International Journal of Orthopaedics Sciences

**ISSN:** 2395-1958
IJOS 2016; 2(4): 294-297

www.orthopaper.com
Received: 16-08-2016
Accepted: 17-09-2016

**Sayed El-Etewy Soudy**
Assistant Professor Orthopedic Surgery, Faculty of Human Medicine, Zagazig University, Egypt

**Correspondence**
**Sayed El-Etewy Soudy**
Assistant Professor Orthopedic Surgery, Faculty of Human Medicine, Zagazig University, Egypt

# Mid-term results of ceramic on ceramic total hip replacement in young adults

**Sayed El-Etewy Soudy**

**DOI:** http://dx.doi.org/10.22271/ortho.2016.v2.i4e.46

**Abstract**
**Background:** With the increased use of (THA) in younger patients with more activity and more wear and stress, the ceramic on ceramic bearing surfaces decrease the rates of wear and increase the prosthesis longevity.
**Patients and Methods:** 58 patients (66 hips) evaluated after THA operation using ceramic bearing surfaces. There were 40 males and 18 females with mean age of 34 years (range: 26-48). The etiology was avascular necrosis of femoral head in 42 hips, and posttraumatic hip arthrosis in 24 hips. Clinically, the indications of operation were disabling pain, marked restriction in hip motions, and flexion adduction deformity. Harris hip score was used in clinical evaluation preoperatively, postoperatively and at last follow up for all patients. For radiological evaluation we used the criteria of Lins *et al* for acetabular evaluation and Engh *et al*. for femoral evaluation.
**Results:** The mean follow-up period was 82 (range, 66–102) months. Clinically, the mean Harris Hip Score improved from 50.5 (range, 24–66) to 89 (range, 45–98) [$p$<0.001]. At the last follow ¬up, excellent results were in 24 hips (36.5%), and good results in 30 (45.5%), fair in 8 hips (12%), and 4 hips (6%) had poor results. No hip had evidence of subsidence, loosening, or osteolysis. A radiolucency of 1 mm of was seen in 2 zones in 8 hips (14%), (in 5 hips it was in zones 1 & 2, and in zones 2 & 3 in 3 hips). There were no progression of these lucencies up to last follow up. In the femoral stem, there were four stems with radiolucent line of 3mm in 2 zones but clinically the patients had no pain and stems were stable until last visit.
**Conclusion:** Total hip replacement with ceramic on ceramic bearing surfaces are functioning well with minimal complications and low rate of loosening in a 5-8 years follow up according to this study.

**Keywords:** Total hip, ceramic, young, adult

## 1. Introduction
Total hip replacement is the treatment of choice in the end-stage diseases of hip joint. The longevity of the replacement is the mean problem especially in young patients. The wear of bearing surface, osteolysis related to wear are limitations to long-term survivorship of prosthesis [1, 2]. The metal-on- polyethylene (MOP) bearing surface was successful in elderly patients, but the wear debris generated with the occurrence of osteolysis leaded to loosening and eventual implant failure [3]. With the use of (THA) in younger patients with more activity and more wear and stress. The ceramic on ceramic bearing surfaces decrease the rates of wear with low coefficient of friction and increase the prosthesis longevity [4]. Authors recorded survival rates of 100% at 8 years [5-8].
This prospective study reported the clinical and radiological results of 66 hips in 58 patients had total hip replacement using ceramic-on-ceramic prostheses.

## 2. Materials and methods
Through the period from May 2006 to November 2015, 72 hips (64 patients) were operated on with total hip replacement using cement less ceramic on ceramic bearing surface. As six patients were lost during follow up, only 58 patients (66 hips) completed to the last follow up. There were 40 males and 18 females with mean age of 34 years (range: 26-48). The right side affected in 28 hips, left side in 22, and 8 bilateral cases.

The etiology was avascular necrosis of femoral head in 42 hips (Figure 1 & 2), and posttraumatic hip arthrosis in 24 hips (Figure 3& 4). Clinically, the indications of operation were disabling pain, marked restriction in hip motions, and flexion adduction deformity. The limb length discrepancy ranged from 3 to 4.5 cm (average: 3.5 cm). Thirty patients (51.5%) had moderate to severe pain with using two crutches for ambulation; Twenty four patients (41.5%) had severe pain and were unable to walk, and four patients (7%) had limited walking ability using a walker. Classification of AVN (avascular necrosis) according to preoperative x- ray revealed Ficat [9] stage III in 15 cases and stage IV in 27 hips. The mean follow up period was 82 months (Range 66 to 102 months).

Harris hip score [10] was used in clinical evaluation preoperatively, postoperatively and at last follow up for all patients. The mean preoperative score was 39.36 (range 30-56). The score consists of 100 points: the pain (1item, 0–44points), the function (7items, 0-47 points), deformity absence (1item, 4points), and the range of motion (2 items, 5points). The total score of (90-100 points) is called excellent, good when (80-90), fair if (70-80), and poor when the total score is (below 70 points).

For radiological evaluation we used the criteria of Lins *et al* [11] for acetabular evaluation and Engh *et al*. [12] for femoral evaluation. The choice of implant was based on the patient's age and activity levels. Femoral head size was 32 mm in 50 hips and 28 mm in 16 hips.

### 2.1 Surgical technique

Under spinal anesthesia in the lateral decubitus, all operations were done through the lateral approach (Hardinage). In all cases, the cement less ceramic on ceramic (Zimmar Co. Inc.) was used (Figure 1). The acetabular metallic shell was anatomic and secured by two screws at least, while the femoral component was press fitted. Postoperative low molecular weight heparin was used for prophylaxis against deep venous thrombosis in all cases. For prevention of hypertrophic ossification the indomethacin was used with 50 mg daily dose for three weeks. Partial weight bearing was allowed using axillary crutches in the first 6 weeks postoperative and full weight bearing with contralateral elbow crutch started after 8 to 9 weeks.

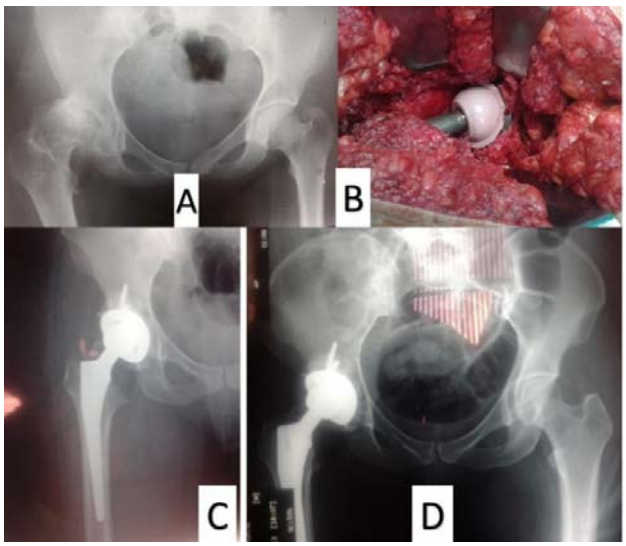


**Fig 1:** 34 years patient with right side AVN of femoral head and hip arthritis: A) preoperative X-ray; B) intraoperative photo with ceramic head and liner; C) 9 months postoperative X-ray; D) 62 months postoperative X-ray.


**Fig 2:** 38 year's male with bilateral AVN of femoral head and hip arthritis: A) preoperative x-ray; B) 2 years x-ray after second hip replacement; C) range of abduction and stability of the both hips 72 months postoperative.

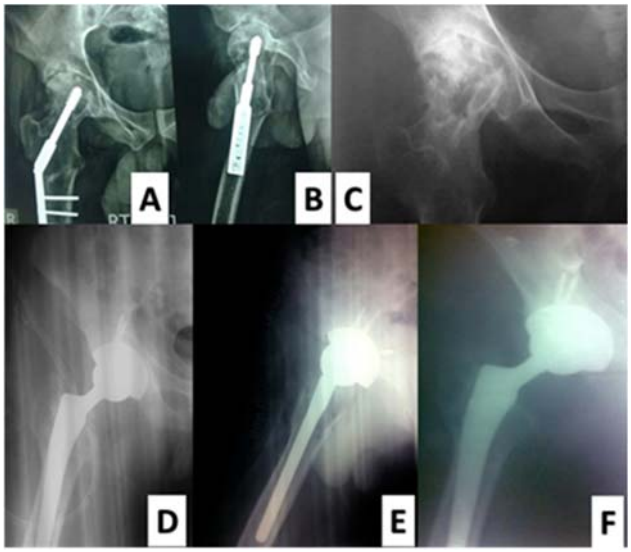


**Fig 3:** 44 year's old female with right side hip arthritis and ankylosis due to posttraumatic arthritis: A & B) preoperative x-ray with DHS fixation; C) hip arthritis after removal of implant; D) postoperative x-ray with ceramic THA; E& F) x-ray36 months postoperative.

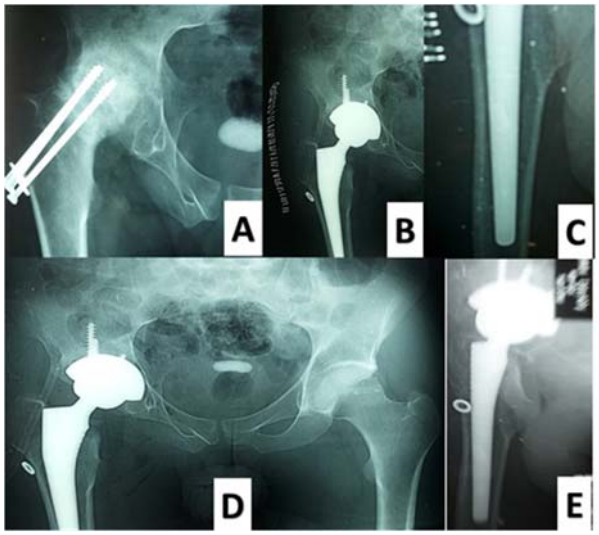


**Fig 4:** 36 years old male with posttraumatic hip arthritis: A) preoperative x-ray with cannulated screw fixation of fracture neck femur and hip arthritis; B & C) postoperative x-ray with ceramic hip replacement; D & E) 48 months postoperative x-ray.

## 3. Results

The mean follow-up period was 82 (range, 66–102) months. Clinically, the mean Harris Hip Score improved from 50.5 (range, 24–66) to 89 (range, 45–98) [$p$<0.001]. At the last follow up, excellent results were in 24 hips (36.5%), good results in 30 (45.5%), fair in 8 hips (12%), and 4 hips (6%) had poor results. No hip had evidence of subsidence, loosening, or osteolysis.

The relief pain and correction of gait were recorded at the final follow up. Postoperatively, no pain or mild pain was found in 35 patients (60%), trochanteric pain was found in 12 (20.5%), and anterior thigh pain in 8 patients (14%). In 3 patients (5.5%) there was moderate to severe pain. The mean limb shortening was improved from 3.5 cm (range: 3 to 4.5) preoperatively to 2.5 cm (range: 2-3) postoperatively. All patients had the ability to walk postoperative at final follow up. Forty patients (69%) were freely walking outdoors using an elbow crutch; and 18 patients (31%) had the ability to walk without aid.

The serial follow up x-rays (AP, Lateral views of hip joint with AP view of pelvis) were evaluated every visit tell the final follow up. There was no postoperative dislocations occurred. Heterotopic ossification was seen in four (7%) of the patients and it was Brooker grade II in three. The acetabular inclination was accepted in all cases. The femoral stem was in neutral position in 46 stems (79.5%), 5 stems (8.5%) were in varus, and 7 stems (12%) were in valgus position.

A radiolucency of 1 mm of was seen in 2 zones in 8 hips (14%), (in 5 hips it was in zones 1 & 2, and in zones 2 & 3 in 3 hips). There were no progression of these lucencies up to last follow up. In the femoral stem, there were four stems with radiolucent line of 3mm in 2 zones but clinically the patients had no pain and stems were stable until last visit.

## 4. Discussion

Avascular necrosis (AVN) of the femoral head is one of the common causes of painful hip in a young adult. The disease usually affects patients in the third and fourth decades of life at the time of diagnosis. AVN leads to progressive joint destruction with eventual advanced arthritic changes requiring surgical treatment [13, 14]. The post traumatic hip joint destruction due to acetabular and femoral head damage, chondrolysis, and ankylosis are major problems and total hip replacement is a good surgical solution to gain motion and relieve pain. The total hip arthroplasty is the main therapeutic option in such cases of advanced stages [15, 16]. Unfortunately, young patients with active lifestyle carry the risk of early loosening and repeated revisions. To overcome these problems; more durable bearing materials have been developed [17].

The longevity of the implanted prosthesis is a major concern of total hip replacement surgery especially in young patients with active lifestyle. Wear of the bearing surfaces resulting in wear debris, subsequent osteolysis, and the eventual loss of fixation. The absence of osteolysis in young patients leads to preservation of bone stock which is very important consideration. The mean challenge in total hip replacement surgery is to minimize wear and osteolysis in the young and active patients with high level of activity. The longevity of hip replacement surgery has been improved with the advances in the design of bearing surfaces. This advance increased the indications of hip arthroplasty for younger active patients [18-20].

Alumina ceramics have extremely low coefficient of friction with high wear resistance**.** Alumina ceramics improved lubrication over other bearing surfaces as they are extremely hard, stable at high temperatures, scratch resistant [21]**.** The current generation of alumina has addressed the early problems of ceramic component fracture and accelerated wear due to insufficient purity, low density, and less mechanical strength of the ceramic material [22].

The early clinical and radiological outcomes of cement less THA are superior to cemented THA even with advances in cementing techniques. Total hip replacement in the young age group favor cement less over cemented technique as regard longevity. The cement less technique has the advantage of reduced operative time, bone stock preservation, and reducing component loosening.

Lins *et al* [11] reported on 37 hips with avascular necrosis treated with cement less total hip arthroplasty. The mean follow-up period was 60 months. They found that 81% of the femoral components, and 97% of the acetabular components were stable at last follow up.

At the short and midterm follow up, many authors reported minimal or no osteolysis. Kim *et al* [23] in a study of 93 hips, there was no osteolysis at a minimum of 10 years follow up in patients younger than 45 years. Shetty *et al* [24] in their study found survival rate of 88.9% in ceramic on ceramic bearings in 249 patients within 10 years follow up.

The results of this study as regard osteolysis were very promising. In the femoral stem, there were four stems with radiolucent line of 3mm in 2 zones but clinically the patients had no pain and stems were stable until last visit. A radiolucency of 1 mm of was seen in 2 zones in 8 hips (%), (in 5 hips it was in zones 1 & 2, and in zones 2 & 3 in 3 hips). There were no progression of these lucencies up to last follow up.

The rates of revision in the previous studies using ceramic on ceramic bearing surfaces in young patients are promising. Patrick *et al* performed their study 2012 [25] of 24 cases young than 20 years had total hip replacement using ceramic on ceramic bearing with follow up 52 months. They had a revision rate of 8% of cases. In Young-Hoo Kim *et al* study 2010 [26] about cement less total hip arthroplasty with ceramic-on-ceramic bearing in patients younger than 45 years, they reported 0% revision of the femoral and the acetabular components at follow up of 11.1 years in aseptic loosening and 1% revision rate in one case due to recurrent dislocation and revision of the acetabular component was done. In this study at 5 years follow up none of the cases needed revision due to loosening.

## 5. Conclusion

Total hip replacement with ceramic on ceramic bearing surfaces are functioning well with minimal

Complications and low rate of loosening in a 5- 8 years follow up according to this study. The ceramic bearings are recommended for hip replacement in young patients. We recommend longer term follow up for more evaluation of the longevity of the prosthesis.

## 6. References


1. Roshan PS, John AS, Roger C, Jonathan PG, Gwo-Chin L. Ceramic-on-ceramic total hip arthroplasty in patients younger than 55 years; J of Orthop Surg. 2014; 22(3):338-41.
2. Chandler HP, Reineck FT, Wixson RL, McCarthy JC. Total hip replacement in patients younger than thirty years old. A five-year follow-up study. J Bone Joint Surg Am. 1981; 63:1426-34.
3. Shetty V, Shitole B, Shetty G, Thakur H, Bhandari M. Optimal bearing surfaces for total hip replacement in the young patient: a meta-analysis. Int Orthop. 2011; 35:1281-7.
4. Zywiel MG, Sayeed SA, Johnson AJ, Schmalzried TP, Mont MA. Survival of hard-on-hard bearings in total hip arthroplasty: a systematic review. Clin Orthop Relat Res 2011; 469:1536-46.
5. Bierbaum BE, Nairus J, Kuesis D, Morrison JC, Ward D. Ceramic-on-ceramic bearings in total hip arthroplasty. Clin Orthop Relat Res. 2002; 405:158-63.
6. D'Antonio J, Capello W, Manley M. Alumina ceramic bearings for total hip arthroplasty; Orthopedics. 2003; 26:39-46.
7. D'Antonio J, Capello W, Manley M, Naughton M, Sutton K. Alumina ceramic bearings for total hip arthroplasty: five-year results of a prospective randomized study. Clin Orthop Relat Res. 2005; 436:164-71.
8. Bierbaum BE, D'Antonio J, Capello W, Manley M, Deshmukh R. Ceramic/ ceramic total hip replacement: the American experience with stryker implants. In: Lazennec JY, Dietrich M, editors. Bioceramics in Joint Arthroplasty, 2004.
9. Muhammad Umar Jawad, Abdul Ahad Haleem, Sean P Scully. In Brief: Ficat Classification: Avascular Necrosis of the Femoral Head. Clin Orthop Relat Res. 2012; 470(9):2636-2639.
10. Söderman P1, Malchau H. Is the Harris hip score system useful to study the outcome of total hip replacement? Clin Orthop Relat Res. 2001; (384):189-97.
11. Lins RE, Barnes BC, Callaghan JJ, Mair SD, McCollum DE. Evaluation of uncemented total hip arthroplasty in patients with avascular necrosis of the femoral head. Clin Orthop 1993; (297):168-73.
12. Engh CA, Bobyn JD, Glassman AH. Porous-coated hip replacement. The factors governing bone ingrowth, stress shielding, and clinical results. J Bone Joint Surg [Br] 1987; 69:45-55.
13. Garino JP, Steinberg ME. Total hip arthroplasty in-patients with avascular necrosis of the femoral head. 2 to 10 years follow-up. Clin. Ortho. 1997; 334:108-15.
14. Ramesh Kumar Sen. Management of avascular necrosis of femoral head at pre- collapse stage Indian J Orthop. 2009; 43(1):6-16.
15. Hannouche D, Zaoui A, Zadegan F, Sedel L, Nizard R. Thirty years of experience with alumina-on-alumina bearings in total hip arthroplasty. Int Orthop. 2011; 35:207-13.
16. Zywiel MG, Sayeed SA, Johnson AJ, Schmalzried TP, Mont MA. Survival of hard-on-hard bearings in total hip arthroplasty: a systematic review. Clin Orthop Relat Res 2011; 469:1536-46.
17. Shetty V, Shitole B, Shetty G, Thakur H, Bhandari M. Optimal bearing surfaces for total hip replacement in the young patient: a meta-analysis. Int Orthop 2011; 35:1281-7.
18. Yoo JJ, Kim YM, Yoon KS, Koo KH, Kim JW, Nam KW. Contemporary alumina-on-alumina total hip arthroplasty performed in patients younger than forty years: a 5-year minimum follow-up study. J Biomed Mater Res B Appl Biomater. 2006; 78:70-5.
19. Sechriest VF, Kyle RF, Marek DJ, Spates JD, Saleh KJ, Kuskowski M. Activity level in young patients with primary total hip arthroplasty: a 5-year minimum follow-up. J Arthroplasty. 2007; 22:39-47.
20. Wagenmakers R, Stevens M, Groothoff JW, Zijlstra W, Bulstra SK, van Beveren J. Physical activity behavior of patients 1 year after primary total hip arthroplasty: a prospective multicenter cohort study. Phys Ther 2011; 91:373-80.
21. Garcia-Rey E, Cruz-Pardos A, Garcia-Cimbrelo E. Alumina-on-alumina total hip arthroplasty in young patients: diagnosis is more important than age. Clin Orthop Relat Res 2009; 467:2281-9.
22. Cogan A, Nizard R, Sedel L. Occurrence of noise in alumina-on-alumina total hip arthroplasty. A survey on 284 consecutive hips. Orthop Traumatol Surg Res 2011; 97:206-10.
23. Kim YH, Choi Y, Kim JS. Cement less total hip arthroplasty with ceramic-on-ceramic bearing in patients younger than 45 years with femoral-head osteonecrosis. Int Orthop 2010; 34:1123.
24. Shetty V, Shitole B, Shetty G, Thakur H, Bhandari M. Optimal bearing surfaces for total hip replacement in the young patient: a meta-analysis. Int Orthop 2011; 35:1281-7.
25. Patrick R, Finkbone, Eric P Severson, Miguel E Cabanela, Robert T, Trousdale. Ceramic-On-Ceramic Total Hip Arthroplasty in Patients Younger Than 20 Years. The Journal of Arthroplasty. 2012; 27(2).
26. Young-Hoo Kim, Yoowang Choi, Jun-Shik Kim. Cement less total hip arthroplasty with ceramic-on-ceramic bearing in patients younger than 45 years with femoral-head osteonecrosis. Int Orthop. 2010; 34(8):1123-112.