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Primary total hip arthroplasty in Kashmir, one to five year clinico-radiologic results

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Abstract

A prospective study was conducted to determine the clinical and radiographic results of primary total hip arthroplasty in a series of patients who were followed for 1-5 years in a university hospital in Kashmir. 113 patients underwent total hip arthroplasty. Six patients were lost to follow-up and six died leaving 101 patients for final evaluation. Bilateral hip replacement at a single stage was done in a case of avascular necrosis, whereas two patients underwent staged hip replacement. The average age of the patients at the time of index operation was 63.6 years. The duration of follow-up averaged five years.

Keywords: Total hip arthroplasty, avascular necrosis, Harris hip score

Introduction

Total Hip Arthroplasty has established itself as a routine and extremely successful procedure. It is a reliable operation with a high degree of patient satisfaction and reproducible results. Improvements in the years have focussed on implant fixation, tribology, and bearing surfaces such that indications have now been extended to include younger patients.

One of the primary goals of total hip arthroplasty without cement is to obtain intimate contact between the prosthesis and the host bone to provide both short and long-term stability of the implant. The wide range of sizes and shapes of the proximal part of the femur has made this goal difficult to achieve. Noble *et al* [16] recorded measurements from 200 cadaveric femora and found no constant relationship between the size and the shape of the proximal femoral metaphysis and those of the diaphysis. In order to overcome this, the use of modular implants has become more widespread. Long term outcome studies are now available which prove the durability of both cemented and cementless components [4-6, 1, 4, 14, 17, 20]

Between Jan 2010 to May 2016, 116 hips were done in 113 pts. All of the procedures were done by two surgeons [JAB and NAM]. Six patients who did not report to the follow up examinations for a minimum of 1 year after the operation were considered to be lost to follow-up. A review of office records for these patients did not reveal any evidence of overt or pending clinical or radiographic failure at the latest follow-up examination. Four of these patients were contacted by telephone for an interview, and each reported that the hip was functioning well. Six patients died, two patients died in the post-operative day 2nd due to? pulmonary embolism /myocardial infarction (2nd pt was diabetic and was known case of arrhythmia); rest four died of reasons unrelated to the arthroplasty. A review of the office notes for these patients confirmed that all of them had good function of the hips at the latest clinical examination [these patients were in age groups of 70-90yrs].

The remaining -101 patients (104 hips) had been followed up clinically and radiographically for a minimum of five years and they form the basis of the study.

The average age of the the patients at the time of the index operations was 63.6 yrs [range 22-92yrs]. There were 50 women and 51 male [50.4 percent]. Right side was involved in 50(48.07 percent) and reconstruction on left side was done in 54 (51.9 percent). The average weight of the patients at the time of index arthroplasty was 61.04kgs [range 48-95kgs.]

The underlying diagnosis leading to total hip replacement were
Avascular Necrosis (AVN) 20 hips

Rheumatoid arthritis, three patients with bilateral involvement, one patient had underwent valgus osteotomy for fracture neck of femur in one hip

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Previously	4
Fracture Neck of Femur [NOF]	63
Failed Hemiarthroplasty	2
Failed Canulated Screw Fixation	6
Osteo arthritis	6
Protrusio [Bilateral]	2
Neglected Acetabular fracture	1

Posterolateral approach was done in all cases excepting one, in which Hardinge approach was used.

40 patients {39.6percent} had radiographic evidence of osteoporosis or a type C femur according to the system of Dorr *et al* (7), which was determined by a cortical index of less than 0.4 preoperatively. The femora in the remaining 61patients [60.3percent] were either type A or type B, according to the system of dorr *et al*.

Implants used

Oromed	40
Avatar	16
Signature	14
Stryker	12
Depuy	12 [MDX Cup were used in 2 hips of AVN]
Zimmer	10
Cemented	64
Non cemented	38
Hybrid	2

a cobalt-chromium femoral head was used in all hips; the dia of the head was 26 mm in 20 hips,

28mm	40
32 mm	30
36 mm	14

The Clinical evaluations were performed by two surgeons according to the method described by Harris ^[12] & with the use of Total Hip arthroplasty outcome evaluation form of the academy of orthopaedic surgeons ^[15]. In addition forms concerning the operative procedure, details about the implants, medical history, and intraoperative and postoperative complications were completed and self-administered questionnaire was filled by the patient. All patient evaluations were based on the initial preoperative visit and the most recent postoperative visit [fig] and the most recent postoperative examination with documentation of pain, activity level, ability to perform activities of daily living, use of walking aids, gait, and range of motion of the hip.



Fig 1: Follow-up photograph of a bilateral hip replacement in a young male aged 23 years suffering from AVN

The radiographic analysis was performed by an independent observer, who was blinded with respect to clinical data. Preoperative and post-operative sequential anteroposterior radiographs of the pelvis and anteroposterior and lateral radiographs of the hip were reviewed at each visit. The radiographs were evaluated with respect to the zones around the femoral component described by Gruen *et al* ^[11] and the cortical index, the amount of filling of the distal part of the canal by the stem, the orientation of the femoral component, the stability of the implant, the degree of subsidence and the extent of the bone-implant demarcation were documented. The cortical index is defined as the ratio of the width of the femur measured ten centimetres distal to the lesser trochanter on an anteroposterior radiograph of the hip. The orientation of the component was classified as valgus, slight valgus, neutral, slight varus or varus. Slight varus or slight valgus alignment was used to describe a femoral stem with less than 5 degrees of malalignment with respect to neutral axis of the femoral canal. Varus or valgus alignment was used to describe a femoral stem that was oriented 5 degrees or more beyond neutral.

Periprosthetic osteo lysis was defined as radiographic appearance of a focal area of bone resorption evidenced as a cystic lesion that was not linear and that was at least five millimeters wide. These lesions were classified according to the seven zones around the femoral implant bone interface described by Gruen *et al* and they were identified as areas of either endosteal, intracortical or cancellous destruction of bone.

Clinical Results

Deaths	6
Lost	6

Average followup was 5 yrs (6mths-6yrs) 100 patients were painless 90 patients were walking without support

15 patients were dissatisfied because of limping which was present in 14.8%.

VAS:	88% good/excellent
	90.75 none/mild pain
	80.5 had no restrictive activity
	96.1% had LL discrepancy less than 1cm

preoperative Harris Hip Score 34points [range 10 to 75] average Harris Hip score at recent follow-up--90 points [range 51 to 98 points].

Mobilisation 1st day/4th p o day

The duration of clinical follow-up for the study ranged from 1yr to six years. preoperatively, pain was reported as mild in six hips, moderate in thirty hips and severe in fifty hips and disabling in eight hips. No data was available for 10 hips. The average postoperative score for pain improved to 42.5 points [range 21-45 points].postoperatively, ninety seven hips [93.2%] were slightly or not painful. Seven patients [6.7 percent] had postoperative pain in thigh. Six of the patients rated the pain in the thigh as mild, with no effect on their usual activity level, whereas one patient had moderate pain that affected his activity level.

Preoperatively, two hips were in patients who had no limp, eleven hips were in patients who had a slight limp, and forty three hips were in patients who had a severe limp. No data was available for forty eight hips. Postoperatively, 80 hips were in patients who had no limp, 10 hips were in patients who had a slight limp, 11 hips were in patients who had a moderate limp, and three hips were in patients who had a severe limp. Preoperatively, sixty seven hips were in patients who were bed ridden (these patients had either fracture neck femur or

neglected fracture neck femur or ankylosis of hip), 16 hips were in patients who reported a sedentary or semi sedentary activity level, thirteen hips were in patients who were able to perform light labor, and four were in patients who were able to perform moderate labor. No data on the preoperative activity level were available for four hips. Postoperatively, none of the patients were bed ridden. 13 hips were in patients who were either sedentary or semi sedentary, 60 hips were in patients who were able to perform light labor, 15 hips were in patients who were able to perform moderate labor, and 16 hips were in patients who were able to perform strenuous labor. Preoperatively, 64 [61.5 percent] of the 104 hips needed external support for walking. 4 hips were in patients who needed a walker, 4 hips were in patients who needed two crutches, 11 hips were in patients who used one cane full time, 20 hips were in patients who needed no external support, and the data for 1 hip was incomplete. Postoperatively, 80 hips [76.9%] were in patients who needed no external support for walking, 10 hips were in patients who needed a cane for long walk, 12 hips were in patients who used one cane full-time, 1 patient who needed a walker because of advanced rheumatoid arthritis with involvement of multiple joints. The data was incomplete in one patient.

Postoperatively, the average range of motion of the hip improved in all planes. The average preoperative ROM was 90 degrees of flexion, 19 degrees of abduction, 18 degrees of adduction, 19 degrees of external rotation and 8 degrees of internal rotation. The average postoperative ROM increased to 105 degrees of flexion, 30 degrees of abduction, 25 degrees of adduction, 31 degrees of external rotation and 20 degrees of internal rotation.

The preoperative Harris Hip Score [12] for this study cohort averaged 34 points [range 10 to 75 points]. At the time of the most recent follow-up examination, the average Harris Hip score was 90 points (range 51 to 98 points). Four patients had a postoperative Harris Hip score of less than 59 points. Two of them had Rheumatoid arthritis with multiple joint involvement, and one had lumbar canal stenosis and had residual pain in the lower extremities and functional limitations related to low back pain. The functional deficits in these three patients was not directly attributable to the index arthroplasty.

Radiographic results

Radiograph	Bony ingrowth of cup 98%
	Subsidence in 5 stems
	Average inclination 48.0 degrees (43.56)

The duration of the radiographic follow-up ranged from 1-6 yrs. 98 percent hips demonstrated stable bone ingrowth according to the criteria of Engh *et al* [9]. Two stems were found to have stable fibrous ingrowth radiologically, and one stem had unstable fibrous ingrowth. Non progressive subsidence (three mm or less) of 5 stems was observed. Evidence of radiolucency at the bone component interface was found in 60 hips [57.6%]. The radiolucency primarily involved either one zone of Gruen *et al* [11] 45 hips, 43% or two zones (11 hips, 10.5%). of the 104 hips, four had radiolucency in zone 4 (the tip of the stem), where the stem is fluted, slotted, and polished. 44 stems had no radiolucent areas.

87 of the femoral stems were in neutral position, 7 patients were in slight varus and 10 were in slight valgus position.

Periprosthetic osteolytic lesions were evident radiologically in 10 hips [8 pt]. The lesions were seen in the femur in six hips, in the acetabulum in two hips and in both femur and the

acetabulum in two hips. All femoral osteolytic lesions were localised in the proximal part of the femur [zone 1, proximal lateral] in six hips and zone 7 (proximal-medial) in three hips. In six of 10 hips that had femoral osteolysis, the lesion did not actually occur at the bone-prosthesis interface. Rather, they occurred in the greater trochanter superior to the proximal-lateral aspect. In all 10 hips, the femoral osteolytic lesions were in only one zone of Gruen *et al* [11].

Four hips had acetabular osteolytic lesions: three hips had an isolated lesion, and one hip had two lesions. The femoral head was thirty six in 1 hip, 32 mm in diameter in 2 hips and 28 mm in the fourth.

One patient of B/L acetabular protrusion fell down, as a result of which acetabular component became loose and was revised.

Association between Clinical and Radiographic outcomes and Demographic and technical factors:

Fifteen hips were in pts who were less than forty-five years old at the time of the index procedure. 20 hips were in patients who were between forty five and sixty four years old, 45 hips were in patients who were between sixty five and seventy five years old, and twenty four hips were in patients who were more than 75 yrs old. The average postoperative Harris hip score "for each age group was 90.1, 90.2, 89.5 and 88.4 points respectively.

Complications

no intraoperative fractures	
Pulmonary embolism	two
Superficial infection	one
DVT	2
Sciatic Nerve palsy	1
Causalgia	5
Dislocation	6

Discussion

The primary focus of the present study was to study and observe the results of primary total hip replacement in Kashmiri population which is perhaps first study of its kind to be done in this region, a disturbed area for almost last three decades.

Total hip replacement has become one of the most successful procedures performed today, with predictably excellent and reproducible results. Hozack *et al* [14] used the medical outcomes study short form-36 to show that primary total hip arthroplasty dramatically enhanced the patient's quality of life. Recent advances have focussed on improving fixation of components and wear properties of bearing surfaces in order to guarantee longevity [17]. Long term outcome studies are now available which prove the durability of both cemented and cementless components [1, 4, 14, 17, 20].

Osteolytic lesions were observed in 7 hips (6%) in our series. This finding compares favourably with those in other series of press fit femoral implants. Xenos *et al* [21] reported a rate of osteolysis of 15% in 92 patients (100 hips) who had been followed for a minimum of seven years after a primary total hip arthroplasty with insertion of a femoral stem with a proximal, circumferential porous coating. Engh *et al* [8] in a study of 393 hips, reported a notably higher rate of osteolysis of 41 percent after an average duration of follow-up of seven years in a subset of seventy four hips that had been treated with an extensively porous-coated femoral stem.

Likewise, the rate of osteolysis in the series of D' Antonio *et al* [6] was 43% (ninety-six of 224 hips) at an average of six

years after total hip arthroplasty performed with insertion of a proximally hydroxyapatite-coated femoral stem. Furthermore, D' Antonio *et al*, reported that significantly higher rates of osteolysis were found to be associated with an age of less than fifty years ($p=0.009$), use of a thirty two-milimeter femoral head ($p=0.0008$), and use of a polyethylene liner with a thickness of less than eight millimeters ($p=0.0030$). The prevalence of osteolysis in this series is particularly important, as a sizeable portion of patients were young and 32mm and 36mm femoral head had been used in good no of patients.

The Clinical results of the present series are similar to those of other reported studies of primary total hip arthroplasty [3, 7, 13]. The average HHS in present series was 91 points, with a good or excellent result in 90.3% (94) of 104 hips. The functional results were similar to those of other series with intermediate and long-term follow-up after insertion of a variety of femoral components. Heekin *et al* [13], in a study of the results of 100 consecutive primary hip arthroplasties with use of a PCA (porous-coated Anatomic) stem (Howmedica, East Rutherford, New Jersey), reported an average Harris Hip Score of 92 points after an average duration of follow-up of five years. In a study of 201 pts (224 hips) who were followed for an average of six years after insertion of a proximally hydroxyapatite-coated stem (osteonics Allendale, New Jersey), D' Antonio *et al* [6] reported an average HHS of 95 points. Our results are also comparable with those of Schmalzried and harris [18], who reported an average HHS of 93 points for ninety-seven hips that had been followed for a minimum of five years after fixation of femoral implant with so called third generation cementing technique. Again it is impossible to directly compare functional results of patient cohorts that were not matched; however, the functional results in our series donot appear to be appreciably different from those of series in which a variety of femoral implants were used.

The prevalence of thigh pain in our cohort was 7 percent (12 hips), which is consistent with Cameron's findings [2] and is substantially less than the rate of 14% of 89 pts after use of a fully porous-coated anatomic (PCA) medullary locking prosthesis reported by Engh *et al* [8] and rate of 16% (of 27 hips after seven years of follow-up) to 18% (of 46 hips after six years of followup) reported by Heekin *et al* [13] in a study of a PCA stem. The rate in the present series is comparable with the rate of 2 percent (of 201 pts) reported by D' Antonio *et al* [6] in a study of a proximally hydroxyapatite-coated stem. Rates of dislocation after primary total hip arthroplasty have ranged from 0-9% in series of 48 to 330 hips in recent reports [5, 7, 14, 18]. The rate of dislocation in our series was 5.7 percent (6 hips). All of the dislocations occurred in patients who were operated through posterolateral approach. One patient dislocated 3 times and open reduction was done and posterior capsule and external rotators were repaired robustly.

Engh *et al* [10] (stated that one of the major radiographic sign of a stable implant was absence of migration. According to this criterion, only one hip had radiographic instability in our series. Therefore the overall prevalence of aseptic loosening in our series was 0.6% (one hip) after an average of 4.9 years of follow-up, which is comparable with the rate of 1% (2 of 224 hips) described by D' Antonio *et al* [6] and is notably lower than the rate of 5% (5 of 100 hips) reported by Heekin *et al* [13] in a study of a PCA stem with a similar duration of follow-up

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