

TITLE

**BIPOLAR ARTHROPLASTY IN NON-INFECTIVE HIP
ARTHRITIS**

**A STUDY DONE AT KING FAISAL HOSPITAL TAIF
SAUDI ARABIA**



**DISSERTATION SUBMITTED TO
UNIVERSITY OF SEYCHELLES
AMERICAN INSTITUTE OF MEDICINE**

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
M.Ch (Orthopaedic Surgery)**

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July 2012

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INTRODUCTION

INTRODUCTION

Hip arthroplasty

Hip arthroplasty is the most commonly performed adult reconstructive hip procedure. An awareness of the history of hip arthroplasty is necessary to appreciate not only its current status but also its future. The use of biological and inorganic materials for hip arthroplasty became popular in the early twentieth century. "Interpositional arthroplasty" gave way to "mould arthroplasty" which was replaced by "cup arthroplasty", which after some modifications by Aufranc became the standard for hip reconstruction until the advent of modern day hip arthroplasty.

Some of the early works were done by Judets, Thompson, Moore, Urist, Ring, McKee - Farrar and most important, Sir John Charnley whose pioneering work on the principles of low-friction-torque arthroplasty and introduction of cold-curing acrylic cement (polymethylmethacrylate, or PMMA) have received wide acceptance.

The Charnley hip arthroplasty results are the benchmarks for evaluating any other types of the hip arthroplasties. The laboratory and clinical contributions of Sir John Charnley have improved the quality of life for many patients.

Not all the patients have the extensive deformities of both the femoral head and acetabulum, for which a dual-assembly total hip prosthesis is required. In some patients, then, it would appear appropriate to make use of system that embraces the low friction principle, but yet does not require removing or distorting the acetabulum, which, in nearly all the instance does not need to be replaced. The combination of these requirements led to the development of "a single assembly" or "endoprosthesis" or "universal prosthesis" "bipolar" type of hip replacement, the credit for which goes to James E. Bateman. Modular hip systems provide not only for selection of various head sizes and neck lengths but now also allow independent sizing of various portions of the stem. This single assembly type of

unit is well tolerated within the body, and clinical progress has been most encouraging. Patients walk early and without pain. A high degree of stability has been maintained **(Harkess, 1998)**.

If the acetabular surface has been relatively spared from the secondary changes of the arthritis and endo-prosthetic hip replacement is indicated; either cemented or cementless bipolar hip arthroplasty is a viable option **(Mehlhoff, 1994)**.

The bipolar arthroplasty as used today has rather specific indications. A younger patient with an avascular head is considered the best candidate. And, the patient with a failed total hip arthroplasty due to loosening of the Acetabular component and bone resorption may have a bipolar prosthesis combined with bone grafting of the acetabulum **(Coventry, 1991)**.

The Hip Joint

The hip joint is the largest ball and socket joint of the human body. The reciprocally curved but non-coextensive and incongruent articular surfaces influence the role that dynamic force systems may play in the generation and progression of disease process in the hip. The process of nutrition of articular cartilage and the mechanism and extent of lubrication of its surfaces is also affected. In the process afflicting the patient with severe pain, deformity, and loss of self-dependency; thus effectively crippling the patient **(Harris, 1974)**.

AIMS AND OBJECTIVE

To study the efficacy of bipolar arthroplasty, as a primary surgical treatment modality in non-infective arthritis of the hip joint.

REVIEW OF LITERATURE

HISTORICAL PERSPECTIVE

Joint Replacement Arthroplasty

Anthropologic documentation of joint disease dates to prehistoric man. Over the millennia, little could be done for the painful joint other than rest and a walking aid. Presumably, oral analgesics and local anti-phlogistics such as heat and cold, tattooing, acupuncture, blistering with canthrides, wet and dry cupping, and cautery were used by the ancients and continue to be used even today. This might be termed as the "**Phase 1**" of treating the painful joint.

Phase 2, bringing us to modern therapy is surgical, specifically joint debridement. Although surgical debridement was done occasionally before the advent of radiography, debridement in effect treats the radiographic joint by removing the loose bodies and spurs. This joint debridement was popularized by Magnuson. It might be termed as the "structural" approach to the degenerative joint. It has fallen into disrepute as it did not address the basic problem that caused the degenerative arthritis. Occasionally joint arthrodesis was also done during this phase, often if and when the debridement procedure failed.

Phase 3 of treatment is based in the physiologic and bio-mechanical aspect. Osteotomy about the hip to increase the weight bearing area and thus, to remove focal overload commenced with work of Pauwels and others.

The next phase in the treatment of the arthritis, **Phase 4**, is joint arthroplasty. Initially was done with fascia lata, chromicized pig bladder, or split thickness skin. This arthroplasties did have a place in an occasional patient.

But not until the pioneers like, Late Sir John Charnley and others developed metallic and plastic materials for joint replacement did the present era of joint arthroplasty begin. And it has flourished since being used in virtually all joints of the body. Replacement of hip became a somewhat standard procedure in the 1960s, with stainless steel, chrome-cobalt, polyethylene, and methyl-methacrylate being used. Knee replacement was developed in 1970s. Subsequently, the elbow, the ankle, the wrist, the finger joints, the shoulder and the joints of foot were replaced with their own particular form of arthroplasty.

Phase 5 in the development of treatment for the arthritic joint is not surgical at all. It addresses the cartilage cell and its ability to differentiate or regenerate from a precursor cell and thus "heal" the arthritic joint. A vast amount of experimental work continues in this area, as well as in the use of cartilage allografts. **(Coventry, 1991)**

No Orthopaedic procedure of this century has captured the imagination of both the medical profession and the lay public as has hip replacement. Not only has it been a tremendous boon to the well-being of patients suffering from hip disease, but it has stimulated the replacement of other joints similarly affected. Hip replacement is the prototype that led the way.

Surgery about the hip became feasible once the operating room environment became less hostile. Deformities of the hip were corrected as early as 19th century. **(Coventry, 1991)**

Timeline of Hip Arthroplasty, (Rang, 2000)

1827 - John Rhea Barton moved a subtrochanteric osteotomy early to create a false joint.

1867 - Louis Ollier studied joint repair after damage.

1885 - Ollier's book on joint resection raises much interest in inter positional arthroplasty

1894 - Jules Pean: prosthetic replacement of tuberculosis shoulder.

Toulouse-Lautrec did a drawing of him operating. Pean went on to design hip and knee replacements.

1902 - John Murphy fat and fascia as an interposition for arthroplasty and goes on to use this for hip, knee, elbow, and jaw.

1903 - Delbert: hip replacement.

1917 - William Baer reports on 100 patients using allograft interposition; in Baltimore.

1921 - Putti uses all kinds of interpositions in Italy. 1923 - Hey Groves replaces ivory ball and stem.

1923 - Marius Smith-Peterson starts developing a mold arthroplasty, first using glass and later Vitallium on the advice of his dentist.

1937 - Methyl methacrylate marketed as Plexiglass.

1938 -Philip Wiles replaces both the femoral head and acetabulum with a metal prosthesis in six patients with juvenile rheumatoid arthritis; 13 years later on patient was walking without pain.

1939 - McKee makes models of a hip prosthesis but war stops him from trying it out, In 1951 he reports on three patients. He continues to improve the design of his metal-on-metal -prosthesis until he retires and the advantages of metal-on -plastic become clearer.

1943 - Austin Moore and Harold Bohlman: femoral head replacement for tumor, the original design has side plates, but later they introduced the idea of an intramedullary stem.

1946 - Robert and Jean Judet develop mushroom shaped head prosthesis. The material is acrylic, which breaks, and the stem - following the axis of the neck - is biomechanically unsound.

1950 - Charnley starts to develop hip replacement but gives up in favour of arthrodesis.

Finds that a failed central dislocation arthrodesis provides painless movement and advocates this for a short time.

1951 - McKee and Farrar describe a metal-on-metal replacement in Norwich.

1952 - F.R.Thompson: femoral head replacement

1953 - Edward Harboush in New York uses dental cement to hold a hip prosthesis and a cup in place.

1954 - John Charnley hears a squeaking Judet prosthesis and hits on the idea low-friction arthroplasty.

1961 - Charnley's report in the Lancet.

1962 - High density polyethylene.

1964 - Peter Ring: metal-on-metal cementless replacement with a screw in the acetabulum. 1968 - Hip Society established under the leadership of Frank Stinchfield

1970 - Ceramic surfaces are introduced by Hulbert. 1973 - Porous coating (Cameron, Mcnab, and Pillar, also Tronzo, Lord, and Hahn.). Food and Drug administration approves use of acrylic cement, opening the way for general use in hip replacements.

In 1823, Barton of Philadelphia performed osteotomies of upper femur. **In 1885, Oilier** published his work on osteotomy in France. **Murphy** of Chicago combined osteotomy with an interposition of soft tissue between the bone ends. **Was this the first hip arthroplasty?** Actually replacing the destroyed joint with an artificial one was long an object of fantasy.

In 1923, Smith-Peterson did first glass mold arthroplasty and later followed it with Cobalt-Chromium-Molybdenum Cup arthroplasty; which was a giant step forward in the concept of hip replacement. **In 1943, Moore and Bohlman** reported a Chrome-Cobalt endoprosthesis. **In 1946, Judets**

used an endoprosthesis - an acrylic femoral head with an attached stem passing through the inter-trochanteric region. Many modifications of the endoprosthesis were made by Mckeever, Valls, Thomson, et al., and others.

In 1948, Philips Wiles attempted an unsuccessful total hip arthroplasty. **In 1951, McKee and Watson-Farrar** performed a stainless-steel total hip replacement, modifying their prosthesis in 1956. **In 1950, Moore** placed his first intra-medullary stainless-steel prosthesis. **In 1971, Charnley** credited Kiaer and Janson with first using methyl-methacrylate. **In 1973 Amstuth** and colleagues began work on their THARIES surface replacement.

In 1974, Bateman, and Gilberty designed a multiple-bearing endoprosthesis with an interposing free riding cup also known as Bipolar or Universal proximal femoral endoprosthesis-basically a combination of the cup arthroplasty and femoral endoprosthesis. The rationale was to lessen the frictional forces between the femoral head and the acetabular cartilage. The femoral could be either secured with cement or press fitted. At present it is also available as a porous-coated stem. The acetabulum unit is lined with polyethylene so that there is no metal to metal contact. The bipolar prosthesis as used today has rather specific indications. A younger patient with arthritis secondary to avascular necrosis of the femoral head is probably the best candidate. And the patient with a failed total hip arthroplasty due to loosening of the acetabular component and bone absorption may have a bipolar prosthesis combined with bone grafting of the acetabulum. A multitude of bipolar designs have appeared;

1. Devas and Hinves, 1983;
2. Gilberty, 1983;
3. Berberane, 1983;
4. Leyshon and Matthews, 1984.

In 1990, Bateman JE described his single assembly total hip prosthesis, as a preliminary report. In which he described the biomechanical principles involved the implant design, operative technique and some early clinical results.

THE HIP JOINT

Relevant Anatomy

In general it can be said that in all joints stability and range of movements are in inverse proportion to each other; the hip joint provides a remarkable example of a high degree of both. It is a synovial joint, which is multi-axial and is of ball and socket (spheroid-cotyloid) variety with center below the middle third of inguinal ligament. Stability is largely due to reciprocally curved but neither co-extensive nor completely congruent articular surfaces and its great range of mobility results from the femur having a neck that is much narrower than the equatorial diameter of the femoral head.

The hip joint does not allow that great a range of motion in the human body, as it does take place at the joint individually, "The strength and stability of the hip joint depends upon factors such as depth of acetabulum, strength and tension in ligaments, length and orientation of the neck of the femur, strength off surrounding muscles, and atmospheric pressure. The capsule of the joint is attached circumferentially around the labrum acetabulae, where it passes laterally like a sleeve, to the neck of femur. In the front it is attached to the inter-trochanteric line but is deficient posteriorly, being attached about 1/2 an inch proximal to the inter-trochanteric crest. (Hanssen, 1991)

Relevant Biomechanics

The hip joint is the pivot upon which the human body is balanced in gait. True bipedalism is limited to the birds and man and the stability of this joint depends upon the bony configuration of the joint, a simple hinge at hip joint would not permit the rotations

needed for gait in birds the center of gravity of the body mass is below that of the hip joints so that the birds act as a pendulum. In birds little force is required to balance the body in stance, the center of gravity in human beings is above the hip joints, thus mechanism must exist to balance the body's mass on the hip where only forces that act are muscular. Constant use of muscles consumes energy, so standing all day is tiring for a human being.

While standing, man tries to shift his weight from one leg to another, to lean back on the ligaments of Bigelow to lock his hips in hyperextension or to lean against something or else when he tries to sit down. Birds do not have this problem and are capable of standing all their lives; in fact, many species cannot fly and rarely sit.

The anatomically varus position of the femoral neck vis-a-vis femoral head allows considerable functional advantage, as they counter-balance the body weight in the frontal plane during one-legged stance. Ideally the abductor muscle should be as far lateral from the hip joint as possible in order to achieve muscle stability in the bipedal stance; however, a compromise must be made because too extreme a lateral placement will limit abduction.

In coronal or sagittal plane, increased leverage results from the anteverted attitude of the femoral neck. The anteversion provides the gluteus maximus with a lever arm and so multiplies the muscle's effectiveness. The longer this lever arm, the less the force gluteus maximus has to exert to maintain us in the upright posture over the hip joint.

Because it is a ball and socket joint, the hip joint allows a wide range of motion, greater than that required for the activities of daily living. Hyper-flexion is the most useful range, for sitting on chairs which are at a lower level than the knees.

The necessity of rotation in bipedal gait involves the required pivoting on the stance phase leg in order to allow for efficient bipedal forward gait. Quadrupeds do not require significant external rotation of the hips in gait as they pivot pelvis by rotating the spine relative to the pelvis (**Chao, 1991**).

MATERIALS AND METHOD

MATERIALS AND METHOD

Study Design

It shall be a retrospective study as well as prospective study of patients operated for non-infective arthritis of the hip joint during a period extending over 7 years from, June 1996 to June 2003.

PATIENTS

Patient selection

Selection of appropriate cases in accordance with the strict inclusion criteria defined for the study, making no compromise what-so-ever, is very important for achieving excellent results in surgery.

A) Inclusion criteria

Patients from third decade of life & onwards and both the sexes, presenting to the Orthopaedic Out Patient Department at KHS hospital, Sewagram with the complaints of, pain in the hip joint at rest or during function, difficulty in bearing weight, limp, deformity of the lower limb, shortening of the lower limb, inability to sit cross legged and/ or squat at any one or both the hip joints were considered.

These patients were then meticulously subjected to thorough physical examination and later evaluated for any radiological evidence of non-infective arthritis of the hip joint. If present, the radiograph showing evidence of avascular necrosis of the femoral head was graded based on the classification proposed by Ficat and Arlet, bony ankylosis, osteoporosis were also noted.

B) Exclusion Criteria

The patients showing radiological evidence of non-infective arthritis of the hip joint in form of avascular necrosis of the femoral head, but with pain awareness at the hip joint responding to analgesics, increasing only on excessive weight bearing with slight

restriction of the activities of daily living, without deformity/ dependency and having a Harris Hip Grading of Excellent (HHS, 90-100) were excluded from the study.

Patients satisfying above criteria were admitted and specifically investigated for the sickle cell disorder. Young patients having bilateral avascular necrosis of the femoral head with deranged hepatic function tests were excluded from the study group.

The Bipolar Prosthesis

The bipolar prosthesis is an intermediate between Austin Moore prosthesis and Total hip. The provision of a completely mobile head element and addition of another head surface for motion in the acetabulum creates a compound system, which provides a greater distribution of weight bearing forces. Thus, minimizing wear and tear changes both on the prosthesis and the acetabulum.

The bipolar arthroplasty was introduced in early 70s by Bateman and Gilbert as a modification of Austin-Moore prosthesis and Thompson prosthesis and as an alternative to the universal prosthesis. Use of bipolar arthroplasty increased as early encouraging reports appeared in the literature.

Design

A multiple bearing principle is affected by creating a double layer of universal motion within the confines of normal hip joint contour. Therefore, providing a low friction layer at metal head-plastic interface or with much less frictional torque that once developed at outer shell-acetabular interface. The addition of weight (walking) shifts the motion to the inner bearing and reduces the damaging effect of metal against acetabular floor. (Vazquez-vela G, 1990).

TALWALKAR TYPE BIPOLAR PROSTHESIS

A three component assembly:

1. Metal cup or outer head (Cobalt-Chrome-Molybdenum alloy), Acetabular Cup: 39 - 51mm size, (odd numbers, the figures indicating the femoral head diameter) are available.

2. Inner Stainless Steel(316L), (Cobalt-Chrome-Molybdenum alloy),

i. Femoral component :-

- a. Head size - 26mm,
- b. Neck-diameter - 19mm,
- c. Neck-length - 35mm,
- d. Neck-shaft angle = 125°,
- e. Shaft length - 157mm,
- f. Shaft thickness - 8mm.

3. High density polyethylene (HDPE) Cup insert lying between the first and second.

The simplest of currently available bipolar prosthesis like Indian version and the Monk prosthesis have an Austin Moor! type stem and the small femoral head cannot be detached from the outer metallic cup-HDPE/ UHMWPE insert complex. Better and modified versions of bipolar prosthesis have a modular system with interchangeable stems e.g., fenestrated, solid, straight, long porous coated, press fit, cement compatible and interchangeable small diameter metallic/ ceramic head which allows adjustment of the neck length. Different sizes of outer metallic cup-UHMWPE insert with press fit locking mechanism over the small head (Biotechnic, France).

Modular version of bipolar prosthesis can be easily converted into total hip replacement in case of any complication occurring on the acetabular side. In the last 20 years generally good clinical results have been reported with the use of arthroplasty with bipolar prosthesis and its current indications have expanded to include:

1. The primary surgical management of non-infective hip joint arthritis secondary to avascular necrosis, rheumatoid arthritis, ankylosing spondylitis, osteoarthritis.
2. In fresh, pathological, iatrogenic, and non-union femoral neck fractures,
3. Dysplastic hips,

4. Acetabular deficiencies, and
5. Failed Total hip arthroplasty.

Bipolar prosthesis confers following advantages over a conventional Austin Moore's prosthesis:

1. Wide range of movements,
2. Intrinsic stability at two bearing interface thus, reducing the chances of dislocation of hip,
3. Decreased incidence of complications like, acetabular erosion, protrusion acetabuli, femoral stems loosening,
4. Increased longevity of the prosthesis.

METHODS

Patients from third decade of life & onwards and both the sexes, presenting to the Orthopaedic Out Patient Department at KHS hospital, Sevagram with the complaints of, pain in the hip joint at rest or during function, difficulty in bearing weight, limp, deformity of the lower limb, shortening of the lower limb, inability to sit cross legged and/ or squat at any one or both the hip joints were considered. These patients were then meticulously subjected to history taking, thorough physical examination and later evaluated for any radiological [X-ray pelvis with both hips - anteroposterior (AP) view and both hips lateral view] evidence of non-infective arthritis of the hip joint. After admission all the patients were fully investigated as per requirement for obtaining surgical fitness. Specific tests for detection of the sickle cell disorder were performed [Sickling test and Hemoglobin electrophoresis, in patients having positive sickling tests].

On History

The detailed history noted chief complaints, past history of duration of complaints, ipsilateral or contralateral involvement of any other joint, constitutional symptoms, symptoms suggestive of tuberculosis, night pain, morning stiffness, remission or exacerbation of the symptoms, chronic progressive back stiffness, trauma, alcoholism, smoking, repeated blood transfusions, symptoms suggestive of sickle cell disorder, chronic drug intake (anti-inflammatory or steroids), etc.

Physical Examination

General examination documented, temperature, pulse, respiratory rate and blood pressure, at the time of admission and subsequently. Observations regarding patient's anxiety, gait pattern, spinal curvature and movements, chest expansion, sacroiliac joint involvement and generalized ligamentous laxity were also made.

Systemic Examination was routinely performed, with emphasis on hepatomegaly, splenomegaly, and masses in both the iliac fossae.

Local Examination was done scrupulously, inspecting and palpating the patient, in standing, sitting and supine positions from front, side and back elaborating on the gait pattern, Trendelenburg's test (to assess the integrity of abductor mechanism of the hip), spinal curvature, soft tissue contours (muscle wasting), pelvic tilt and rotation, bony contours and alignment, shortening, tenderness (direct & indirect), movements at the normal and affected hip [range, deformity (fixed flexion, adduction, internal rotation etc.), restriction, association with pain, tenderness, muscle spasm, and crepitus], supra-trochanteric shortening (Bryant's triangle, Three finger test, Nelaton's line, Schoemaker's line, Chiene's test, & Morris's bitrochanteric test), the limb length deficit, and some special tests were also performed (Vascular sign of Narath, Telescopy).

On admission all the patients were graded as excellent, good, fair, and poor based on the pre-operative Harris Hip assessment Scores assigned to them [HHS - calculated, based on history and physical examinations].

Radiographic Evaluation

All patients were subjected to radiographic examination. This included standard radiographs, antero-posterior view of pelvis with both the hips in identical position and the cross-table lateral views of both the hips.

Other investigations

Hematological / biochemical investigations as required for surgical fitness. Sickling tests, hemoglobin electrophoresis, liver functions tests, serological test for RA factor, an electrocardiograph and X-ray Chest postero-anterior view of all the patients.

Preoperative planning

Good quality radiographs to assess the extent of the arthritis, after a complete examination of the patient are an essential pre-requisite, selection of the size of prosthesis looking at the normal side in unilateral involvement (intraoperative in case of bilateral involvement). Adequate blood was arranged for surgery for any intraoperative transfusion,

if required. The patient was fully explained about the nature of the disease process, its possible etiology, the anesthesia, the planned operation; its need, nature, & benefits, possible pre/ intra/ post-operative blood transfusion, the possible postoperative limitations necessitating a modification in his life style and occupation, and the study involved; in his own language. An informed, valid, explained, documented, signed, and witnessed consent was taken from all the patients undergoing arthroplasty. The patient was shaved from the back down to the knees posteriorly as well as anteriorly including the private parts, after removing all the accessories and kept sedated and fasting from the previous night. Sensitivity testing was done routinely for Xylocaine and penicillin and preoperative prophylactic antibiotics were started (penicillin & gentamicin) 24 hr. before surgery. Patient's clothes were changed and was shifted to OT the next morning.

Arthroplasty

Bipolar arthroplasty was done preferably under the sub-arachnoid block with the radiographs on the view box. Patient was cleaned and draped in the lateral decubitus position with affected hip upwards; the need for adductor tenotomy was assessed preoperatively and was done after doing the arthroplasty under anesthesia in supine position, to increase the range of abduction.

The hip joint was approached using the standard Posterior Moore's approach, extending from the posterior margin of the greater trochanter, obliquely upwards and backwards towards the posterior superior iliac spine; the length of incision varies a little with the retraction required, but it is usually a full-hand's spread and extends inferiorly along the postero-lateral aspect of thigh for 2 to 3 inches (5.1 to 7.6cms). Skin and full thickness subcutaneous tissue dissected up to deep fascia and retracted. The tendinous part of gluteus maximus muscle over the postero-lateral aspect of the greater-trochanter is incised. Loose areolar tissue is cleared from the trochanter and the insertion of the gluteus medius and minimus defined. The sciatic nerve should be defined and pushed medially.

After gauze dissection the external rotator muscles come into view, branches of medial circumflex femoral vessels pass over these muscles and the main branch of the vessel should be looked for at the lower border of the quadratus femoris and ligated. These external rotator muscles are divided fairly closely to the posterior inter-trochanteric ridge. The posterior capsule of the hip is opened about half-an inch from the acetabular margin.

The head of the femur is extracted, using the skid after doing osteotomy of the neck. The acetabular cavity and cartilage is inspected, irrigated, dried and packed using a tape gauge. The neck of femur is vigilantly excised using an electric saw, keeping an adequate amount of calcar just above the lesser trochanter. Preoperative, radiological assessment of the femoral head size is done by comparing from the opposite side (if normal). Intra-operatively the size of excised head of femur, if not grossly deformed, is measured using templates, and trial with the prosthesis is done, if the femoral head is grossly deformed; are the methods used to assess the size of prosthesis required. Excised head of the femur is preserved.

The neck and shaft of proximal femur are then prepared using a rasp with Tommy's bar, making an entry point as laterally as possible on the cut surface of femur, thus maintaining the valgus, and the 15° anteversion of femoral neck with respect to the femoral shaft. After adequate preparation the selected size of pre-sterilized (gamma irradiated) Talwalkar's bipolar orosthesis (marketed by INOR, Mumbai) is taken and press fitted into the prepared medullary canal, ensuring a snugly fit prosthesis in proper-15° of anteversion and without any movement between the shaft & stem.

The tape gauge is then removed, acetabular cavity examined for any foreign body, bleeding, bone pieces, blood clots and prosthesis is reduced carefully and gently applying sustained traction on to the leg gradually extending, abducting, and externally rotating the limb. Movements of the limb at the hip joint are then checked for any loosening at the

head-acetabular interface and shaft-stem interface. After achieving the hemostasis, the wound is closed in layers over a negative suction drain and dressed opening the drain.

Post-operative care

Patient is advised to rest in supine position with both limbs in abduction, keeping a pillow between the limbs and a pillow transversely below the ipsilateral knee joint and not to flex the operated hip/ nor to sit. Patient is kept fasting for four hours, parenteral antibiotics for 10 days & parenteral analgesics for 48 hours are started postoperatively.

The primary operative site is checked 48 to 72 hours after surgery and drain removed, dressing the wound in strict aseptic precautions and the patient is ambulated using standard walking framer with both the lower limbs in abduction. Static quadriceps exercises, ankle and toe mobilization, pelvic lift exercises and bowel-bladder-back care is given.

Anti-osteoporotic regimen is started for an elderly patients Suture removal is done on 10th (alternate) -12th (complete) day and the patient is discharged after complete suture removal and assessing the postoperative HHS, with an advice to follow-up 6 weeks after the surgery or earlier in case of any problem.

Advice on discharge

Change of profession for athletes/ heavy manual workers, to avoid sitting in cross-legged/ squatting position, not to flex the operated hip excessively, quadriceps and pelvic lift exercises, ankle and toe mobilization, and ambulation using a standard walking frame with the limbs in abduction. Antibiotics and ad-lib analgesics were given orally for 10 days after discharge. Patient was asked to follow-up after 6 weeks, 6, 12, 24, and 36 months, or at any time in case of a problem and HHS was assigned at each follow-up visit. Patient may or may not require a revision arthroplasty at a later date depending upon the wear and tear of the prosthesis.

OUTCOMES

EVALUATION OF RESULTS

The evaluation of results was done by using the new method reported by **W.H. Harris, 1969**. The rationale of this new method of evaluation is as described.

Pain and functional capacity are the two basic considerations. They constitute the indications for surgery in the vast majority of patients with hip problems, and hence receive heaviest weightings. In specific cases, correction of deformity or restoration of motion may be of prime importance but such cases are uncommon. Based on this reasoning a point scale with a maximum of 100 points is used with the following maximum possible scores:

Pain	44
Function	47
Range of motion	05
Absence of deformity	04
Total	100

Grading of operated hip by **Harris hip assessment scores**:

<u>Grading</u>	Score
Excellent	90 – 100
Good	80 – 89
Fair	70 – 79
Poor	< 70

The gradations of **Pain (44)** because of its subjective nature are inevitably imperfect but the following gradations have proved workable and satisfactory.

<u>Amount of Pain</u>	<u>Description</u>	<u>Points Allotted</u>
None		44
Slight	Occasional or awareness of pain of low grade; No compromise of activities	40
Mild	No-effect on average activities; Rarely moderate pain on un-usual activities; may take aspirin.	30
Moderate	Tolerable makes concessions to pain, Some limitation of ordinary activities but Able to work regularly; may require analgesic stronger than aspirin, occasionally	20
Marked	Severe pain at times but ambulatory; Serious limitation of activities; Takes analgesics stronger than aspirin frequently.	10
Disabled	Severe pain even/ forces in bed; Crippled by pain, bedridden.	0

Function (47) is broken down into daily activities (14) and gait (33). The following selected functional activities give a satisfactory profile.

<u>Function</u>	<u>Daily Activity</u>	<u>Points Allotted</u>
<u>Stairs</u>		
	Foot over foot without banister use	4
	Foot over foot using banister use,	2
	Stairs in any manner,	1
	Unable to do stairs	0
<u>Transportation</u>		
	Able to enter public transportation	1
<u>Sitting</u>		
	Comfortable in any chair for one hour,	5
	Comfortable in a high chair for one-half hour,	3
	Unable to sit comfortably in any chair,	0
<u>Shoes and Socks</u>		
	Puts on socks and ties shoes with ease,	4
	Puts on socks and ties shoes with difficulty,	2
	Unable to puts on socks or tie shoes.	0

Gait (33) presents a problem in assessment, excluding pain, which is considered separately, gait can be characterized in terms of support, limp, and distance that can be walked.

<u>Description</u>	<u>Points Allotted</u>
<u>Limp:</u>	
None	11
Slight	8
Moderate	5
Severe	0
<u>Support:</u>	
None	11
Single cane for long walks	7
Single cane most of the time	5
One crutch	3
Two canes	2
Two crutches	0
Unable to walk (specify reason)	0
<u>Distance:</u>	
Unlimited	11
Six blocks	8
Two or three blocks	5
Indoors only	0

ANALYSIS

ANALYSIS OF RESULTS

Drinker 1979, compared Bateman hemi-arthroplasties with non-cemented Thompson hemi-arthroplasties and found no difference with respect to operative time; blood requirement; length of hospitalization; rates of infection, dislocation, or mortality; or over-all mortality.

Bowman et al. 1985, in their study concluded that bipolar hip arthroplasty appears to be an attractive alternative to conventional total hip replacement; never-the-less its role in revision arthroplasty, particularly when acetabular bone defects are present, is well established now.

Phillips 1987, in his study of fluoroscopic motion of the bipolar prosthesis, concluded that in 80% of the arthritis group prosthesis functioned as a bipolar hip replacement with movements occurring at the inner-metal-on-polyethylene surface. By contrast in 75% of the fracture group the prosthesis functioned as a unipolar device with movement occurring at the outer-metal-on-cartilage surface. The action of the prosthesis depends upon the condition of the acetabular cartilage.

McConville et al. 1989 reported a retrospective, study representing their experience with bipolar hemi-arthroplasty in 100 consecutive patients with degenerative arthritis of hip joint. 70 of 100 patients were available for follow-up assessment. Mean follow-up interval was 4.3 years (range, 2-23 years). Mean modified Harris hip score was 78.8. Good-to-excellent results were obtained in 75.8% (excellent, 22.9%; good, 52.9%). Revision was required in 6 (8.6%). Sub-group analysis revealed comparable outcome in 50 patients with at least 10 years of follow-up assessment (mean, 5.1 years), indicating no deterioration of results. Anterior thigh pain due to femoral component loosening was the predominant complaint. Use of proportionately sized femoral components and use of bone cement when indicated should decrease the incidence of anterior thigh pain. This

intermediate term follow-up study suggests a role of bipolar hemiarthroplasty in the primary surgical treatment of osteoarthritis.

Bateman et al. 1990, for the first time carried out bipolar arthroplasty, this pioneering study done at the author's institution comprised of 1213 hips. Included in it was a group of 760 osteoarthritic hips on which follow-up study was done for six months, five years, ten years, and fifteen years. Studies of the acetabulum show healthy bone preservation as long as fifteen years after the surgery. A process of floor re-enforcement in certain states has also been identified. The relatively simple operative technique has resulted in very few post-operative complications. Clinical results as long as 15 years post-surgery compared favorably with two-piece replacement techniques.

Cabanela 1990, in a relatively small series of patients reported the results of bipolar prosthesis in avascular necrosis of femoral head as being inferior to those of the total hip arthroplasty. Femoral loosening rates were not reduced by using the bipolar prosthesis.

Mess 1990, carried out cine-roentgenographic motion studies on 14 hips, in which bipolar arthroplasty was done for osteonecrosis of the femoral head. Their study revealed motion at both the inner and outer bearings upto seven years post-operatively. In the unloaded mode inner and outer bearings motions were equal, whereas inner bearing motion increased significantly in the weight bearing position. However, there is still controversy about the ratio of motion between inner and outer bearings and whether this ratio is subject to change after implantation.

Vazquez-vela et al. 1990 performed 400 hemiarthroplasties with the Bateman (or universal) prosthesis from 1974 to 1985, including 286 cases of osteoarthritic (OA) and 114 cases of rheumatoid anffntis (RA). Evaluation was made using the d'Aubgine-Postel method. The follow-up period was from three to 14 years, with an average duration of eight years, five months. The results were excellent in 230 cases (172 OA, 58 RA), good in 140 (98 OA, 42 RA), fair in 8 (4 OA, 4 RA), and poor in 22 (12 OA, 10 RA). Radiolucencies were

observed on the femoral side in 25%. Radiolucency of 2.5 mm was seen in 20 cases (5%). The complications were six cases of the fractures of plastic insert, four cases of protrusion acetabuli, four cases of dislocations, eight cases of loosening of femoral stem, one deep and two superficial infections, 15 cases of thrombophlebitis, one pulmonary embolism and one death. Re-operations were performed in 20 patients (5%). They concluded that universal arthroplasty appears to be safe and reliable procedure.

Takaoka et al. 1992 treated eighty-three hips in 66 patients with non-traumatic avascular necrosis of the femoral head showing evidence of severe collapse or secondary osteoarthritic changes with surgical implantation of bipolar hip prosthesis either with or without cement fixation of the femoral stems. The cases were observed for more than three years (range, 3 to 10 years; average, 5 years to 7 months) and assessed in terms of functional and roentgenographic terms. These results were compared with the results of classic hemiarthroplasties using fixed head prosthesis (Austin-Moore-type with curved or straight stems, done at author's institution). The incidence of proximal migration of bipolar heads was significantly lower when compared with that observed in Austin-Moore type head-fixed group. They concluded that bipolar hip prosthesis is preferred for treatment of advanced avascular necrosis of femoral head, providing that stable initial fixation can be achieved.

Sanjay et al. 1996, reported a retrospective study of 26 un-cemented bipolar hip replacements for avascular replacements of the femoral head due to sickle cell disease, carried out between 1987 and 1992. All patients were treated according to a protocol. Average follow-up was 4.6 years (range, 2.1 to 7 years). After operation the average Harris hip score improved from 36 to 88. Bone culture was positive for bacterial culture in four hips (coagulase negative staphylococcus in three). There was progressive wear of acetabular articular cartilage in 2 cases, but without any clinical or radiological evidence of loosening of femoral stem. Seventeen complications occurred in 9 of the 21 patients (5 in

one patient). A longitudinal split of the femur was the commonest operative complication and occurred in 5 hips. Femoral medullary sclerosis was seen in 8 cases. They concluded that patients with sickle cell disease have a high risk of complications, but this type of hip replacements should be considered in carefully selected patients who have avascular necrosis of the femoral head, that un-cemented bipolar hip replacement is a viable option in carefully selected patients having avascular necrosis of the femoral head, secondary to the sickle cell disease.

Ito et al. 2000, in their study evaluating clinical and radiographic results of bipolar hemi-arthroplasties for the treatment of osteonecrosis of the femoral head. 48 hips in 35 patients with a mean age of 37 years who underwent primary bipolar hemi-arthroplasties were observed for an average of 11.4 years. Osteonecrosis of the femoral head was associated with corticosteroid use (21 patients), alcohol (6 patients), idiopathic (4 patients), and other conditions (4 patients). The average Harris hip score was 46 before surgery and 86 at the time of final follow-up. 21 (42%) hips were radiographic failures, and 12 (25%) were revised. Groin symptoms were present in 20 (42%) hips. Radiographic proximal migration of greater than 4mm and osteoarthritic signs of the acetabulum indicated a high risk of groin symptoms. The results were inferior to those previously reported for total hip arthroplasty. They concluded that for the treatment of osteonecrosis of femoral head, in which necrotic lesions are wide, total hip arthroplasty is a better alternative to the bipolar hemi-arthroplasty.

Chan et al. 2000, studied 28 cases with bilateral avascular necrosis of the femoral head who were treated with cementless bipolar endoprosthesis in one hip and cementless total hip arthroplasty in the other. All the hips selected for bipolar endoprosthesis were classified as having avascular necrosis of the femoral head Ficat Stage III, and those for total hip arthroplasty were classified as having Ficat Stage IV avascular necrosis. They concluded that in young patients with Ficat Stage III osteonecrosis, the use of cementless

bipolar endoprosthesis with a bone ingrowth stem may be considered as an alternative to total hip arthroplasty, which is not the preferred treatment for all patients with osteonecrosis.

Nagai et al. 2002, studied the long term results of bipolar endo-prosthetic replacement in 12 patients (12 hips, 11 out of 12 retained the prosthesis for at least 12 years) 12 to 18 years after surgery. These patients had Ficat stage III non-traumatic osteonecrosis of the femoral head. The original Bateman universal proximal femoral endoprosthesis was inserted without cement as a primary surgical intervention. They concluded that the original Bateman endoprosthesis was effective in delaying the need for total hip replacement for more than 10 years in patients with Ficat stage III nontraumatic osteonecrosis of the femoral head.

Evaluation of results

Grading of operated hip was done by Harris hip assessment scores:

Grading	Score
Excellent	90-100
Good	80-89
Fair	70-79
Poor	<70

Modified Harris hip assessment scores are based on four parameters with respective points allotted to each of them -

44 for pain (as is subjective and cannot be assessed accurately);

47 for function (as can be assessed);

05 for range of movement, and

04 for absence of deformity.

OBSERVATIONS AND RESULT

The present study included 35 hips in 29 patients who underwent bipolar arthroplasty for non-infective hip arthritis using Talwalkar's bipolar prosthesis without using bone cement, in the department of Orthopaedics and Traumatology, Mahatma Gandhi Institute of Medical Sciences, Sevagram. 10 hips out of these 35 hips were retrospective and remaining 25 were prospective cases. The study included the patients operated from June 1996 to June 2003. All the patients were considered for the final result as they were all followed up for a minimum period of six weeks.

AGE INCIDENCE:

The maximum age of the patient included in the study was 60 years and the minimum was 19 years. The mean age was 36.17 years.

Table - I: - Age incidence of patients

Sr. No	Age group (in years)	No. of patients	Percentage
1.	0-20	01	03.45
2.	20-40	16	55.17
3.	40-60	12	41.38
TOTAL		29	100.00

The maximum number of patients, 16 (55.17%) belonged to 20 - 40 years age group.

SEX INCIDENCE:

There were 17 (58.62 %) males and 12 (41.38 %) females in this study group.

Table - II: - Sex Incidence

Sr. No	Males	Percentage	Females	Percentage
1.	17	58.62	12	41.38

LATERALITY OF INVOLVEMENT:

The right hip was involved in 09 (31.03 %) patients and the left hip was involved in 06 (20.69 %) patients. Bilateral hip involvement was seen in 14 (48.27 %) patients.

Table III: - Laterality on involvement

Sr. No	Side involved	No. of patients	Percentage
1.	Right	09	31.03
2.	Left	06	20.69
3.	Bilateral	14	48.27
TOTAL		29	100.00

Although, maximum number of patients, 14 (48.27 %) had bilateral hip involvement. Only 6 out of 14 were operated bilaterally.

PRESENTING SYMPTOMATOLOGY:

In this study painful hip and restriction of movements were the most common presenting complaint. 19 (65.51 %) patients had some kind of deformity.

Table IV: - Presenting Symptomatology

Sr. No	Chief complaint	No. of patients	Percentage
1.	Painful hip	29	100
2.	Restriction of movements	29	100
3.	Deformity	19	65.51

DURATION OF PRESENTING SYMPTOMS:

In our study, 10 (34.48 %) patients presented to the out patient department within 18 months after the onset of the symptoms, 12 (41.38 %) presented within 18-24 months. Another 3 (10,35 %) patients presented after 24-36 months, and 4 (13.79 %) patients presented more than 3 years after the onset of the symptoms.

Table V: - Duration of Presenting symptoms

Sr. No	Duration of onset of symptoms (In months)	No. of patients	Percentage
1.	12-18	10	34.48
2.	18-24	12	41.38
3.	24-36	03	10.35
4.	>36	04	13.79
TOTAL			100.00

**CLINICO-RADIOLOGICAL DIAGNOSIS OF
NON-INFECTIVE HIP ARTHRITIS:**

The commonest diagnosis for which bipolar arthroplasty was done in non-infective arthritis of the hip joint was avascular necrosis of the femoral head in 26 (89.65 %) patients, which was secondary to the following causes in decreasing order of their frequency; idiopathic (34.62%), chronic alcoholism (34.62%), sickle cell disorder (15.38 %), post-traumatic (11.54%), and steroid induced (3.84 %).

Ankylosing spondylitis and rheumatoid arthritis accounted for 01 (3.45%) and 02 (06.90 %) patients respectively.

Table VI: - Clinico-radiological diagnosis of non-infective hip arthritis.

Sr. No	Diagnosis	No. of patients	Percentage
1.	AVNFH (secondary to)	6	89.65
	Idiopathic	09	34.62
	Chronic alcoholism	09	34.62
	Sickle cell disorder	04	15.38
	Post-traumatic	03	11.54
	Steroid induced	01	03.84
2.	RA	02	06.90
3.	AS	01	03.45
TOTAL		29	100.00

SIZE OF TALWALKAR'S BIPOLAR PROSTHESIS USED:

The commonest prosthesis size used was number 45 mm in 13 (37.14 %) hips, largest size used was 49 mm in 8 (22.86 %) hips and the smallest size used was 41 mm one in 6 (17.14 %) hips.

The most common prosthesis sizes used in males was 45 - 49 mm; with the commonest one being 49 mm, in 8 hips and in females was 41 - 45 mm; with the commonest one used being 45 mm, in 7 hips.

Table VII: - Size of Talwalkar's Bipolar prosthesis used.

Sr. No	Size of Talwalkar's Bipolar prosthesis (In mm.)	No. of hips	Percentage
1.	41	06	17.14
2.	43	07	20.00
3.	45	13	37.14
4.	47	01	02.86
5.	49	08	22.86
TOTAL		35	100.00

**MEAN PRE AND POST-OPERATIVE HARRIS HIP SCORES:
(HHS)**

Table V III: - Mean Pre & post-operative Harris Hip Scores.

Mean Preoperative HHS	Mean Postoperative Final HHS	Difference
39.58	83.08	43.50

COMPLICATIONS FOLLOWING BIPOLAR ARTHROPLASTY:

Complications like; longitudinal spilt of the femoral shaft, deep infection, anterior thigh pain, and osteolysis were observed. One patient died due to post-operative bleeding diathesis.

Table IX: - Complications following Bipolar Arthroplasty.

Sr. No	Complications	No. of patients	Percentage
1.	Deep infection	1	2.85
2.	Longitudinal spilt of the femoral shaft	1	2.85
3.	Anterior thigh pain	1	2.85
4.	Hip pain	1	2.85
5.	Death	1	2.85
TOTAL		5	14.25

FOLLOW- UP DURATION:

21 out of 29 patients were available for final follow-up. Two (6.90 %) out of six retrospective patients had a follow up of > 36 months. Amongst the prospective patients, 03 (10.34 %) were followed up for > 24 months, 08 (27.59 %) had a follow-up of > 12 months, 03 (10.34 %) a follow-up of > 6 months, and 05 (17.24 %) had a minimum follow-up of 4 months.

Table X: - Follow-up duration.

Sr. No	Follow-up duration (in months)	No. of patients	Percentage
1.	0 - 6	5	17.24
2.	6- 12	3	10.34
3.	12- 24	8	27.59
4.	24 -36	3	10.34
5.	> 36	2	6,90
6.	Could not be followed-up	8	27.59
TOTAL		29	100.00

6 (20.69 %) patients were lost to follow-up during early postoperative period. The mean follow-up observed in the current study was of 1.77 years (21.29 months). One patient died due to complications and one was in coma due to head injury at the time of final follow-up.

RESULT

The results were analyzed using the Harris Hip Score, which is based on the parameters of pain (44), function (47), range of motion (05), absence of deformity (04). The results were graded as excellent, good, fair, and poor. In our study, 24 hips in 21 patients were available for evaluation at the time of final followup. The result was excellent in eleven hips, good in eight, fair in two and poor in three. Overall, 19 (79.17 %) out of 24 hips showed good to excellent results, and only 5 (20.83 %) hips had fair or poor results.

Table XI: - Results

HHS	GRADE	No. of hips	Percentage
90 - 100	Excellent	11	45.83
80-89	Good	08	33.33
70-79	Fair	02	08.33
< 70	Poor	03	12.50

Note: 1 patient died due to post-operative complication,

1 was in coma due to head injury, and

6 patients could not be followed-up.

DISCUSSION

DISCUSSION

Non-infective arthritis of the hip joint predominantly affects a young to middle aged population. Given this epidemiological perspective arthroplasty is not the first choice treatment but young patients having healthy acetabulum, extensive bone necrosis, severe collapse of femoral head, and joint subluxation, make bipolar replacement surgery; a viable primary treatment modality.

As of today, total hip arthroplasty is an established surgical modality of treatment for severe cases of non-infective arthritis of the hip joint secondary to avascular necrosis of femoral head, rheumatoid arthritis, and ankylosing spondylitis. In our study, we have tried to emphasize that bipolar arthroplasty is also an effective primary surgical modality.

The paramount factor to be kept in mind is patient selection; the patients must learn to cope up with the new joint, understand its limitations and must have pragmatic and restricted expectations from the joint so as to have a functional and problem free hip joint for a long period of time.

The present study group consisted of 29 patients, out of which 17 (58.62 %) were males and 12 (41.38 %) were females. This finding of preponderance of non-infective arthritis in males in our study co-relates with **Ito et al 2000, Nagai et al 2002, and Takaoka et al 1992.**

In our series, the minimum age of patient was 19 years, maximum was 60 years with the average age at the time of surgery being 36.17 years; this mean age incidence co-relates with **Ito et al 2000, and Nagai et al 2002.**

In the present study, we observed that the affected hip joint was right-sided in 9 (31.03 %) patients, left-sided in 6 (20.69 %) and majority, 14 (48.27 %) patients had bilateral involvement. This finding is consistent with **Takaoka et al 1992.**

In the present study, we found that avascular necrosis was the most frequently encountered cause of non-infective hip arthritis and it accounted for 26 (89.66 %) patients. According to Ficat - Arlet classification AVN was Grade III & IV in 25 (71.43 %) & 06 (17.14 %) hips respectively.

Table - I: Comparison of indications for bipolar arthroplasty with studies using similar bipolar prosthesis.

Study		Takaoka et al (1992) (n = 66)	Sanjay et al (1996) n = 26)	Ito et al (2000) (n = 35)	Nagai et al (2002) (n = 21)	Current 2003 (n=29)
In di ca ti on	Avascular Necrosis (AVN)	66 (100 %)	26 (100 %)	35 (100 %)	21 (100 %)	26 (89.65 %)
	Rheumatoid Arthritis (RA)	-	-	-	-	02 (06.90 %)
	Ankylosing Spondylitis (AS)	-	-	-	-	01 (03.45 %)

Idiopathic variety and alcoholism were the two most common etiologies leading to avascular necrosis of femoral head in the current series.

**Table - II: Comparison of etiology of avascular necrosis
in different studies.**

Study	Avascular necrosis of Femoral head (AVN)				
	Chronic alcoholism	Idiopathic	Sickle cell disorder	Post- traumatic	Steroid induced
Takaoka et al (1992)	21 (31.82 %)	07 (10.61)	-	-	38 (57.57 %)
Sanjay et al (1996)	-	-	26 (100 %)	-	-
Ito et al (2000)	06 (17.14 %)	04 (11.43 %)	04 (11.43 %)		21 (60.00 %)
Nagai et al (2002)	09 (42.85 %)	-	-	-	11 (52.38 %)
Current series (n = 26)	09 (34.62 %)	09 (34.62 %)	04 (15.38 %)	03 (11.54 %)	01 (03.84 %)

We in our study used the posterior Moore's approach; with the patient in lateral decubitus position, the affected hip facing upwards and the extremity draped free. This approach was also used by **Mc Conville et al 1989**.

20 (57.15 %) hips required adductor tenotomy to improve the postoperative range of motion. In the present study we found that there was significant pain relief postoperatively, functional range of hip movements was achieved earlier in the patients with unilateral hip joint affection as compared to the patients with bilateral hip involvement and also in those who adhered to strict post-operative rehabilitation program. The average hospital stay was 21.5 days.

In the current study we encountered five complications; early onset deep infection in one patient. The patient of early onset deep infection was managed with regular bed side dressings and intravenous antibiotics in the wards, the patient recovered well. The second complication was that of anterior thigh pain in a young male, which subsided in due course of time as the patient was encouraged to ambulate within the limits of pain. One of the patients had ipsilateral hip pain with a poor HHS, radiogram of the hip revealed proximal femoral osteolysis. The symptoms improved once the patient was started on anti-osteoporotics and advised to ambulate & do abductor/ gluteal strengthening-exercises regularly. One patient died because of uncontrollable early post-operative hemorrhage. This middle-aged chronic alcoholic, had initial mildly deranged hepatic function tests, intra-operatively we encountered an unpredictably narrow proximal femoral medullary canal, the reaming of which consumed time. The blood loss during the surgery was replaced adequately. But, that might have decompensated already compromised hepatic function leading to disseminated intravascular coagulation. Increased amount of blood loss during surgery; correspondingly, increases the transfusion requirements and also the subsequent risk of transfusion reactions, clotting abnormalities and infection **(Dhaon et al 2002)**.

One patient sustained longitudinal split fracture of the femoral shaft, while reaming. The surgery was completed and cerclage wiring was done at the fracture site. The patient was ambulated six weeks after surgery. One patient developed Brooker's Gr. II Heterotopic ossification in the operated hip joint without any symptoms.

There were no prosthetic failures/ loosening, peri-prosthetic fractures or revision surgeries; no dislocations, sciatic nerve palsies, and protrusio. None of our patients had pulmonary embolism or deep vein thrombosis.

In the present study, the results were analyzed using the Harris hip scores (HHS). In our study, 35 hips in 29 patients underwent bipolar arthroplasty for the treatment of non-infective hip arthritis. Six patients could not be followed-up during the early postoperative

period, one was in coma due to head injury, and one died during immediate postoperative period. The remaining 24 hips in 21 patients showed excellent results in 11 (45.33 %) hips, good in 8 (33.33 %), fair in 2 (8.33 %) and poor in 3 (12.50 %). The results when compared with other studies using similar prosthesis, co-related well.

We attribute these satisfactory results to; proper patient selection (good pre-operative muscle power, absence or intra-operative release of soft tissue contractures), early post-operative ambulation coupled with aggressive, active flexion/ abduction exercises within the limits of pain, asking the patients not to squat/ sit cross-legged and a well motivated patient willing to accept the limitations of the new joint.

We could not compare our results with **Takaoka et al. 1992, Vazquez-Vela et al. 1990**, as they had evaluated their results using a dissimilar method (a different scoring system for evaluation of results). In our study, eleven hips could not be evaluated. The mean duration of follow-up in present series was 1.77 years (21.29 months).

In our study, 30 hips in 26 patients underwent bipolar arthroplasty for the late stages of avascular necrosis (AVN) of the femoral head; they had gratifying results. Out of 22 hips in 20 patients that were available for final followup; 17 (77.27 %) hips had good to excellent results.

Table - III: Comparison of results of present series with other studies.

S. No	Author (year) (n = no. of patients)	HIPS	Excellent	Good	Fair	Poor
1.	McConville et al (1989) (n = 100)	70	16 (22.90 %)	37 (52.90 %)	04 (05.70 %)	13 (18.50 %)
2.	Vazquez-vela et al. (1990) (n = 400)	400	230 (57.50 %)	140 (35.00%)	08 (02.00%)	22 (05.50 %)
3.	Ito et al (2000) (n = 48)	48	08 (16.67 %)	22 (45.83 %)	04 (08.33 %)	14 (29.17 %)
4.	Present series (n = 21)	24	11 (45.33 %)	08 (33.33 %)	02 (08.33 %)	03 (12.50 %)

Mean Harris Hip Scores preoperatively and at the final follow-up in the present study were 39.58 and 83.08 respectively, and this is comparable to the experience of **Ito et al 2000, McConville et al 1989, and Sanjay et al 1996**; in their respective studies; using bipolar arthroplasty for non-infective arthritis of hip joint.

Table - IV: Comparison of Mean Harris hip scores (HHS) pre and post-operatively in various studies.

SrNo	Author (year) (n=no. of patients)	No. of hips	Mean Harris Hip Scores		
			Pre - op.	Post - op.	Difference
1.	McConville et al (1989) (n = 100)	70	—	78.80	—
2.	Sanjay et al (1996) (n = 26)	26	36.00	88.00	52.00
3.	Ito et al (2000) (n = 48)	48	46.00	86.00	40.00
4.	Present series (n = 21)	24	39.58	83.08	43.50

SUMMARY

- 35 hips in 29 patients were considered for the present study, which were diagnosed as having non-infective arthritis of the hip joint that resulted in functional impairment, pain and stiffness around the affected hip joint.
- The prosthesis used was, pre-sterilized (gamma irradiated) Talwalkar's bipolar prosthesis (marketed by INOR, Mumbai).
- Patients from the age group 19 - 60 years were studied.
- Bilateral hip involvement was more common than unilateral involvement; which further, was more common on right side.
- The male sex was affected more than the female sex.
- The commonest indication for bipolar arthroplasty was avascular necrosis (AVN) of the femoral head.
- The commonest prosthesis size used was number 45, largest size used was number 49 and the smallest size used was 41 mm one. The most common prosthesis size used in males was 49 mm (range: 45 - 49 mm) and in females, it was 45 mm (range: 41 - 45 mm).
- Patients were discharged on the twelfth post-operative day with advice to avoid consuming alcohol, steroids or other NSAIDs, squatting, sitting cross-legged, and change of profession for heavy manual workers. They were advised to do active abduction and flexion exercises in supine and lateral decubitus positions as early as possible in post-operative period.

- They were asked to follow-up at the intervals of 6 weeks, 6, 12, 24, 36 months from the date of surgery. The mean follow-up in the current study was of 21.29 months. Eight patients could not be followed-up.
- Five patients had post-operative complications. One each had deep infection, hip pain, thigh pain, and longitudinal split fracture of femur. One patient died of post-operative complication of DIG.
- Mean pre-operative and post-operative HHS in the present study was 39.58 and 83.08, respectively.
- Results were graded using the Harris hip scores (HHS). In our analysis, 11 (45.83 %) hips had excellent results, 08 (33.33 %) had good results, results were fair in 2 (8.33 %) and poor in 3 (12.5 %) hips.

CONCLUSIONS

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RECOMMENDATIONS

CONCLUSIONS & RECOMMENDATIONS

- Non-infective arthritis of the hip joint predominantly affects a young to middle aged population. Given this epidemiological perspective arthroplasty is not the first choice treatment but young patients having healthy acetabulum and extensive collapse of femoral head, with joint subluxation, make it a viable primary alternative.
- Bipolar arthroplasty is a simple, reliable, viable and a cost effective procedure as a primary surgical treatment modality in the patients with non-infective arthritis of the hip joint. Hence, bipolar arthroplasty is recommended for such indications, especially in the Indian scenario, where funds for the operative procedure as well as adequate infrastructure for the hospital are, by and large, limited.
- Technical ease (can be done by an average Orthopaedic surgeon without sophisticated instruments or intricacies of the procedure), optional use of bone cement on the femoral side, omission of most of the acetabular complications, no problems of head-socket malalignment or high density poly-ethylene (HDPE) synovitis; makes bipolar arthroplasty an appealing procedure.
- The patient selection criteria must be strictly adhered to.
- After surgery, patients must be advised to avoid squatting, sitting cross-legged, doing heavy manual work in order to increase the longevity of the prosthesis.

- Post-operatively, active exercises must be instituted early to strengthen the extensors and abductors of the hip joint, so as to minimize the chances of prosthesis loosening and dislocation. The patient must adhere to strict rehabilitation program for an excellent outcome.
- The patient must be explained regarding the limitations and longevity of the prosthesis and must have realistic and restricted expectations from the joint so as to have a good, problem free hip joint for a long period of time.

REFERENCES

BIBLIOGRAPHY

1. Bateman JE. The Classic - Single Assembly Total Hip Prosthesis - Preliminary Report. Clin Orthop 1990; 251: 3-6.
2. Bateman JE, Basenji AR, Bayne O, et al. Long-term results of bipolar arthroplasty in osteoarthritis of the hip. Clin Orthop 1990; 251: 54-66.
3. Bowman A, Walker M, Kilfoyle R, et al. Experiences with the bipolar prosthesis in hip arthroplasty - A clinical study. Orthopedics 1985; 8: 460-467.
4. Cabanela ME. Bipolar versus Total hip arthroplasty for avascular necrosis of the femoral head A Comparison. Clin Orthop 1990; 261: 59-62.
5. Chan YS, Shih CH. Bipolar versus Total hip arthroplasty for osteonecrosis in the same patient. Clin Orthop 2000; 379: 169-177.
6. Chao EYS, Kaufman KR, Stauffer RN. Biomechanics. In Joint Replacement Arthroplasty. Edited by Morrey BF. Edition 1st. New York, Edinburgh, London, Melbourne, Tokyo. Churchill Livingstone 1991; 529-548.
7. Coventry MB. Historical perspective of hip arthroplasty. In Joint Replacement Arthroplasty. Edited by Morrey BF. Edition 1st. New York, Edinburgh, London, Melbourne, Tokyo. Churchill Livingstone 1991; 491- 499.
8. Coventry MB. The history of joint replacement arthroplasty. In Joint Replacement Arthroplasty. Edited by Morrey BF. Edition 1st. New York, Edinburgh, London, Melbourne, Tokyo. Churchill Livingstone 1991; 3-5.

9. Dhaon BK, Sharma V, Jaiswal A. Simultaneous bilateral versus unilateral total knee replacement in osteoarthritic knee. *Ind J Orthop.* 2002; 36 (4): 234-237.
10. Drinker H and Murray WR. The Universal proximal femoral endoprosthesis. *J Bone Joint Surg* 1979; 61-A: 1167-1174.
11. Harkess AJ. Arthroplasty of hip. In *Campbell's Operative Orthopaedics*. Edited by Canale. Edition 9th, Vol. 1, Mosby 1998; 267-300.
12. Harris WH. Type Hip: Proceedings of the second open scientific meeting of the Hip Society. *Stylus Mosey* 1974; 3.
13. Harris WH. Traumatic arthritis of hip after dislocation and acetabular fractures. Treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg* 1969; 51-A: 737-755.
14. Hanssen AD. Anatomy and Surgical approaches. In *Joint Replacement Arthroplasty*. Edited by Morrey BF. Edition. 1st. New York, Edinburgh, London, Melbourne, Tokyo. Churchill Livingstone 1991; 501-528.
15. Ito H, Matson T, Kaneda K. Bipolar hemiarthroplasty for osteonecrosis of the femoral head - A 7 to 18 years follow-up. *Clin Orthop* 2000; 374: 201-211.
16. McConville OR, BowmanAJ Jr, Kilofyle RM, et al. Bipolar hemiarthroplasty in degenerative arthritis of the hip. 100 Consecutive cases. *Clin Orthop* 1989; 251: 67-74.
17. Mehlhoff MA. The adult hip. In *Turek's Orthopaedics, Principles and their applications*. Edited by Weinstein SL. And Buckwalter. Edition 5th. J.B.Lippincott and Company. Philadelphia 1994; 543.
18. Mess D, Barmada R. Clinical and motion studies of the Bateman bipolar prosthesis in osteonecrosis of the hip. *Clin Orthop* 1990; 251: 44-47.

19. Nagai I, Takatori Y, Kuruta Y et al. Non self-centering Bateman bipolar endoprosthesis for non traumatic osteonecrosis of the femoral head: a 12- to 18-year follow-up study. J Orthop Sci 2002; 7: 74-78.
20. Phillips TW. The Bateman bipolar femoral head replacement. A fluoroscopic of movement over a four-year period. J Bone Joint Surg 1987 64-B: 761-764.
21. Rang M. Adult Hip. The Story of Orthopaedics. Ed.3.Philadelphia, London, Sydney, Toronto. W.B.Saunders Company. A Harcourt Health Sciences Company 2000; 35-64.
22. Sanjay BKS, Moreau PG. Bipolar hip replacement in sickle cell disease. International Orthopaedics (SICOT) 1996; 20: 222-226.
23. Takaoka K, Nishsina,T, Ohzono K et al. Bipolar prosthetic replacement for the treatment of avascular necrosis of the femoral head. Clin Orthop 1992; 277:121-127.
24. Vazquez-Vela G, Vazquez-Vela E, Dobarganes FG. The Bateman bipolar prosthesis in osteonecrosis and rheumatoid arthritis - A review of 400 cases. Clin Orthop 1990; 251: 82-86.

PROFORMA
'BIPOLAR ARTHROPLASTY IN NON-INFECTIVE HIP ARTHRITIS'
Case No.

Name :
Age :
Sex :
Occupation :
Address :
MRD No. :
OPD No. :
Date of Admission :
Date of Surgery :
Date of Discharge :

Chief Complaints :

Relevant History

Of trauma / steroid intake / sickle cell disease / alcoholism etc.

Significant Complaints

Pain
Tenderness Deformity
Muscle spasm /stiffness
Shortening
Limp
Dependency
Inability to sit cross legged/squat/bear weight
Restriction of movements

General Examination :

General condition :
Pulse :
Blood pressure :
Temperature :

Systemic Examination :

Respiratory System :
Cardiovascular System :
Gastrointestinal System :
Central Nervous System :

Local Examination

A) Inspection

Standing -- Pelvic tilt
Rotational deformity
Lumbar Lordosis

Gait -- Antalgic +/-

Supine -- Pelvic lie Bony contours & alignment
Deformity
Shortening
Active movements

B) Palpation

Bone contours
Soft tissue contours
Tenderness
 direct
 indirect
Deformity

Movements:

Flexion (knee flexed)
Flexion (knee extended)
Extension (knee extended)
Abduction
Adduction
Internal rotation
External rotation

Affected hip

Opposite hip

Measurements:

	Pre-operative affected hip	Pre-operative opposite hip	Post operative affected hip
Apparent length			
True length			
Limb length deficit			

Special Tests

Trendelenburg's test
Narath's test
Telescopy

Investigations:

Roentgenograms No. & Date

Findings

Diagnosis :

Management:

Hematological and biochemical investigations as may be required for surgical fitness.

Surgical procedure: BIPOLAR ARTHROPLASTY

Date	
Anaesthesia	SPINAL
Significant events	
Intraoperative	
Postoperative	
Adductor tenotomy	+ / -

Primary wound:	Seen on
	Condition
	Drain removed on
	Sutures removed on

Post-operative rehabilitation:

- Limb attitude in abduction
- Quadriceps exercises
- Ankle and toe mobilization
- Pelvic lift exercises
- Ambulation using a standard walking frame / stick

Complications:

- Intra-operative
- Early-postoperative
- Late-postoperative

Post-operative evaluation:

- Pain
- Function Deformity Range of motion

FOLLOW UP:

Sr. no.	Date	Check X-Ray	Preoperative score	Discharge score	Post - operative score	GRADING
1.						
2.						
3.						
4.						
5.						
6.						
7.						

Grading of operated hip by Harris hip assessment scores:

Grading	Score
Excellent	90-100
Good	80-89
Fair	70-79
Poor	<70

Harris hip assessment scores are based on four parameters with respective points allotted to each of them: 44 for pain (as is subjective and cannot be assessed accurately); 47 for function (as can be assessed); 04 for absence of deformity, and 05 for range of movement. (Ito, H., et al⁵; McConville, O.R.⁶)

