

STUDY OF FUNCTIONAL OUTCOMES OF TOTAL HIP ARTHROPLASTY THROUGH HARDINGE'S APPROACH

Orthopaedics

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ABSTRACT

Introduction: Degenerative hip disorders are one of the most common and debilitating musculoskeletal disorders with increased morbidity and decreased quality of life. Total hip arthroplasty is a modern surgical procedure which has relieved patients from incapacitating pain arising from the hip joint.

Many surgical approaches to hip have evolved over the period of time for Total hip arthroplasty. Surgical approaches differs mainly in position of patient in supine or lateral and whether the hip is dislocated anteriorly or posteriorly. The choice of surgical approaches is largely depending on personal preference and training. Gibsons posterior and hardinges direct lateral approach are the two most commonly used surgical approaches.

To evaluate the Clinical and Functional outcomes of Total Hip Replacement after Harding's approach Harris Hip Score and radiological assessment was used. Harris Hip Score comprised of Pain, Functional disabilities, Deformity, Range of movements

Objective: To study the clinical, radiological and fuctional outcome and complications associated with total hip arthroplasty through hardinge approach.

Materials And Methods: A Prospective study was carried out from July 2019 to December 2020 under Department of Orthopaedics, SRG Hospital and Medical College, Jhalawar including 58 patients who fulfilled the inclusion criteria operated for total hip arthroplasty through hardinge approach. Patient's follow up was up to 12 months.

Results: The functional assessments were made with modified Harris Hip scores. The results showed excellent in 41 patients (70.68%), good in 15 patients (25.86%), Fair in 2 patients (3.44%). There are no poor results in our study. Harding's approach has no incidence of prosthesis dislocation.

Conclusion: The Harding's approach provides easy access to the hip joint and provides excellent exposure of both acetabular and proximal femur. Harding's approach is a good approach for the outcome of the Harris hip score with no major complication with satisfactory clinical, functional and radiological outcomes. Harding's approach has no incidence of prosthesis dislocation.

KEYWORDS

Total hip arthroplasty; Harding approach, modified Harris Hip scores.

INTRODUCTION

Disease/Trauma which involves the hip joint disables the individual from his day-to-day activity. Degenerative hip disorders are one of the most common and debilitating musculoskeletal disorders with increased morbidity and decreased quality of life [1].

The normal hip functions as a "ball-and-socket" joint. The femoral head (ball) articulates with the acetabulum (Socket), allowing smooth range of motion in multiple planes. Any condition that affects either of these structures can leads to deterioration of the joint. This damage can lead to deformity, pain and loss of functions. The most common condition affect in the hip joint is osteoarthritis. Other conditions which damage the hip joint are idiopathic osteonecrosis, alcohol induced and other secondary osteonecrosis, Inflammatory arthritis (Rheumatoid arthritis, psoriatic arthritis, spondyloarthropathies, etc.), developmental dysplasia, childhood hip disorders & trauma [2].

Total hip arthroplasty (THA) is one of the most common procedures in the world. For instance, in 2010, total hip replacement occurrence in the United States was less than 1% of all arthroplasty surgeries. The estimation was 2.5 million individuals divided into 1.4 million females and 1.1 million males [3].

Total hip arthroplasty with an artificial prosthesis is a reconstructive procedure that has improved the management of degenerative disorders of the hip joint that have responded poorly to conventional medical therapy and improved the functional quality of life by providing the stable, painless and mobile hip joint [4].

Many surgical approaches to hip have evolved over the period of time surgical approaches for Total hip arthroplasty and this approaches differs mainly in position of patient in supine or lateral and whether the hip is dislocated anteriorly or posteriorly. The choice of surgical approaches is largely depends on personal preference and training. Gibsons Posterior and Hardinges Direct Lateral approach are the two most commonly used surgical approaches. Although long term results of this differing approaches are unknown at his point short term benefits of some approaches have been reported [5].

A direct lateral approach to the hip joint was first described by McFarland and Osborne (1954) based on the basic anatomical principle that the gluteus medius and vastus lateralis muscles act in functional continuity via their fascial connection over the greater trochanter. He detached the whole gluteus medius together with the vastus lateralis from the posterior border of the greater trochanter and swung them forward like a bucket handle. This lateral approach was popularized by Harding [6] (1982) by reflecting the anterior half of the gluteus medius and vastus lateralis. The lateral approach requires reflection of the anterior fibres of gluteus medius and minimus from the greater trochanter.

One of the complications of Total hip arthroplasty by hardinge approach is postoperative weakness of hip abduction. This may occur either through denervation of the gluteal flap, following damage to the inferior branch of the superior gluteal nerve or by failure to establish reattachment of the flap to the greater trochanter. Harding was aware of these problems and cautioned against excessive retraction of the gluteal flap [7]

In this study we evaluate the clinical, radiological and fuctional outcome and the complications associated with total hip arthroplasty by Harding approach.

AIMS

To study the clinical, radiological and fuctional outcome and the complications associated with total hip arthroplasty through hardinge approach.

MATERIALS AND METHOD

A Prospective study was carried out from July 2019 to December 2020 under Department of Orthopaedics, SRG Hospital and Medical College, Jhalawar including 58 patients who fulfilled the inclusion criteria operated for total hip arthroplasty through hardinge approach.

Inclusion Criteria

1. All patients operated for total hip arthroplasty giving informed consent for the trial.

2. Ambulatory patient before fracture or disease
3. Non-pathological neck femur fracture
4. Avascular necrosis of hip
5. Osteoarthritis of hip joint
6. Patients who are fit and willing to go for surgery

Exclusion Criteria

1. Active sinus or infection of hip joint
2. Pathological neck femur fractures,
3. Patients with an additional acute lower extremity fracture in addition to the neck femur fracture,
4. Non-Ambulatory patient before fracture or disease and painful hip before trauma,
5. Patients with severe medical comorbidities and are unfit for surgery.

Methodology

Detailed history of the patients was taken on admission to the ward. This included age, sex, occupation, complaints, associated present and past medical history. After that patient's general physical examination and systemic examination was taken. Routine blood investigations were done for all the patients. Special attention was paid to CRP, ESR, throat and urine culture and if these were abnormal, surgery was deferred. Standard anteroposterior and lateral X-rays were taken including pelvis with both hips. Analgesics, antibiotics, tetanus toxoid and blood transfusions were given as needed before surgery.

Pre-operative Planning

Pre-op planning includes Preoperative Clinical and Radiological Assessment of patients.

The aim of the pre-op planning are:

1. An acetabular cup is located in the proper anatomical position.
2. Centre of rotation of femoral head is located in proper anatomical position.
3. Restoration of abductor moment arm.
4. Restoration of proper limb length.

Preoperative Clinical Assessment

The patients were preoperative evaluated according to the modified Harris hip scoring system. The scores taken into account were of pain, function, functional activities, range of motion, and deformities. Also a mention of the limb length discrepancy and flexion contracture is made. The deformity and ROM were measured with goniometer.

The physical examination of the patients done after taking Preoperative informed consent. Physical examination included examination of spine and both lower extremities including opposite hip, both knees and foot. Trendelenburg test to assess the abductor musculature mechanism was done when possible. Neurovascular status of affected extremity was evaluated. Any occult infections such as skin lesions, dental caries and urinary tract infections were present and treated preoperatively.

Preoperative Radiological Assessment

The Aim of preoperative radiographic assessment is to confirm the diagnosis, To determine anatomic relationship of the femur and pelvis to allow for accurate restoration of joint anatomy and biomechanics. AP view of pelvis with both hips along with upper end femur, AP X-ray of hip in 15 degrees of internal rotation and lateral X-ray of hip were taken. X-rays of spine and knees were also taken to detect any abnormality.

Size of the acetabulum, Bone stock of the acetabulum, Any protrusion and periacetabular osteophyte formation, The structural integrity of the acetabulum, Need for bone grafting and Size of the femoral canal were noted after proper radiological evaluation.

Templating was done for the acetabular and femur components. The appropriate acetabular cup size and anteversion were determined. On the femoral side, using a template, appropriate neck length, offset and stem size of the implant were chosen.

A single surgeon performed all the surgeries, using the Hardinge approach to all the hips in all cases.

Surgical Technique:

The patient is positioned in lateral position OT table. A straight incision centres at the anterior third of the greater trochanter and extending 3-5 cm proximally towards posterior superior iliac spine and 5-8 cm

distally along shaft of femur. The subcutaneous tissue is cut in line of the incision. The fascia is split at the interval between the Tensor Fascia Lata and gluteus maximus in line with the skin incision. The gluteus medius insertion is identified around the greater trochanter. It extends from trochanteric ridge extending superiorly and posteriorly. Blunt retractors are used to separate the muscle fibers of the gluteus medius at its anterior middle one-third junction, up to 3 cm cephalad to its insertion. Care is taken to observe and protect the inferior branch of the superior gluteal nerve as it courses between the gluteus medius and minimus muscles. Electrocautery is used to split and detach the combined tendon and periosteum of the gluteus medius and vastus lateralis. This Split is carried anterior to the trochanter to leave behind a posterior tendinous cuff for later suturing. Distally, the incision is curved posteriorly at the vastus ridge and taken in line with the fibers of the vastus lateralis. The gluteus minimus and joint capsule are split either in line with the neck of the femur or in line with the tendinous fibres of the gluteus minimus. After adequate exposure of the anterior capsule, Adequate capsulectomy is done by T shape incision and femoral head is dislocated out of acetabulum by manoeuvring hip in flexion, external rotation and adduction. The femoral neck cut is done as per preoperative planning and using neck cutting guide. The leg is then positioned with hip in 30° of flexion and mild external rotation to give good acetabular exposure. Excision of labrum along with osteophytes from acetabular rim is done to achieve good acetabular exposure. Synovial tissue from the fovea and medial osteophyte is excised. The transverse acetabular ligament is identified. For acetabular preparation and proper exposure of acetabulum, a Hohmann retractor was placed in the acetabular notch beneath the transverse acetabular ligament and a posterior rim retractor. After this The acetabulum was prepared in proper manner. Progressive and Concentric reaming of acetabulum is done keeping in view the version and inclination of the implant. Trial acetabular prosthesis was placed in proper position. The optimal position of placement was 45° of inclination and 15° of anteversion.

For femoral preparation, the leg was held perpendicular to the floor. Care was taken while preparing the femoral shaft not to damage the posterior fibres of the gluteus medius with the rasp which can be avoided by retracting this muscle with a blunt Hohmann retractor. Metaphyseal preparation done by box osteotome, IM Initiator, Canal opener. Preparation of the femoral canal was done using the appropriate reamers and broaches. Trial model femoral stem is inserted, Trial reduction is done using appropriate stem and head size the leg length and stability are assessed. Final implantation done. A Ethibond suture was used to repair the capsule. The conjoint tendon flap (gluteus medius and minimus, vastus lateralis) was reattached to the greater trochanter condensation remnant, the split gluteus and vastus are approximated with Vicryl sutures. The fascia lata, subcutaneous tissues and skin are closed in layer by layer over a drain.

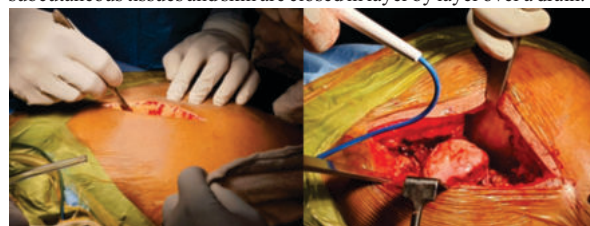


Figure 1 Skin Incision

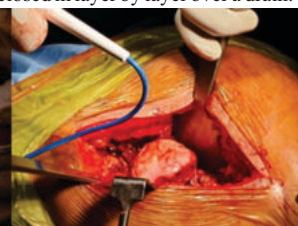


Figure 2 Head of Femur is Dislocated



Figure 3 Head of Femur is cut

Figure 4 Acetabulum Reaming



Figure 5 Trial Cup Sizer

Figure 6 Acetabulum Shell Insertion

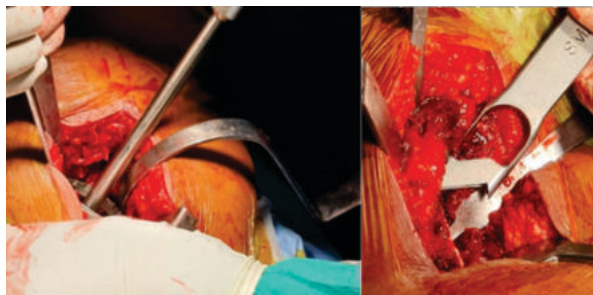


Figure 7 Acetabulum Liner Insertion

Figure 8 Metaphyseal Preparation By Box Osteotome

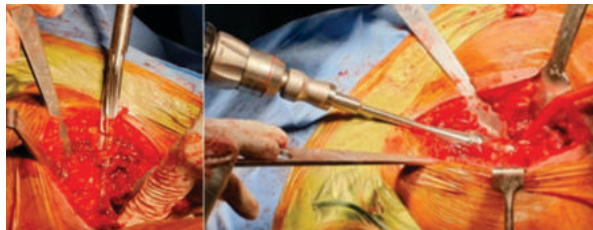


Figure 9 Femoral Canal Opening

Figure 10 IM Initiator



Figure 11 Femoral canal Preparation By Sequencial Broaching

Figure 12 Femoral Stem Insertion

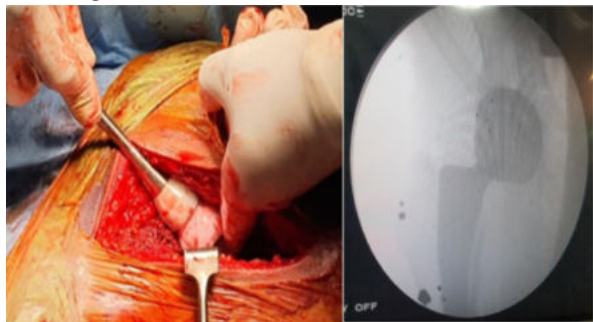


Figure 13 Femoral Head Impaction

Figure 14 Fluoroscopic Image by Reduction

Post-Operative Care And Rehabilitation:

The hip is positioned in approximately 15 degrees of abduction by a pillow to separate both lower limbs and also prevent extremes of flexion. First post op day, X-rays are taken. The patient is made to sit

and advised for static quadriceps exercises, knee and ankle mobilization exercises. Second post op day check dress done. Patient is walked with walker with weight bearing as tolerable. Drains were removed 24 to 48 hours after surgery. IV antibiotics were given for 48 hrs after that change to oral antibiotics for further 5 days more. Low molecular weight heparin for first five days after surgery for DVT prophylaxis. sutures was removed on 12th post op day.

Patients were strictly advised for don't squat, don't sit cross legged, don't use Indian toilets, don't cross the lower limb across the midline.



Figure 15 Preop and Postop X-Ray



Figure 16 Preop and Postop X-Ray



Figure 17 Preop and Postop X-Ray

Follow up Protocol:

The patients were followed up after a month, then 3 months, 6 months and 12 months.

RESULTS:

- A total of 58 patients are operated for total hip arthroplasty by Hardinge's Approach, as per the our study protocol.
- Among 58 patients in this study, 46 patients (79.31%) were males and 12 patients (20.68%) were females. All the patients belong to age between 17 to 86 years of age. The average age of the study population was 44.29 years.

Age Group	Male	Female
< 30 Year	12	00
31-40 Year	10	04
41-50 Year	09	01
51-60 Year	09	05
>60 Year	06	02
Total	46	12

- Preoperative diagnosis among 58 patients in our study, 34 patients (58.62%) were due to secondary osteoarthritis due to avascular necrosis of femoral head, 10 patients (17.24%) due to non-union neck of femur, 5 patients (8.62%) due to failed previous reconstruction, 3 patients (5.17%) due to healed cases of Perthes disease, 3 patients (5.27%) due to primary osteoarthritis of hip, 2 patients (3.44%) due to acetabular dysplasia and 1 patients (1.72%) due to malunited acetabular fracture.

Preoperative Diagnosis	No. of Patients	Percentage
2° osteoarthritis due to AVN of femoral head	34	58.62%
Non-union neck of femur	10	17.24%
Failed previous reconstruction	05	8.62%
Healed cases of Perthes disease	03	5.17%
1° osteoarthritis of hip	03	5.17%
Acetabular dysplasia	02	3.44%
Malunited acetabular fracture	01	1.72%

- A total of 58 patients 32(55.17%) have got cemented total hip arthroplasty and 26 patients (44.82%) underwent uncemented total hip arthroplasty.

Type	No. Of Patients	Percentage
Cemented	32	55.17%
Uncemented	26	44.82%

- The functional assessments were made with modified Harris Hip scores. The results showed excellent in 41 patients (70.68%), good in 15 patients (25.86%), Fair in 2 patients (3.44%). There are no poor results in our study.

Modified Harris Hip Score		
Results	No. Of Hips	Percentage
Excellent	41	70.68
Good	15	25.86
Fair	02	3.44
Poor	00	0

Patient 1



Figure 18 Standing

Figure 19 Sitting



Figure 20 Hip Flexion with Knee Flexion



Figure 21 Hip Flexion with Knee Extension



Figure 22 Adduction



Figure 23 Abduction

Patient 2



Figure 24 Standing

Figure 25 Standing



Figure 26 Hip Flexion With Knee Extension

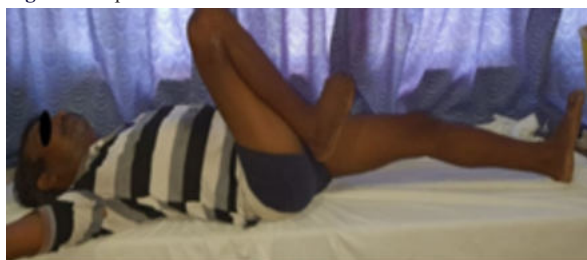


Figure 27 Hip Flexion With Knee Flexion



Figure 28 Abduction



Figure 29 Adduction

Complications:

In our study, Out of 58 patients, Three (5.17%) patients developed superficial wound infection treated with culture sensitive antibiotics and regular dressing, wound healed well subsequently without deep infection. There was no incidence of deep infection.

There are two (3.44%) patients have Limb Length Discrepancy. They are conservatively managed by shoe lift.

No incidence of prosthetic dislocation in any of the patient due to better placement of implants and modified lateral approach in our study.

There were no cases of dislocation of the prosthesis, peri-prosthetic fracture, implant loosening, subsidence, Heterotrophic Ossification, Deep Infection, Thromboembolism, Nerve Injury and Vascular Injury.

Complication	No. Of Patients	Percentage
Dislocation of the prosthesis	-	-
Limb Length Discrepancy	2	3.44%
Peri-prosthetic fracture	-	-
Implant loosening	-	-
Thromboembolism	-	-
Subsidence	-	-
Superficial Infection	3	5.17%
Deep Infection	-	-
Heterotrophic Ossification	-	-
Nerve Injury	-	-
Vascular Injury	-	-

DISCUSSION:

The hip joint is a major weight bearing joint playing a vital role in supporting body weight and in forward propulsion of body by its versatile anatomic and sound biochemical construction by nature. We did total 58 cases of total hip arthroplasty through Hardinge's lateral approach. Age of the patients is between 17 - 86 years in them, males are 46 patients and females are 12 patients. The most common cause of total hip replacement was secondary OA secondary to AVN accounting to 58.62% of cases and Non-union neck of femur accounting to 17.24% of cases. The other cases account only 24.14% of the hip replacement in our study.

Bourne et al., in a study of 101 total hip replacements reported an average Harris hip score of 96 points, but only patients who were free of pain were evaluated. When patients who had pain were included, the overall average score was 90 points [9]. Barrack and Lebar reported an average Harris hip score of 93 points after 49 arthroplasties.[10]

The functional assessments were made with modified Harris Hip scores. The results showed excellent in 41 patients (70.68%), good in 15 patients (25.86%), Fair in 2 patients (3.44%). There are no poor results in our study.

Out of 58 patients, We found postoperative superficial wound infection

in three patients,. That also subsided after culture sensitive intravenous antibiotic therapy. Limb Length Discrepancy in two patients. They are conservatively managed by shoe lift. We found no postoperative dislocations of Hip joint in cases done in Hardinge's Lateral approach.

Marcel Dudda, A Gueleryuez, E Gautier, A Busato, C Roeder (2010) [8] evaluated risk factors for early dislocation after primary total hip arthroplasty (THA) in matched case control study of 175 cases with dislocation and 651 controls, showed posterior approach was 6 fold more prone to dislocation than the anterolateral or straight lateral approach. There was no incidence of prosthetic dislocation in our study due to modified lateral approach and better placement of prosthesis.

The modified Hardinge Approach as described in this study offers predictable and easy access to the hip joint and provides excellent exposure of both acetabular and proximal femoral regions. In this modified Hardinge's approach, the posterior capsule intact and the anterior capsule repaired, provides a soft tissue envelope around the joint. This may give additional stability against dislocation. So There was no incidence of dislocation.

Lateral Hardinge approach was found to have a common complication of total hip arthroplasty which was abductor lurch[11]. The reason behind the lurch was postulated to be the injury to the inferior branch of superior gluteal nerve. The injury could be due to direct injury or due to stretch during surgery. The lurch may or may not improve with physiotherapy postoperatively. Modified Hardinge approach significantly reduced this complication when done with care.

CONCLUSION

The Hardinge's approach provides easy access to the hip joint and provides excellent exposure of both acetabular and proximal femur. Hardinge's approach is a good approach for the outcome of the Harris hip score with no complication with satisfactory clinical, functional and radiological outcomes. Hardinge's approach has no incidence of prosthesis dislocation.

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