Assessment of Hip Osteoarthritis after Cementless Total Hip Arthroplasty

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ABSTRACT

Background: The purpose of hip arthroplasty is to restore function by restoring normal anatomy and thus normal hip biomechanics. The aim of the present study was to evaluate the clinical and radiologic outcomes of young patients with degenerative osteoartheritis who have a total hip arthroplasty (THA). Patients and methods: This retrospective study wasconducted in Orthopedic Surgery Department, Faculty of Medicine, Zagazig University on 18 patients with degenerative osteoarthritis. Patients with significant disabling hip pain and moderate to severe functional limitation of activities of daily living due to osteoarthritis of the hip joint with any of the etiologies. Clinical assessment was done byusing Harris Hip Score at 6 weeks, 3 and 6 months follow up, also we used radiographs in analyzed with reference to signs of loosening at end of 3 months and 6 month. Results: Mean of pain score improved from marked pain (10.1±8.26) to slight pain (38.7±5.04) post- operative. Mean Walk score improved from (1.1±1.02) pre-operative to (9.3±1.53). Post- operative. Mean of Support score improved from (1.9±1.1) pre-operative to post- operative (7.8±2.39). Limping improved from moderate limping (2.2±2.6) pre-operative to (9±1.45) post-operative. Mean climbing upstairs score in most cases improved from (0.55±0.51) pre-operative to (1.9±0.32) post- operative. A statistically significant increase in points of all parameters postoperative. Wear Shoes stocks score improved from (2±0) to (3.1±1.02) post- operative, sitting improved from (1.6±1.53) to sit comfortably to any chair for one hours (4.3±0.97) postoperative. Mean of uses public transportation increased to be postoperative 0.78±0.43 and deformity improved to be 3.1±0.58.Range motion improved to do normal motion range post- operative. Conclusion: Cementless total hip arthroplasty has reassuring results in patients <50 years of age. It is not associated with any significant early or late complications and has outstanding functional outcomes. Patients usually do not experience any pain, limping, difficulty in walking and attain normal limb length. They develop no restriction in the range of movement.
Keywords: Hip Osteoarthritis; Harris parameters; total hip arthroplasty

INTRODUCTION

The hip joint is one of the largest weight-bearing joints in the body, only second to the knee joint, and is commonly affected by osteoarthritis. The current accepted understanding of hip osteoarthritis is that although articular cartilage is mainly affected, the entire joint also is affected. The osteoarthritis process involves progressive loss of articular cartilage, subchondral cysts, osteophyte formation, periarticular ligamentous laxity, muscle weakness, and possible synovial inflammation **(1)**.

There is a growing consensus that osteoarthritis is not the result of a singular process affecting the joints but rather results from a number of distinct conditions, each associated with unique etiologic factors and possible treatments that share a common final pathway **(2)**.

Cementless prostheses were introduced in the early 1980s in an attempt to prevent aseptic loosening of the acetabular cup and the difficulties associated with revision of cemented Total hip replacement (THA). Early investigators reported encouraging short-term clinical results with porous-coated THAs **(3)**. First-generation cementless devices, however, were associated with high rates of thigh pain, femoral component subsidence, aseptic loosening, proximal bone loss attributed to adaptive bone remodeling, and osteolysis caused by polyethylene debris. Second-generation stems were designed to improve fit, reduce micromotion, and optimize resistance to axial, bending, and rotational forces and thereby minimize some of these complications **(4)**.With these newer designs, patients younger than 50 and with different diagnoses have had survival rates ranging from 84.9% to 100% (femoral component) and from 81.3% to 98% (acetabular component) at a follow-up of 5 to 10 years **(5)**.

The existing variability in the survivorship of cementless THA is largely attributable to specific design features. The geometry and surface texture of implants are two of the most important factors for long-term fixation and stability. Surface structures similar to cancellous bone support bony anchorage with direct bone contact to provide long-term stability. Meso-structure surfaces with a pore size of 100-

2,000 μm and a porosity larger than 40% can replicates surface structures similar to cancellous bone morphology and optimize osseusintegration **(6)**.

The purpose of this study is to evaluate the clinical and radiologic outcomes of young patients with degenerative osteoartheritis who have a total hip arthroplasty (THA).

PATIENTS AND METHODS

This study was conducted on 18 patients with osteoarthritis of hip joint at Orthopedic Surgery Department, Faculty of Medicine, Zagazig University.

Inclusion criteria:

Patients diagnosed with osteoarthritis of hip joint with stage III and IV. Patients with significant disabling hip pain and moderate to severe functional limitation of activities of daily living due to osteoarthritis of the hip joint with any of the etiologies. Patients having a minimum period of 6 months of follow up.

Exclusion criteria:

Total hip arthroplasties for patients of post-operative hemiarthroplasties. PreviousTHRs. Patients with bleeding diathesis. Patients with renal or hepatic impairment. Patients with cardiopulmonary or cerebrovascular disorders.

Preoperative and operative steps:

All patients were subjected to full history, general examination was done to know the causeof osteoarthritis if degenerative, metabolic, congenital or developmental causes. Back examination: to exclude back as a source of pain or as associated back disorder. Local examination including: site of hip pain and range of movement.

Full laboratory pre-operative evaluation including complete blood count; PT, PTT, INR. Random blood sugar; Liver and kidney function tests; Complete urine analysis; E.S.R, C.R.P**;** Hepatic viruses HCV and HBV; HIV virus and Blood type.

Preoperative planning by plastic overlay templates supplied by the prosthesis manufacturer can shorten the operative time by eliminating repetition of steps. The wide array of implant sizes and femoral neck lengths allows precise fitting to the patient. Low residue diet during hospital stay and bowel evacuation at night in the day before the operation and in the early morning of the operation day and patient instructed to fast for 6-8 hours before surgery.

Surgical technique:

After complete sterilization of the operating room, patient admitted to the theater after sedation. Spinal or epidural anesthesia was given. Catheterization then shaving hair at the incision site and a trained technician prepared the surgical site within 5 minutes wash up using surgical soapbovidine iodine (Betadine) from the nipple line to the toes and from anterior midline to posterior midline. Positioning the patient in a dead lateral position by using side supports of operating table with support in between legs Final preparation is carried out by fully gowned surgical team in the usual way and complete draping by completely sterilized arthroplasty drapings **(Figure 1)**.

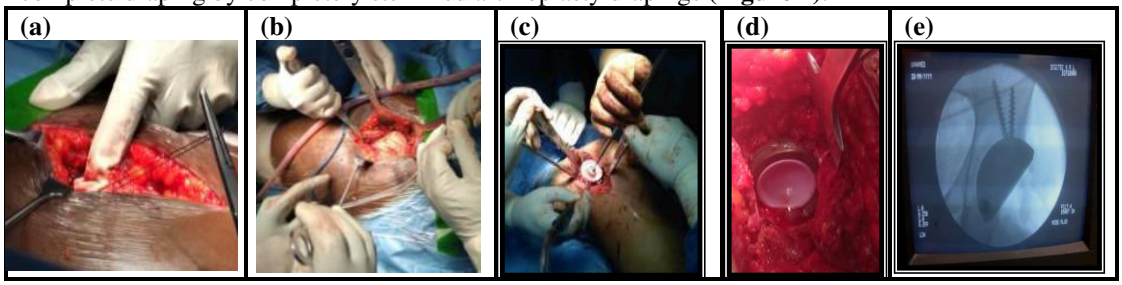

Figure (1): Surgical technique **(a)** Stay suture for gluteus minimus; **(b)** Femoral neck osteotomy and cetabular exposure; **(c) Acetabular reaming and linear application, (d)** True cup and linear orientation after application**, (e)** Fluoroscopic assessment for cup orientation.

Preparing the femur for the femoral stem by gradual ascending reaming. Do not implant the final stem but leave the trial stem/rasp in its final position for the trial reduction and cup alignment procedures. Inserting the femoral stem trial neck with the stem trial/rasp in its final position in the

prepared femur, attach the desired trial neck. The appropriate trial head matching the cup bore size inserted fully in the trial neck length collar. Trial reduction followed by assessment range of motion, stability, impingement and leg length. Change the neck trial model if required to achieve correct soft tissue tension and repeat the procedure. Now, we can take fluoroscopic image to check for cup and stem position. Remove all trial components and implant the definitive stem implant. Then trial again with appropriate neck and head trial model.Thedefinitive head is placed over the neck sleeve and press down firmly until resistance is felt. It is essential that the head is not tilted or placed at an angle on the sleeve to ensure proper seating**.**

The wound and the hip joint are irrigated thoroughly, a deep suction drain can be utilized, then the anterior flap (gluteus medius, gluteus minimus and the anterior capsule) is returned to its anatomic position at the greater trochanter by heavy absorbable suture, then the fascia of gluteus maximus and the fascia lata are closed continues heavy with absorbable suture. Then the subcutaneous tissue is closed with absorbable suture and the skin is closed with skin staples.

Rehabilitation after Hip replacement:

Hip replacement surgery is one of the most successful procedures in modern medicine. One of the most critical factors in achieving successful total hip replacement depends upon patient diligence in physical rehabilitation. Patient must actively participate in the rehabilitation process, to achieve optimal results.

All patients were requested to do routine x-ray at time of discharge (an only anteroposterior radiograph of the hip which should include the acetabulum and the entire stem length). The inclination and anteversion of the cup is measured, as well as the varus or valgus tilt of femoral stem and its size. Keep dressing on the wound clean and dry. Be sure to change it if it gets dirty or wet.

Post-Operative Care:

All patients were given I.V antibiotic 1st generation cephalosporinfor 24 hrs as single dose after hypersensitivity test. Anti-inflammatory (Celebrex, Naprosyn, Ibuprofen, etc.). Anti-coagulant (clexane 40 I.U) for 3-5 days followed by oral anticoagulant for 35 days. All medication should be taken with food to prevent nausea. If nausea, vomiting, rash, headache, abdominal cramping, blood in stool or other symptoms occur, you should seek medical advice.

Follow Up Evaluation:

Clinical assessment was done byusing Harris Hip Score at 6 months follow upalso we used radiographs inanalyzed with reference to signs of loosening at end of 3months and 6month.

Statistical analysis:

Data analyzed using Microsoft Excel software. Data were then imported into (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage , quantitative continues group represent by mean ± SD , the following tests were used to test differences for significance;. difference and association of qualitative variable by Chi square test (X2) . Differences between quantitative independent groups by t test. P value was set at <0.05 for significant results &<0.001 for high significant result.

RESULTS

The present study showed age was distributed as 38.66±5.32 with minimum 29 and maximum 47 years, regard sex distribution male were majority with 61.1% and female 38.9%, and 50% were smoker. Right was majority with 66.75 and left 33.3% **(Figure 2)**.

All group had pain and limitation of movement **(Table 1).** Only 6 cases (33.3%) used bone graft **(Figure 3).** Regarding causes of osteoarthritis, majority was AVN with 50.0% **(Table 2)**.

Concerning the Harris parameters, a statistically significant increase in points of all parameters postoperative. Mean of pain score improved from marked pain (10.1±8.26) to slight pain (38.7±5.04) post- operative. Mean Walk score improved from (1.1±1.02) pre-operative to (9.3±1.53) .post-operative. Mean of Support score improved from (1.9±1.1) pre-operative to post- operative (7.8±2.39). Limping improved from moderate limping (2.2±2.6) pre-operative to (9±1.45) post- operative.Mean Climbing upstairs score in most cases improved from (0.55±0.51) pre-operative to (1.9±0.32) post-operative **(Table 3)**.

A statistically significant increase in points of all parameters postoperative. Wear Shoes stocks score improved from (2±0) to (3.1±1.02) post- operative.sitting improved from (1.6±1.53) to sit comfortably to any chair for one hours (4.3±0.97) postoperative. mean of uses public transportation increased to be postoperative 0.78±0.43 and deformity improved to be 3.1±0.58.Range motion improved to do normal motion range post- operative **(Table 4).**

Female patient, 43 years old, patient known case of multiple sclerosis on cortisone treatment from long duration, presented c\o left hip pain which increased by motion and decreased by rest and analgesia, on hip examination shows limited flexion abduction and internal rotation of left hip, on x-ray of the pelvis shows AVN of the left hip, patient advised to done cementless THR of the left hip. Diagnosis was 2ry O.A (AVN) of left hip. Routine operation, postoperative program and 6 months follow up were performed **(Figure 4).**

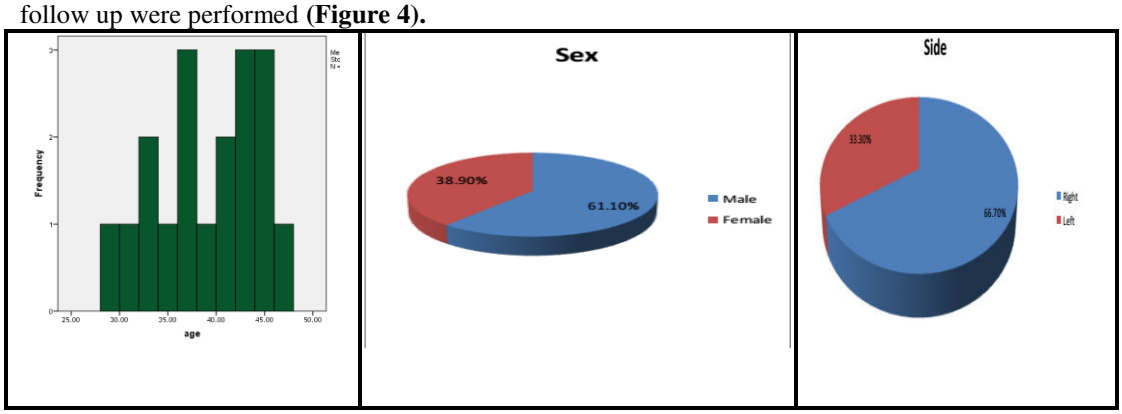

Figure (2): Age, sex and side distribution among studied group.

Table (1): Complaint distribution among studied group

		N	%
Pain	**-VE**	0	0.0
	+VE	18	100.0
Limitation of movement	**-VE**	0	0.0
	+VE	18	100.0
Swelling	**-VE**	18	100.0
	+VE	0	0.0
	Total	18	100.0

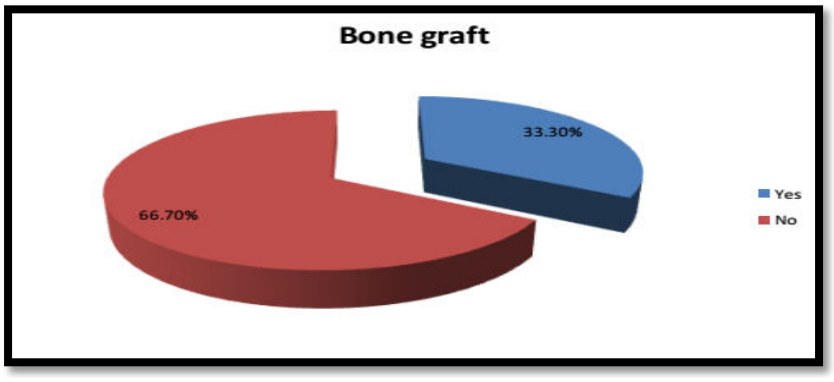

Figure (3): Graft uses distribution among studied group.

Table (2): Causes of osteoarthritis

		N	%
	AVN	9	50.0
	Ankylosingspondylitis	3	16.7
	Rheumatoid arthritis	2	11.1
	Slipped capital femoral epiphesis	2	11.1
	Perthis disease	1	5.5
	Systemic Lupus Erythematosus	1	5.5
	Total	18	100.0

Table (3): Comparison of parameters of Harris score pre and postoperative for studied group

Parameters	Harris' score		W	p-value
	Preoperative	Postoperative		
Pain Mean± SD Median (range)	10.1±8.26 0-20	38.7±5.04 30-44	3.77	0.0001 (S)
Walked Mean± SD Median (range)	1.1±1.02 0-2	9.3±1.53 8-11	3.76	0.0001 (S)
Support Mean± SD Median (range)	1.9±1.1 0-3	7.8±2.39 5-11	3.74	0.0001 (S)
Limp Mean± SD Median (range)	2.2±2.6 0-5	9±1.45 8-11	3.78	0.0001 (S)
Stair Mean± SD Median (range)	0.55±0.51 0-1	1.9±0.32 1-2	3.62	0.0001 (S)

W=Wilcoxon Signed Ranks Test S=significant p<0.05.

Table (4):Rest of comparison of parameters of Harris score pre and postoperative for studied group

Parameters	Harris' score		W	P
	Preoperative	Postoperative		
Shoes stocks Mean± SD Median (range)	2±0 2-2	3.1±1.02 2-4	3.16	0.002
Sitting Mean± SD Median (range)	1.6±1.53 0-3	4.3±0.97 3-5	3.82	0.0001 (S)
Transportation Mean± SD Median (range)	0.33±0.48 0-1	0.78±0.43 0-1	2.31	0.021
Deformity Mean± SD Median (range)	0.88±0.9 0-2	3.1±0.58 2-4	3.77	0.0001 (S)
Range motion Mean± SD (range)	1.1±0.76 0-2	3.9±0.58 3-5	3.782	0.0001 (S)

W=Wilcoxon Signed Ranks Test

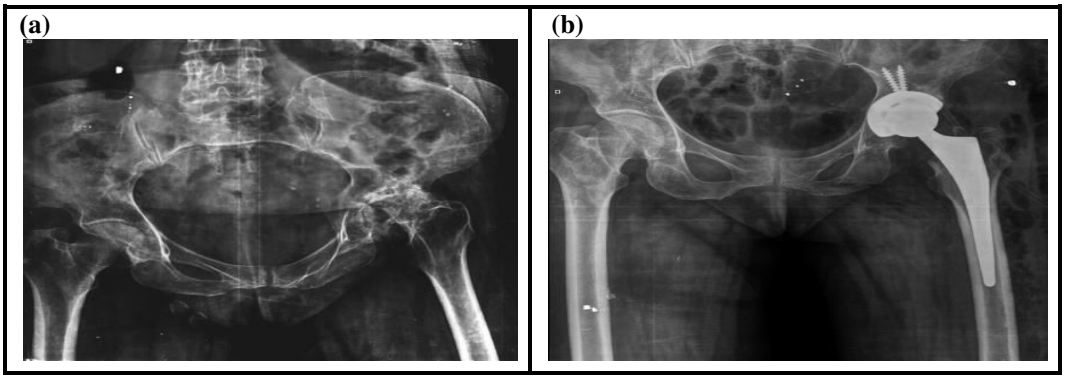

Figure (4): A female case with2ry O.A (AVN) of left hip showing (a) X-ray preoperatively, (b) X-ray post operatively follow up after 6 month

DISCUSSION:

Management of the hip osteoarthritis is a challenging for Orthopaedic Surgeons for the years all over the world. So the objective of the study was to determine the functional outcome and the complications associated with uncemented total hip replacement for young patients with degenerative osteoarthritis.

Regarding studied group; The present study included male were majority with 61.1% and female 38.9%. This covenant with findings of **Wapabeti (7)** defined that 35.5% of patients was female.

In contrast **Trung (8)** stated that male/female ratio was (0.5:1) among patients operated by THA. Also **Stafford et al., (9)** reported result of National Joint Registry of England and Wales, the patients mean age was 71 years (range: 29–96 years) who were treated from osteoarthritis by Total hip replacement. One same line **Tutega et al., (10)** revealed mean age of patients included in cementlessTHA was 63.52 range (50– 82years).

The above finding established that mean age of our patients was younger than age of previous studies this explained by Egyptian Population Pyramid composed mainly from young people with relativeshort life expectancy.

The present study detected that allstudied group had pain and limitation of movement. Similar to **Jian and Zhan (11)** clarified the main symptoms and sign of hip osteoarthritis included: Severe pain in hip or groin**,** inability to weight bearing on the side of affected hip**,** swelling around hip area**,** shorter leg on the side of affected hip**.**

In present study underlying cause of oesteoarthritis of studied group the majority was AVN with 50.0%,(16.7%) due to ankylosing spondylitis,(11.1 %) due to rheumatoid arthritis ,(11.1 %) due to Slipped capital femoral epiphesis,(5.5%) due to Perthis disease and,(5.5%) due to systemic lupus erythematosus. Difference with **Trung (8)** defined that THA was operated to 86.7% of patients due to osteoporosis situation.

Difference with **Brunner et al., (12)** as before surgery, An antero posterior view of the pelvis was done and An antero posterior and lateral views are done to fractured hip joint, whole femur and ipsilateral knee joint. X-ray of our patients clarified that 66.6% of studied group had Secondary post traumatic OA hip followed by 11.1% had unilateral AVN of femur head then 16.6% had X-ray manifestation of Ankloysing spondylitis and lastly (5.5)% of studied group had Systemic lupus erythematosus with destructive erosion of hip. Diagnosis of hip fracture can usually be established with a detailed history thorough physical examination and plain-film radiographs of the symptomatic hip. If radiographic findings are suspicious for a hip fracture, other imaging modalities can be useful in confirming the diagnosis.

According to surgical approach in our present study**;** Harding direct lateral approach in lateral position was used. The direct lateral approach is preferable to avoid the seriousness of recurrent dislocations and its early occurrence **(13).** But A cohort study of 713cementless THA, in which the approaches were determined by the surgeons preferences, found the rate of dislocation was 2% with the direct lateral approach while 12% with the posterior approach with a posterior repair and 14% without a posterior repair. The posterior approach was the only factor associated with an increased risk of

dislocation. Recurrent dislocation is a particularly overwhelming complication which lead to a loss of stability (**14).**

Concerning the Harris parameters, the current study showed that statistically significant increase in points of all parameters postoperative. Mean of pain score improved from marked pain (10.1±8.26) to slight pain (38.7±5.04) post- operative. Mean Walk score improved from (1.1±1.02) pre-operative to (9.3±1.53) .post- operative. Mean of upport score improved from (1.9±1.1) pre-operative to post- operative (7.8±2.39). Limping improved from moderate limping (2.2±2.6) pre-operative to (9±1.45) post- operative. Mean climbing upstairs score in most cases improved from (0.55±0.51) pre-operative to (1.9±0.32) post-operative. In agreement with the present study, **Taheriazam and Saeidinia (15)** revealed that HHS score improved from mean preoperative score of 44.93±8.40 (ranged 30–62) to 89.76±9.97 (ranged 45– 96) after 6 months follow-up. The mean of 12 months follow-up HHS score and final follow-up scores were 94.54±2.31 (ranged 90–98) and 95.41±2.27 (ranged 92–99) respectively. All of the differences between preoperative HHS score and its follow-ups were significantly improved (P=0.0001).

The current study showed that statistically significant increase in points of all parameters postoperative. Wear Shoes stocks score improved from (2±0) to (3.1±1.02) post- operative. sitting improved from (1.6±1.53) to sit comfortably to any chair for one hours (4.3±0.97) post- operative. mean of uses public transportation increased to be postoperative 0.78±0.43 and deformity improved to be 3.1±0.58. Range motion improved to do normal motion range post- operative. **Moura and Figueiredo (16)** reported that he mean Harris Hip Score improved from 42.91 ± 14.59 preoperatively to 88.55 ± 4.50 postoperatively with a significant difference.

Purvance et al., (17) reported that the Harris Hip Score from improved from 48 preoperatively to 81 postoperatively with a significant difference and On follow up, the patient showed improved range of motion of hip joint without pain.

A modular distal fixation stem consists of a proximal sleeve and a shaft component; it can easily and precisely provide stable fixation of the distal stem in the diaphyseal portion of the femur, which has relatively good bone quality, by bridging bone defects, and can be conveniently assembled at the desired anteversion angle or leg length intra-operatively **(18).** Also, **Cameron (19)** conducted a 3.5-year follow-up of patients who underwent Cementless THA with modular femoral stems and reported a success rate of 94%. We did not detect any mechanical defects or stress shielding in the present study.

CONCLUSION:

Cementless total hip arthroplasty has reassuring results in patients <50 years of age. It is not associated with any significant early or late complications and has outstanding functional outcomes. Patients usually do not experience any pain, limping, difficulty in walking and attain normal limb length. They develop no restriction in the range of movement.

No Conflict of interest.

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