter

rationale was that erosion and protrusion of acetabulum would be less because motion is present between metal head & polyethylene socket (inner bearing), as well as between metallic cup & acetabulum (outer bearing), since cup is not fixed in bone [2]. The rationale was based on theory that distribution of shear forces between the inner and outer bearings will spare acetabular surface from wear and erosion. Also, acetabular wear is diminished through reduction of total amount of motion that occurs between the acetabular cartilage and metallic outer shell by the interposition of a second low-friction interbearing within the implant. The biggest advantage of the design is because of compound bearing surface, bipolar designs provide greater overall range of motion than either unipolar designs or conventional THR. The bipolar head usually is larger in diameter and provides additional stability. Parvizi and Morrey reported 81% success in terms of gained hip stability using this technique at an average follow-up of five years [3]. The problem of this technique is related to the bipolar articulation on cartilage denuded acetabular bone, resulting in hip pain and gradual erosion of the acetabular bone stock [4].

Indications for bipolar hemi-replacement arthroplasty are [5]

1) femoral neck fracture (traumatic or pathological)
2) Comminuted inter-trochanteric fractures
3) salvage procedure in revision THR surgery (secondary abductor deficiency) e.g.
   - Hip instability from deficiency of abductors is a relative indication because bipolar component is intrinsically more stable than fixed component;
   - If patient has absent or weak abductor musculature, bipolar implant provides added stability against dislocation compared with THR.

Through this case we would like to share our realization that bipolar arthroplasty gives excellent results in cases with abductor deficiency. Another purpose of sharing this experience is that, there are not many publications related to bipolar arthroplasty in recent literature. Through this case we have discussed the salient features of implant design.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **May 26, 2014**
Date of Peer Review: **Aug 13, 2014**
Date of Acceptance: **Sep 08, 2014**
Date of Publishing: **Jan 01, 2015**