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Original Research Article

A prospective study of functional and clinical outcome of total hip arthroplasty with ceramic on ceramic bearing surfaces

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Abstract

Background: The incidence of chronic disabling conditions of the hip including osteoarthritis, inflammatory arthritis and osteonecrosis is on the rise. Total hip arthroplasty (THA) is one of the most common surgical procedures performed in these conditions. The increasing number of young and active patients is requiring long lasting and reliable primary hip arthroplasty (THA). Ceramic on ceramic (COC) hip articulations made from alumina have become an attractive option for young and active patients who require THA. The reports suggesting the study of clinical and functional outcome of ceramic on ceramic bearing surfaces are scant in this part of the country. Hence it was decided to take up this study with the aim of studying the clinical and functional outcome of ceramic on ceramic bearing surfaces.

Objectives: To study and compare the clinical and functional outcome of ceramic on ceramic bearing surfaces total hip arthropalsty in a group of patients.

Methodology: A prospective comparative study was undertaken in the Department of orthopaedics of GS Kulkarni Hospital, Miraj. A total of 30 patients undergoing THA with ceramic on ceramic bearing surface were included as study sample and same number of patients with other bearing surface implants was included as controls. The clinical and functional outcomes were evaluated by Modified Harris Hip Score. The radiological assessment included positioning and alignment of the acetabular and femoral components and complications such as periprosthetic fractures, loosening, osteolysis, dislocation, subsidence and heterotrophic ossification.

Results: In our study, both study groups COC and other implants group were statistically comparable for demographical parameters. The stem size, head size, offset, shell size and the liner size were comparable in both study groups. The difference between mean pre operative score and mean post operative was statistically significant in both study groups in various categories such as pain, gait, functional activity, absence of deformity and ROM scores. The acetabular angle and the coverage were not statistically significant between study groups. However the femoral varus deformity was present in 13.3% of the patents in ceramic on ceramic surface group of patients and 36.7% of the other implant cases which was statistically significant between the two groups. Superficial infection was the common complication in both the groups. One patient in ceramic on ceramic surface group had Anterior thigh pain (ATP). About 6.7% of the patients in other type of implant group had ATP and osteolysis. one patient had nerve injury in other implants group.

Conclusion: This study was mainly undertaken to compare the efficacy of the ceramic on ceramic surface with the other type of implants. This study had reported that, majority of the

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patients with COC were between 41 – 50 years, majority of male gender and AVN was the main indication for the surgery. In both study groups the pain scores, functional gait score, function activity scores, absence of deformity scores, ROM scores, total scores and acetabular angle were significantly different before and after surgery. But there was no statistically significant difference after surgery between the ceramic on ceramic and other type of implant groups except for femoral varus deformity. But this study is not without limitations. The sample size is not large enough to generalize the study results. But this study was able to bring out many facts about the use of ceramic on ceramic implants. Further research with elegant methodology can bring out many facts about the disease.

Key words: Osteoarthritis Hip, Avascular necrosis (AVN), Total Hip Arthroplasty (THA), ceramic on ceramic bearing surfaces (COC), Modified Harris Hip Score

1. Introduction

Total hip arthroplasty (THA) is one of the most common surgical procedures performed worldwide. It mainly involves the surgical excision of the head and proximal neck of the femur and removal of the acetabular cartilage and sub chondral bone [1]. The human joint is extremely complex on the account of the functional demands on it by the body. The literature available shows that, more than 950,000 primary and revision THAs were performed globally in the year 2010 [2].

The studies available shows that, there is significant increase in annual rates of primary and revision THA from the year 1990 to 2002 in US. There was increase in revision rates from 9.5/100,000 to 15.2/100,000 [3]. In Denmark, the incidence rates of primary and revision THA increased by 30% and by 10% from 1996 to 2002. The increase in primary THA were noticed in all the age groups, but was highest for patients aged 50 – 59 and lowest for those aged 10 – 49 years [4].

The incidence of chronic disabling conditions of the hip including osteoarthritis, inflammatory arthritis and osteonecrosis is on the rise. Severe osteoarthritis of hip is common indication for the total hip arthroplasty accounting for almost 70% of the cases. Severe pain and limitation in activities of daily living is the primary indication of this procedure. The refractory pain to conservative measures including oral non steroidal anti inflammatory medication, weight reduction, activity restriction and the use of the supports such as cane warrants the total hip replacement [5].

The research available shows that the conventional cemented total hip arthroplasty dramatically improves a patient's function and quality of life. The rate of femoral loosening appears to be substantially reduced with the use of contemporary prosthesis and modern cementing techniques. The mechanical loosening have been reported in the young, heavy, active men and with certain prosthetic designs regardless of cementing techniques [6].

The increasing number of young and active patients is requiring long lasting and reliable primary hip arthroplasty (THA) [7]. It is well known that bearing surface wear and particle driven osteolysis remain the major factors threatening the longevity and limiting the performance of the implant [8].

Non cemented total hip arthroplasty was developed in response to evidence that the cement debris plays an important role in promoting the bone lysis and loosening. Prosthetic devices are designed and developed to achieve fixation without cement either by "press - fit" or by biologic in growth. Non cemented devices are most frequently used in young patients with high physical demands, where a revision surgical procedure in the future will be more likely. Preliminary data suggest that non cemented total hip arthroplasties have a relatively low revision rate and excellent prosthetic durability for as long as 15 years. Compared with cemented hip arthroplasties, however, patients have higher incidence of low grade temporary thigh pain. The results of the two procedures are almost similar, although the short term results appear to be less satisfactory compared with the cemented hip arthroplasty after 5 to

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20 years [9].

Ceramic on ceramic (COC) hip articulations made from alumina have become an attractive option for young and active patients who require THA. This is partially due to the excellent wear characteristics and outstanding tribiological properties of alumina gives COC surface a great advantage of over metal on metal (MOM) surfaces [10].

The literature available had shown that, COC bearings allow the use of larger femoral heads with the same dimensions of the acetabular component because of the lower minimum thickness of the material. As a result of modern grinding and laser techniques, material properties such as density and the size and distribution of particles have been improved with an increase in the chemical stability of the material [11]. The hydrophilic surface of the ceramic results in reduced friction by virtue of excellent lubrication. Ceramic wear particles exhibit excellent biocompatibility [12].

The reports suggesting the study of clinical and functional outcome of ceramic on ceramic bearing surfaces are scant in this part of the country. Hence it was decided to take up this study with the aim of studying the clinical and functional outcome of ceramic on ceramic bearing surfaces.

2. Materials and Methods

2.1 Source of data

A prospective comparative study was conducted in order to achieve the study objectives. This study was undertaken in the Department of orthopaedics of GS Kulkarni Hospital, Miraj, Maharashtra between August 2018 to July, 2020. A total of 30 patients undergoing THA with ceramic on ceramic bearing surface were included as study sample and same number of patients with other bearing surface implants was included as controls.

2.2 Inclusion Criteria

1. Age: Above 18 years up to 70 years of either sex
2. The patients undergoing total hip replacement arthroplasty with ceramic on ceramic based surface
3. Patients with primary and secondary osteoarthritis
4. Patients with osteoarthritis of bilateral hip

2.3 Exclusion Criteria

1. The patients with previous hip replacement
2. Patients medically unfit for surgery
3. Patient who have deformity and disability of ipsilateral hip and ankle joint
4. Previous hemiarthroplasty or fusion on ipsilateral side

2.4 Clinical Assessment

On admission of the patient, a careful history was elicited from the patient. Inpatients meeting the inclusion and exclusion criteria were selected for the study. All the patients were explained about the aims of the study, the methods involved and an informed written consent was obtained before being included in the study. The physical fitness of the patient undergoing a major surgery was assessed. Physical examination included examination of spine and both lower extremities including opposite hip, both knees and foot. All the patients were evaluated according to the modified Harris hip scoring system. Trendelenburg test to assess the abductor musculature mechanism was done. Neurovascular status of affected extremity was evaluated. The scores were taken account were of pain, function, range of motion and deformities. Also mention of limb length discrepancy and flexion contracture is made.

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2.5 Radiographic Assessment

The goal 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. Standard pelvic roentgenogram AP view with both hips along with upper end femur, AP X ray of hip in 15 degrees of internal rotation and lateral X rays of Hip were taken. X rays of spine and knees were also taken to know their status. Bone stock, medullary cavity, limb length discrepancy and neck of femur were noted. Bone stock, floor, migration, protrusion, osteophytes and approximate cup size of acetabulum were also noted.

2.6 Pre operative evaluations and preparation

The aim of the preoperative planning by clinical and radiological assessment was to obtain results post operatively.

1. An acetabular socket located in the anatomical position.
2. Centre of rotation of femoral head located in its normal anatomical position.
3. Restoration of limb length
4. Restoration of abductor moment arm

Routine blood investigations were conducted for all the patients. Special attention was given to CRP and ESR, if they were abnormal, surgery was deferred. Any occult infections like skin lesions, dental caries and urinary tract infections were identified and treated preoperatively Analgesics, antibiotics, tetanus toxoid and blood transfusion was given as needed before surgery. Aspirin, anticoagulants and other anti inflammatory drugs were stopped 10 days prior to surgery. Pre-operative antibiotics were administered 30 min before the operation.

2.7 Operative procedure

A posterolateral approach was used in this study where curvilinear incision was made over the greater trochanteric and extended proximally to ream the femoral canal from the superior direction. The hip joint was approached by spitting the gluteus maximus. The capsule was incised and hip was dislocated posteriorly by flexing, abducting and gently internally rotating the hip. On dislocating, the femoral head was extracted after neck osteotomy which was performed according to a pre planned template. The acetabulum is prepared excising the soft tissues attached to it,rearning it up to the bleeding subchondral bone. All the osteophytes, if present were excised and the wound irrigated to remove any leftover debris. Any subchondral cysts in acetabulum were covered by using morcellised femoral head as graft. The ceramic acetabular cup sizes were used higher than the last reamer used. Screws were used to fix the acetabular cup along the posterosuperior quadrant keeping in mid centre of the offset placed superiorly or posterosuperiorly.

The acetabular cup placed was covered with a mop to protect it from any debris. The proximal femur was exposed and delivered out by markedly internal rotating the limb. The femoral canal was hand reamed to the anticipated stem size as determined by templating and maintaining the anteversion. On introducing the femoral stem, the stability was tested to rotational and extraction forces. The prosthetic head of the appropriate size was placed on the trunnion and affixed with mallet over a plastic capped head impacter. The femoral head was reduced, the stability confirmed through a functional range of motion. Wound was closed over a suction drain.

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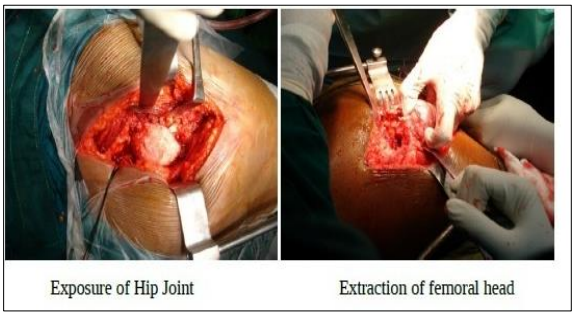
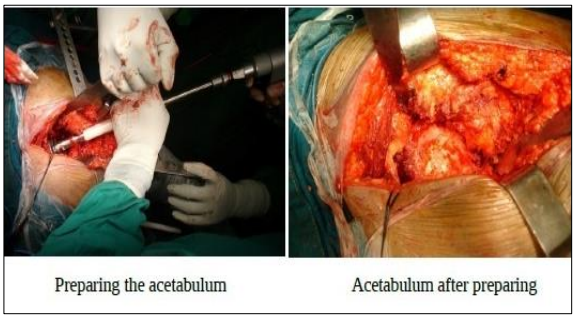
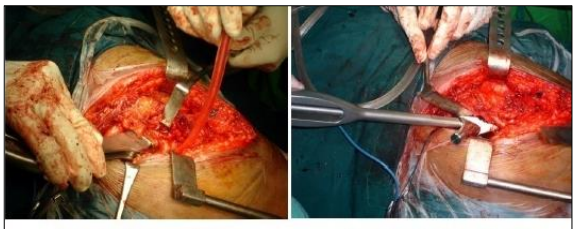


Exposure of Hip Joint Extraction of femoral head



Preparing the acetabulum Acetabulum after preparing



Preparing the femoral stem Inserting the femoral stem

2.8 Post Operative Period

The hip was position in approximately 15 degrees of abduction while the patient is recovering from the anesthetic using a triangular pillow to maintain abduction and prevent extremes of flexion.First post op day, check X rays are taken. The patient is taught static quadriceps exercises, knee and ankle mobilization exercised and made to sit. Second post op day dressing changed and smaller dressing is applied. Gait training was started using a walker with weight bearing to tolerance. Drains were removed 24 to 48 hours after surgery. IV antibiotics were given for 48 hours later switched over to oral antibiotics for further 5 days more. DVT prophylaxis was given in the form of low molecular weight heparin / heparin for first five days after surgery.Twelfth post op day suture were removed and discharged from the hospital to be reviewed after one month. They were advised not to squat, not to sit cross legged, not to use Indian toilets, not to cross the limb across the midline.

2.9 Follow Up

The patients were followed up at 6 weeks, 3 months, 6 months, 1 year and at yearly intervals. Patient follow up was for a minimum of 6 months to a maximum of 24 months (2 years)

2.10 Clinical assessment

During each visit, medical history was taken and physical examination was done. The deformity and ROM were measured with goniometer. The clinical and functional outcomes were evaluated by Modified Harris Hip Score. Questions are grouped into categories: Pain, function, functional activities, deformity and range of motion. Based on a total of 100 points possible, each question is awarded a certain number of points. The interpretations are as follows. Less than 70 is poor, 70- 79 is fair, 80-89 is good and 90-100 is excellent. Radiological assessment [10, 13, 15].

A radiograph was taken at the end of the procedure and during follow up visits. The standard radiograph was an anteroposterior view of pelvis including both hips and sufficient length of femur. The radiological assessment included positioning and alignment of the acetabular and femoral components and complications such as periprosthetic fractures, loosening, osteolysis, dislocation, subsidence and heterotrophic ossification.

2.11 Statistical Analysis

All details were entered in predesigned proforma and entered in to an excel sheet. The data

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thus obtained wasanalyzed using Statistical Package for Social Services (SPSS vs 20). The categorical data was presented as frequencies and percentages. The quantitative data was presented as measures of central tendency and dispersion. Chi square test for categorical variables and Independent Sample T test for quantitative variables was used as tests of significance. A p value of less than 0.05 was considered as statistically significant.

3. Results

Table 1: Demographical distribution of the study groups

Demographic parameter		Ceramic on Ceramic surface N (%)	Other type of implants N (%)	P value
Age (in years)	20-30	1 (3.3)	0	p value=0.732
	31-40	9 (30.0)	8 (26.7)	
	41-50	12 (40.0)	12 (40.0)	
	51-60	4 (13.3)	7 (23.3)	
	>60	4 (13.3)	3 (10.0)	
	Total	30 (100)	30 (100)	
Gender	Male	23 (76.7)	22 (73.3)	p value=0.766
	Female	7 (23.3)	8 (26.7)	
	Total	30 (100)	30 (100)	
Side Affected	Left	15 (50.0)	14 (46.7)	p value=0.796
	Right	15 (50.0)	16 (53.3)	
	Total	30 (100)	30 (100)	
Indication for Surgery	Arthritis Chronic non specific	4 (13.3)	3 (10.0)	p value=0.874
	AS with ankylosed hip joint	2 (6.7)	3 (10.0)	
	AVN	16 (53.3)	14 (46.7)	
	Non union fracture of NOF	8 (26.7)	10 (13.3)	
	Total	30 (100)	30 (100)	

There was no statistical significant association between the two groups with respect to age, sex, side affected and indications for surgery.

Table 2: Distribution of the study group according to stem size, head size, offset, shell size and liner size

Implant Parameter	Size	Ceramic on Ceramic surface N (%)	Other type of implants N (%)	P value
Stem Size	9	4 (13.3)	3 (10.0)	p value=0.716
	10	4 (13.3)	4 (13.3)	
	11	6 (20.0)	7 (23.3)	
	12	3 (10.0)	7 (23.3)	
	13	7 (23.3)	6 (20.0)	
	14	6 (20.0)	3 (10.0)	
	Total	30 (100)	30 (100)	
Head Size	28	18 (60.0)	21 (70.0)	p value=0.63
	32	8 (26.7)	5 (16.7)	
	36	4 (13.3)	4 (13.3)	
	Total	30 (100)	30 (100)	
Offset	Plus 1.5	8 (26.7)	8 (26.7)	p value=0.934
	Plus 3	10 (33.3)	9 (30.0)	

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	Plus 3.5	6 (20.0)	5 (16.7)	
	Plus 5	6 (20.0)	8 (26.7)	
	Total	30 (100)	30 (100)	
Shell Size	50	3 (10.0)	6 (20.0)	p value=0.743
	52	7 (23.3)	8 (26.7)	
	54	7 (23.3)	6 (20.0)	
	56	7 (23.3)	4 (13.3)	
	58	6 (20.0)	6 (20.0)	
	Total	30 (100)	30 (100)	
Liner Size	28	18 (60.0)	21 (70.0)	p value=0.63
	32	8 (26.7)	5 (16.7)	
	36	4 (13.3)	4 (13.3)	
	Total	30 (100)	30 (100)	

The stem size was 13 in 23.3% of the ceramic on ceramic surface patients and 11 and 12 in 23.3% of the patients respectively in other type of implant group. The head size in ceramic on ceramic group was 28 mm in 60% of the cases and 70% of the cases of other type of implant group. Offset was Plus 3 in 33.3% of the ceramic on ceramic surface group and in 30% of the patients with other implant group. The shell size was 52, 54, 56 in 23.3% of the ceramic on ceramic surface group and 52 in 26.7% of the other implant group. The liner size was 28 in 60% of the cases of ceramic on ceramic surface and 70% of the cases of other type of implant group. This difference in above parameters was not statistically significant between the two groups.

Table 3: Distribution of the study group according to Modified Harris Hip score

Modified Harris Hip Score categories		Ceramic on Ceramic surface Mean ± SD	Other type of implants Mean ± SD	T value	P value
Pain	Pre op	12.67±4.5	13.0±4.66	0.282	0.779, NS
	Post op	42.0±3.71	41.2±4.77	0.724	0.472, NS
	P value	<0.0005	<0.0005		
Function gait	Pre op	10.07±8.63	9.93±8.34	0.061	0.952, NS
	Post op	27.2±5.23	26.7±5.04	0.377	0.708, NS
	P value	<0.0005	<0.0005		
Function activity	Pre op	5.3±2.71	5.47±2.6	0.243	0.809, NS
	Post op	12.07±1.44	12.0±1.29	0.189	0.85, NS
	P value	<0.0005	<0.0005		
Abscence of deformity	Pre op	3.47±1.38	3.33±1.51	0.356	0.723, NS
	Post op	4.0±0	4.0±0	0.0	1.0, NS
	P value	0.043	0.023		
Rom score	Pre op	2.3±1.37	2.37±1.27	0.195	0.846, NS
	Post op	4.7±0.48	4.7±0.48	0.0	1.0, NS
	P value	<0.0005	<0.0005		
Total Score	Pre op	33.8±10.19	34.1±9.08	0.12	0.905, NS
	Post op	89.93±5.85	88.57±7.3	0.8	0.427, NS
	P value	<0.0005	<0.0005		

The difference between mean pre operative score and mean post operative was statistically significant in both study groups in various categories such as pain, gait, functional activity, absence of deformity and ROM scores. However, there was no statistically significant difference noted in the scores between the study groups both in preoperative and post operative scores.

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Table 4: Distribution of the study group according to radiological parameters

Radiological Parameter		Ceramic on Ceramic surface N (%)	Other type of implants N (%)	P value
Acetabular angle	< 50	16 (53.3)	19 (63.3)	p value=0.432
	> 50	14 (46.7)	11 (36.7)	
	Total	30 (100)	30 (100)	
Coverage	Average	4 (13.3)	8 (26.7)	p value=0.197
	Good	26 (86.7)	22 (73.3)	
	Total	30 (100)	30 (100)	
Femoral varus deformity	Yes	4 (13.3)	11 (36.7)	p value=0.037
	No	26 (86.7)	19 (63.3)	
	Total	30 (100)	30 (100)	

The acetabular angle was less than 50 in 53.3% of the ceramic on ceramic surface group patients and 63.3% of the other type of implant cases which was not statistically significant between the groups. The coverage was good in 86.7% of the ceramic on ceramic surface group of patients and 73.3% of the other type of implants group of patients which was not statistically significant. However the femoral varus deformity was present in 13.3% of the patients in ceramic on ceramic surface group of patients and 36.7% of the other implant cases which was statistically significant between the two groups.

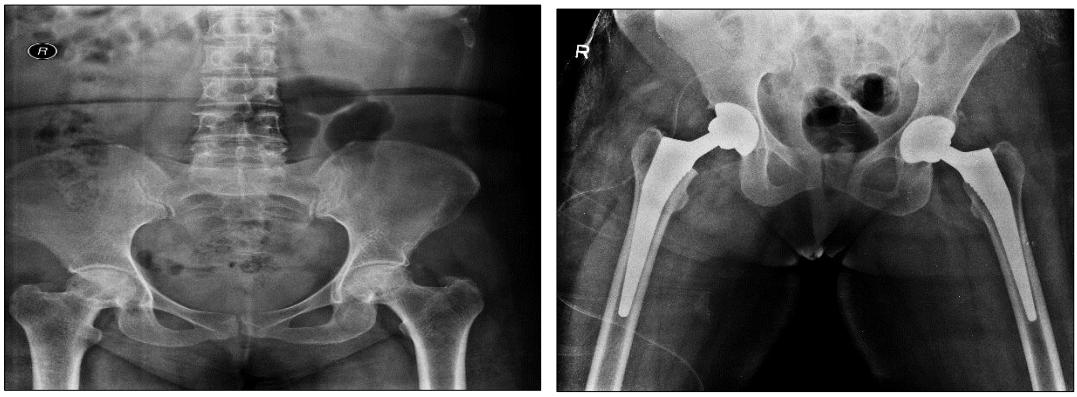
Table 5: Distribution of the study group according to complications

Complications	Ceramic on Ceramic surface N (%)	Other type of implants N (%)
Nerve injury	0	1 (3.3)
Superficial infection	2 (6.7)	2 (6.7)
Anterior thigh pain	1 (3.3)	2 (6.7)
Osteolysis	0	2 (6.7)

Superficial infection was the common complication in both the groups. One patient in ceramic on ceramic surface group had anterior thigh pain (ATP). About 6.7% of the patients in other type of implant group had ATP and osteolysis. One patient had nerve injury in other implants group.

4. Illustration

4.1 Radiographs



Pre OP Post OP

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4.2 Clinical Photos

5. Discussion

A prospective comparative study was conducted in order to achieve the study objectives of comparison between ceramic on ceramic surface implant with other types of THR implants. A total of 30 patients undergoing THA with ceramic on ceramic based surface were included as study sample and same number of patients with other implants was included as controls.

5.1 Age group

Majority of the patients in this study belonged to 41 – 50 years of age. There was no statistical significant association between the age group between the two groups. This ensures the comparability between the two groups. In a study by Mayor *et al*, the mean age of men was 63.2 years and 64.6 years among the women [14]. In a study by Reuven *et al*, the mean age of the patients was 41.8 years ranging from 21 – 56 years [15]. In a study by Agarwala *et al*, the mean age of MOM group was 56.3 years and COC group was 48.4 years which was statistically significant [16]. In a study by Beaupre *et al*, the mean age of patients who completed 10 years of follow up was 53.2 years and lost to follow up was 50.1 years [17]. A study by Wang *et al* have reported that, mean age of the patients undergoing COC athroplasty was 64.5 years [18]. In a similar study by Kurtz *et al*, 38.2% of ceramic on ceramic belonged to 65 – 69 years and 26.5% of the metal on polyethylene belonged to 70 – 74 years [19].

5.2 Sex

About 76.7% of the patients in the ceramic group and 73.3% in the other implant group were males. There was no significant difference between the two groups with respect to sex.In a study by Mayor *et al*, females outnumbered males [14]. Reuven *et al* have observed that, 10 patients were males and 40 were females in contrary to the results of this study [15]. Agarwala *et al* also reported similar findings [16]. In a study by Beaupre *et al*, the males outnumbered females [17]. In a study by Wang *et al*, females outnumbered males in contrary to these study results [18]. In a study by Kurtz *et al*, majority of the patients were males in contrary to these study results [19].

5.3 Indication for arthroplasty

The main indication in ceramic on ceramic surface was Avascular necrosis (53.3%) followed by non union fracture, arthritis – Chronic non specific causes in 13.3% of the cases and AS with ankylosed hip joint in 6.7% of the cases. The indication in other types of implant group was avascular necrosis (46.7%), non union fracture in 13.3% of the cases, arthritis – chronic non specific in 10% of the other implant cases and AS with ankylosed hip joint in 10% of the cases. In a study by Reuven *et al*, osteoarthritis was the main indication in 40% of the cases [15]. A study by Wang *et al* had reported that, the main indication of surgery was Avascular necrosis of the femoral head [18]. In a study by Agarwala *et al*, Osteoarthrtis was the main indication in both MOM and COC groups [16].

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5.4 Side affected

In ceramic on ceramic group, 50% of the patients were operated on left side and in other implants group, 53.3% were operated on right side which was not statistically significant. In a study by Reuven *et al*, 31 cases were affected on right side and 29 were affected on left side [15].

5.5 Stem size

The stem size was 13 in 23.3% of the ceramic on ceramic surface patients and 11 and 12 in 23.3% of the patients respectively in other type of implant group which was also not statistically significant. No studies were available to compare these results.

5.6 Mean head size

The mean head size in ceramic on ceramic group was 34.4 mm and 31.73 mm in other type of implant group which was not statistically significant. In a study by Reuven *et al*, the femoral head was delta 36 mm in 58% of the cases and 28 mm in 42% of the hips [15].

5.7 Offset

The offset was Plus 3 in 33.3% of the ceramic on ceramic surface group and in 30% of the patients with other implant group. There was no statistically significant difference in the offset between the ceramic on ceramic surface group and other implant group. The studies were not available to compare these results.

5.8 Shell Size

The shell size was 52, 54, 56 in 23.3% of the ceramic on ceramic surface group and 52 in 26.7% of the other implant group. None of the studies compared these results.

5.9 Liner size

The liner size was 28 in 60% of the cases of ceramic on ceramic surface and 70% of the cases of other type of implant group which was also not statistically significant. No studies were available compare these results.

5.10 Pain score

The mean pre operative pain score in the ceramic on ceramic group was 12.67 and post operative pain was 42.0 which was statistically significant. The mean pre operative pain score in the other implant group was 13 and post operative pain was 41.2 which was also statistically significant. But these scores were not statistically significant between the two groups before and after operation. In a study by Beaupre *et al*, the mean WOMAC pain scores were not statistically significant between the ceramic and polyethylene groups after 10 years [17].

5.11 Function gait score

Mean pre operative function gait score was 10.07 and post operative function gait score was 27.2 which was statistically significant in the ceramic on ceramic group. The mean pre operative function gait score was 9.93 before and 26.7 after the operation which was statistically significant. The function gait score was also not statistically significant before

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and after operation between the two groups. The studies were not available to compare these results.

5.12 Function score

In ceramic on ceramic surface group, mean function activity score before operation was 5.3 and after operation was 12.07 which was statistically significant before and after the operation. In other type of implant group, the mean function activity score before operation was 5.47 and 12.0 after operation which was also statistically significant before and after operation. In a study by Beaupre *et al*, there was no statistically significant difference in the WOMAC function scores between the ceramic and polyethylene group after 10 years [17].

5.13 Absence of deformity score

In ceramic on ceramic surface, mean absence of deformity score before operation was 3.47 and after the operation was 4 which was statistically significant before and after operation. In Other implant group, the mean absence of deformity score before operation was 3.33 and after operation was 4.0 which was also statistically significant. The studies were not available to compare these results.

5.14 ROM score

In ceramic on ceramic surface group, the mean ROM score before operation was 2.3 and after operation was 4.7 and in other implant group, the mean ROM score before the operation was 2.37 and after the operation was 4.7 which was statistically significant before and after operation. In a study by Agarwala *et al*, the mean MOM score was 248.5 and COC score was 253.9 which was not statistically significant [16].

5.15 Total score

The mean total score before operation was 33.8 and after operation was 89.93 in ceramic on ceramic surface group which was statistically significant before and after operation. The mean total score before the operation was 34.1 and after operation was 88.57 in other implant group which was also statistically significant. In a study by Agarwala *et al*, the mean modified harris hip score (MHHS) was also not statistically significant before and after operation between MOM and COC groups [16].

5.16 Acetabular angle

This study had shown that, the acetabular angle was less than 50 in 53.3% of the ceramic on ceramic surface group patients and 63.3% of the other type of implant cases which was not statistically significant between the groups. The studies were not available to compare these results.

5.17 Coverage

The coverage was good in 86.7% of the ceramic on ceramic surface group of patients and 73.3% of the other type of implants group of patients which was not statistically significant. The studies were not available to compare these results.

5.18 Femoral varus deformity

The femoral varus deformity was present in 13.3% of the patients in ceramic on ceramic surface group of patients and 36.7% of the other implant cases which was statistically significant between the two groups. No studies reported these results.

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5.19 Complications

Superficial infection was the common complication in both the groups. One patient in ceramic on ceramic surface group had anterior thigh pain (ATP). About 6.7% of the patients in other type of implant group had ATP and osteolysis. One patient had nerve injury in other implants group. No studies reported these results.

6. Conclusion

This study was mainly undertaken to compare the efficacy of the ceramic on ceramic surface with the other type of implants. This study had reported that, majority of the patients with COC were between 41 – 50 years, with male predominance and AVN was the main indication for the surgery. In both study groups the pain scores, functional gait score, function activity scores, absence of deformity scores, ROM scores, total scores and acetabular angle were significantly different before and after surgery. But there was no statistically significant difference after surgery between the ceramic on ceramic and other type of implant groups except for femoral varus deformity. But this study is not without limitations. The sample size is not large enough to generalize the study results. But this study was able to bring out many facts about the use of ceramic on ceramic implants. Further research with elegant methodology can bring out many facts about the disease.

6.1 Declarations

6.2 Funding: None

6.3 Conflict of interest: None declared

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