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Comparison of functional outcomes of hip arthroplasty via posterior and lateral approach

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Abstract
Many surgical approaches to hip have evolved over the period of time surgical approaches differs chiefly 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. Arthroplasty surgeons remained discordant in their choice between two approaches.
In this study we try to evaluate the clinical, radiological and functional outcome of hemi-replacement and total hip replacement operated by posterior or lateral approach.
No significant difference was found in limb length discrepancy in both approach. Incidence of dislocation was found high in patients operated by posterior approach. Peri prosthetic fractures were seen in 2 cases operated by lateral approach. Dislocation rate was 10 percent with posterior approach. Post-operative lurch was found significantly higher in THR with lateral approach. No significant difference was seen in intra-op blood loss, duration of surgery.
Superiority of one approach over another approach could not be established.

Keywords: Hemireplacement arthroplasty (Hra), total hip arhtroplasty (Tha/Thr), sickle cell anemia

Introduction
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, in turn, can lead to deformity, pain and loss of functions. The most common condition affect in the hip joint in this way is osteoarthritis. Other conditions affect the hip joint adversely include idiopathic osteonecrosis, alcohol induced and other secondary osteonecrosis. Inflammatory arthritis (Rheumatoid arthritis, psoriatic arthritis, spondyloarthropathies, etc.), developmental dysplasia, childhood hip disorders & trauma [1].
Total Hip Arthroplasty (THA) is a procedure whereby the diseased articular surfaces are replaced with synthetic materials, thus relieving pain and improving joint kinematics and function [38].
Hemi replacement Arthroplasty (HRA) is a procedure in which femoral component is replaced by prosthesis, commonly in cases on neck of femur fractures [38].
Many surgical approaches to hip have evolved over the period of time surgical approaches differs chiefly 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 [2].
The anterolateral and posterolateral approaches were compared by Macedo *et al.* [3] in 1999 and in 2002. When assessing postoperative complications, they found that anterolateral approach demanded longer surgical times, increased intraoperative bleeding and greater need for blood transfusion. However, the functional difference was not assessed postoperatively.

In 2010, Chin J Traunatol. & CO. Comparative study of anterolateral approach versus posterolateral approach for total hip replacement in the treatment of femoral neck fractures in elderly patients. Concludes, Anterolateral approach can decrease trauma, operation time, length of hospital stay and bed stay and rehabilitation time [4].

Arthroplasty surgeons remained discordant in their choice between two approaches.

In this study we try to evaluate the clinical, radiological and functional outcome of hemireplacement and total hip replacement operated by posterior or lateral approach.

Aims

- To evaluate the clinical, radiological and functional outcome of hemi-replacement and total hip arthroplasty by posterior and lateral APPROACH
- To determine safety and efficacy of the two approach
- To determine superiority of one over another approach
- To determine significant predictors of complications

Inclusion criteria

1. All patients operated for hip arthroplasty giving informed consent for the trial will be included in the study
2. Outside the home ambulatory patient before fracture
3. Non-pathological neck femur fracture
4. Avascular necrosis of hip

Material and Methods

- 54 patients operated for total hip or hemi arthroplasty alternatively via lateral and posterior approach
- **Position:** Supine or lateral for lateral approach and lateral for posterior approach
- **Anaesthesia:** Spinal or General
- **Antibiotics:** Prophylactic antibiotic half an hour before surgery and to be continued for 48 hours after surgery.
- **Stitch Removal:**12 To 15 Days
- **Dressing** on 2nd day (Removal of suction drain) and 7th day
- **Evaluation:** On basis of intra operative notes, Harris hip score and Radiographical evaluation
- **Follow Up:** On 1 month, 3 month and 6 months

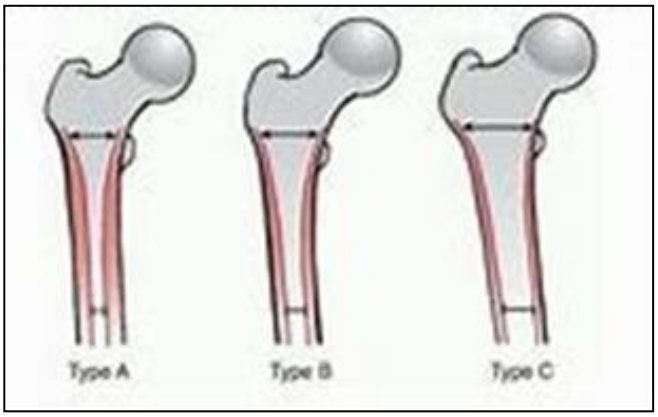

Fig 1: Dorr classification of morphology of femur

Modified Harris Hip Score (23)
Please mark one choice for each topic:
Pain:

- None/ignores (44points)
- Slight, occasional, no compromise in activity (40 points)
- Mild, no effect on ordinary activity, pain after activity, uses aspirin (30 points)
- Moderate, tolerable, makes concessions, occasional codeine (20 points)
- Marked, serious limitations (10 points)
- Totally disabled (0 points)
- Function: Gait Limp
- None (11 points)
- Slight (8 points)
- Moderate (5 points)
- Severe (0 points)
- Unable to walk (0 points) Support
- None (11 points)
- Cane, long walks (7 points)
- Cane, full time (5 points)
- Crutch (4 points)
- 2 canes (2 points)
- 2 crutches (1 points)
- Unable to walk (0 points) Distance Walked
- Unlimited (11 points)
- 6 blocks (8 points)
- 2-3 blocks (5 points)
- Indoors only (2 points)
- Bed and chair (0 points) Functional Activities:
- Stairs
- Normally (4 points)
- Normally with banister (2 points)
- Any method (1 points)
- Not able (0 points) Socks/Shoes
- With ease (4 points)
- With difficulty (2 points)
- Unable (0 points) Sitting
- Any chair, 1 hour (5 points)
- High chair, ½ hour (3 points)
- Unable to sit, ½ hour, any chair (0 points) Public Transportation
- Able to enter public transportation (1 points)
- Unable to use public transportation (0 points) Absence of deformity (all yes=4; less than 4=0) 1) less than 30* fixed flexion contracture 2) less than 10* fixed abduction 3) less than 10* fixed internal rotation in extension 4) limb length discrepancy less than 3.2 cm

Range of motion score__ Flexion_ Adduction_____ _____ Abduction_____External rotation _____

Internal rotation _

Scale: 211-300(5); 161-210(4); 101-160(3);61-100(2);31-60(1);0-30(0)

Total harris hip score:____

Surgical approach

1) Posterior Approach (39)

Incision-make 10 to 15 cm curved incision 0n posterior edge of greater trochanter (GT). Begin 7 cm above and posterior to GT. curve posterior to the GT and continue down shaft of femur.

Superficial dissection-incise fascia lata to uncover vastus lateralis distally. Lengthen fascial incision in line with skin incision. Split fibers of gluteus maximus in proximal incision. Cauterize vessels during split to avoid excessive blood loss.

Deep dissection-internally rotate the hip to place the short external rotators on stretch. Place stay suture in piriformis and obturator internus tendon (short external rotators) detach piriformis and obturator internus close to femoral insertion. Reflect backwards to protect sciatic nerve. Incise capsule with longitudinal or T-shaped incision. Dislocate hip with internal

rotation after capsulotomy.
Proximal extension-may extend proximal incision towards iliac crest for exposure of ilium
Distal extension-extend incision distally down line of femur down to level of knee. Vastus lateralis may either be split or elevated from lateral inter muscular septum.
Closure done in double layer with modes is of short external rotators.

2) Lateral approach (40)
Incision-begin 5cm proximal to tip of greater trochanter. Longitudinal incision centered over tip of greater trochanter and extends down the line of the femur about 8cm.
Superficial dissection-split fascia lata and retract anteriorly to expose tendon of gluteus medius. Detach fibers of gluteus medius that attach to fascia lata using sharp dissection.
Deep dissection-split fibers of gluteus medius longitudinally starting at middle of greater trochanter. Do not extend more than 3-5 cm above greater trochanter to prevent injury to superior gluteal nerve. Extend incision inferior through the fibers of vastus lateralis. Develop anterior flap anterior aspect of gluteus medius from anterior greater trochanter with its underlying gluteus minimus. Anterior part of Vastus lateralis requires sharp dissection of muscles off bone or lifting small fleck of bone. Expose anterior joint capsule follow dissection anteriorly along greater trochanter and onto femoral neck which leads to capsule. Gluteus minimus needs to be released from anterior greater trochanter

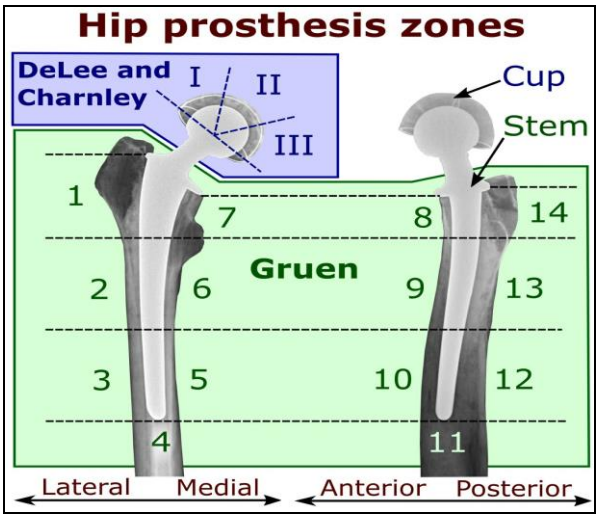

Fig 2: Delee and charnley has described zones as above

Radiological evaluation of Total HIP Arthroplasty

Table 1: Following tools are meadured for evaluation of total hip arthroplasty

		6 weeks	3 months	6 months
1	Limb length discrepancy			
2	The horizontal center of rotation			
3	The vertical center of rotation			
4	The acetabular inclination			
5	Stress shielding			
6	The acetabular antiversion			
7	Femoral stem positioning			
8	Cement mantle			
9	Spot welding			
10	Subsidence of stem/migration of acetabular component			
11	Other positive finding			

Heterotrophic ossification classified by the system of brooker *et al*

Grade I	Represents islands of bone with in the soft tissue about the hip
Grade I*I	Include bone spurs in the pelvis or proximal end of femur leaving at least 1 cm between the opposing surfaces.
Grade III	Represent bone spurs that extend, from the pelvis or the proximal end of femur which reduce the space between the opposing bone surfaces to less than I cm.
Grade IV	Indicates radiographic ankyloses

Table 2: Vancouver classification of periprosthetic fracture

Type	Description
A	Fracture in trochenteric region
B1	Fracture around or just below, with well fixed stem
B2	Fracture around or just below,with loose stem but good proximal bone
B3	Fracture around or just below, with poor quality or severly cominuted proximal bone
C	Fracture below the prosthesis

Results
Comorbidity frequency

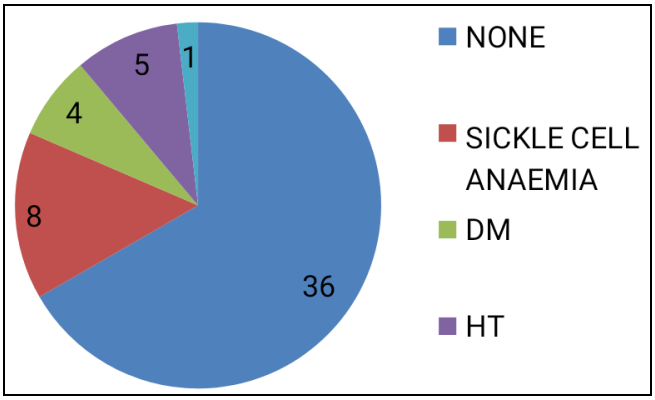

Fig 3: Sickle cell anaemia is themajor indicator for hip arthroplastyj

Indications for hip replacement

- Sickle cell was a major co-morbidity associated with hip arthroplasty

Dorr's index

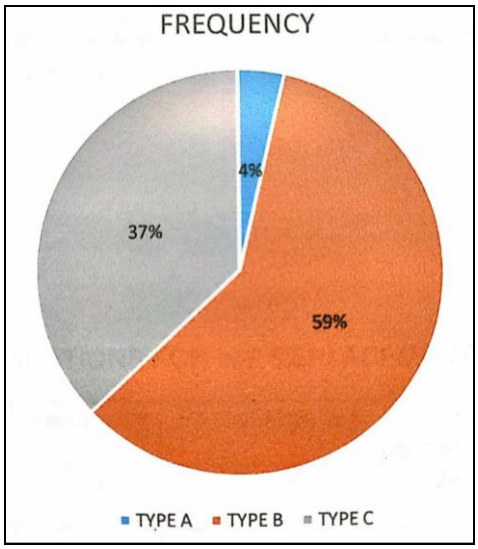

Fig 4: Dorr type 2 canal is found in 59% of femurs

Harris-3 Month

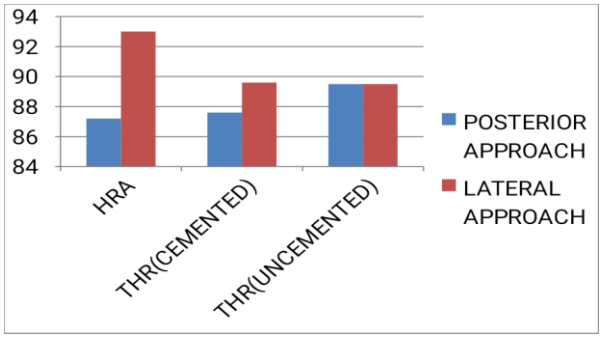

Fig 5: Comparision of Harris hip score at 3 months

Harris-6 Month

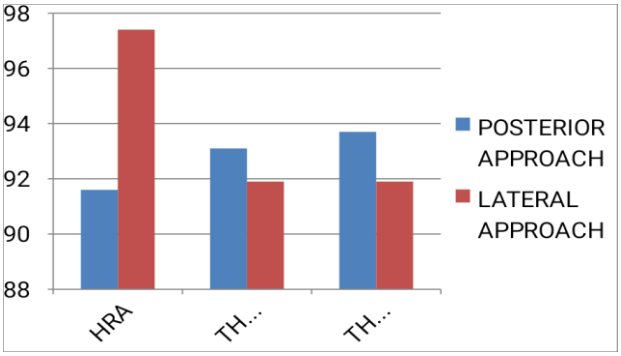

Fig 6: Comparision of harris hip score at 6 months

Table 3: Mean Harris hip score

	Surgical approach	N	Mean	Std.deviation	P.value
Harrish 3 month	Lateral	24	88.59	4.2	0.13
	Posterior	30	87.96	4.1	
Harris 6 month	Lateral	24	90.33	3.6	0.11
	Posterior	30	92.27	3.2	

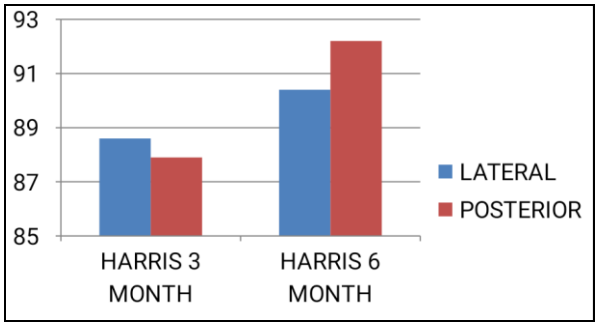

Fig 7: At 6 Months Hip Score Was Found Slightly Higher In Posterior Approach

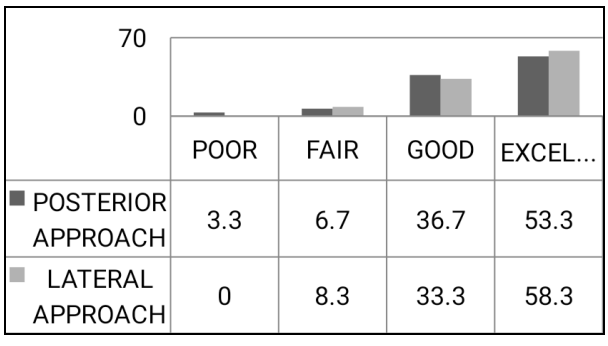

Fig 8: 90 to 92% patient having good to excellent results

Table 4: Lurch And Dislocation Statistics

Surgery Type	Posterior Approach	Lateral Approach
Lurch		
Hra	9.09%	0%
Thr (Cemented)	70%	100%
Thr (Uncemented)	14.29%	66.69%
Dislocation		
HRA	9.09%	0%
Thr (Cemented)	10%	0%
Thr (Uncemented)	14.29%	0%

Incidence of Dislocation Was Found High in Patients Operated by Posterior Approach and lurch is found high in patients operated by lateral approach

Table 5: Femoral Stem Positioning

		Femoral stem positioning			
		center	Varus	valgus	Total
Posterior approach	Counts	22	6	2	30
	% within	73.33%	20%	6.67%	100%
Lateral approach	Counts	18	5	1	24
	% within	75%	20.83%	4.12%	100%

Femoral stem was found eccentric in 26.67 percent of cases in posterior approach and 25 percent in lateral approach

Table 6: Limb length discrepancy

Type-sx	N	Posterior approach	Lateral approach	P.value
HRA	16	0.36cm	0.6cm	0.06
THR (cemented)	21	0.6cm	0.4cm	0.09
THR (Un-cemented)	16	0.5cm	0.17cm	0.06

No significant difference was found in limb length discrepancy in both approach

Table 7: Blood loss and duration of surgery statistics

	Type-sx	N	Posterior approach	Lateral approach	P.value
Blood loss(ml)	HRA	16	265	264	0.07
	THR(cemented)	21	340	354	0.08
	THR(Un-cemented)	16	351	369	0.07
Duration of surgery	HRA	16	65	63	0.06
	THR(cemented)	21	111	111	0.09
	THR(Un-cemented)	16	101	107	0.07

- No significant difference was seen in intra-op blood loss, duration of surgery
- Heterotropic ossification was seen in 2 cases operated by lateral approach
- Peri prosthetic fractures were seen in 2 cases operated by lateral approach

Discussion

- Total Hip Replacement/Hemiarthroplasty was performed as a mode of treatment in 54 selected patients alternatively by lateral and posterior approach in new civil hospital, surat. Hip replacement in all cases was

performed in otherwise active individuals the age group ranged from 17 to 85 years. Such cases were followed up and evaluated clinically and radiologically.

- In our study, the follow up period was 6 months. All patients were alive at the last follow up. Coates and armor (34) had reported a mortality of 29%, 7% were known to have died in the first month mainly due to medical complications like ischemic heart diseases, pulmonary embolism and septicemia complicating wound infection. In the later studies mortality reported was significantly reduced, Taine and armor 3% at one month 10% at 6 months
- (1985), Delamarter and moreland 27 12% at one year (1987), Gebhart *et al* report a 0% in hospital mortality (1991). This has been attributable to advances in anaesthesia and critical care medicine and improvement in medical facilities.
- All the operations were performed in modular operation theater with laminar airflow under antibiotic cover. This suggested that prophylactic antibiotic significantly reduced the rate of sepsis in conventional operation theater. This was based on the studies in favor of the use of systemic antibiotics, in orthopaedic surgery, by Bryan *et al*. Wilson *et al* reported significant decrease in infection rate, when prophylactic antibiotics are used. In our study, superficial infection was detected in 5 patients. 1 patient had deep infection. All 6 patients were surgically debrided and treated with intravenous antibiotics according to culture sensitivity report for 2 weeks followed by oral antibiotics for 4 weeks.17
- Numerous approaches to the hip joint have been described, each claiming to have an advantage over the other. We have used the modified hardenings' approach based on the anatomical observation made by Macfarland and Osborne8, that gluteus medius and vastus lateralis are in direct functional continuity. It was incised and hip dislocated anteriorly. Charnley recommended osteotomy of greater trochanter. For better visualization of acetabulum and operative field.
- In our study we have used modified Gibson approach pioneered by kocher lenghenbach, in which short externer rotater were tagged and cut capsule incised in & hip dislocated posteriorly capsule were closed in double layer.
- According to the Harris hip score 91% patients had well to excellent results in our study with mean score of 93. Taine and armor had reported 70% good or excellent results, Gregory *et al* 2 reported a mean harris score of 83 with 6 patients having poor results (Score <70). But in 4 of these cases this was due to factors other than the hip itself.
- Only 9% patients complained of hip pain with 3% patient requiring regular analgesics. Coates and armour22 reported 89% patients to be pain free or having mild pain whereas 11% had severe pain which limited function and for which patients required 76% patients to be pain free following operation.
- Post operative lurch was found significantly high in total hip replacement done by lateral approach can be explained on the basis that abductors were elevated leading to shortening of the abductor lever arm. In case of hemi-replacement arthroplasty lurch was found in higher percentage of patients in posterior approach. Marco Antonio *et al* [19]
- Incidence of hip dislocation was found significantly high in patients operated by posterior approach 11% compared to zero dislocation in lateral approach, all cases were managed with closed reduction under anaesthesia and immobilization for 4 weeks. No implant loosening was found. Rate of dislocation reported in various series was Coates and Armour 22 8%, Sim and Stauffer 25 10.7%, Cartlide 14 14.6%, Taine and Armour 12.3%, Dorr *et al* 18% and Greenough and Jones 43 8%.
- No subsidence or migration of the femur or acetabulum components was seen. There was no change in the orientation of the formal or acetabular components till last follow up. Stress shielding was found in 54% of cases radiolucent zones were seen around the formal component in six cases which were non progressive till last follow up. Radiolucent shadow in all the above cases occupied <50% area at the bone cement interface.

Conclusion

- Femoral Stem Was Found Eccentric In 26.67 Perecent Of Cases In Posterior Approach And 25 Percent In Lateral Approach
- Heterotropic Ossification Was Seen In 2 Cases Operated By Lateral Approach
- Peri Prosthetic Fractures Were Seen In 2 Cases Operated By Lateral Approach
- None Of The Patients In Our Study Had Complications Of Immobilsation Like Deep Vein Thrombosis, Pneumonia Atelectasis.
- Early Mobilization With Hip Replacement And Post Operative Anti- Coagulants Was Main Reason For The Significant Reduction in these complications.
- At 6 Months Hip Score Was Found Slightly Higher In Posterior Approach
- Dislocation Rate Was 10 Percent With Posterior Approach.
- Dislocation Did Not Occur With Any Patient In Lateral Approach
- Post Operative Lurch Was Found Significantly Higher In Thr With Lateral Approach
- No Significant Difference Was Seen In Intra-Op Blood Loss, duration of Surgery.

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