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FUNCTIONAL OUTCOME OF SIMULTANEOUS BILATERAL TOTAL HIP ARTHROPLASTY IN TERMS OF ENCOUNTERED COMPLICATIONS

Orthopaedics

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KEYWORDS

INTRODUCTION

Sir John Charnley gave the concept of low friction arthroplasty which revolutionized the concept of total hip arthroplasty[1]. Total hip arthroplasty (THA) is among the most successful surgical operations because it relieves pain and restores hip function and mobility for various end-stage degenerative conditions of the hip joint[2],[3].

Although THA was initially designed for elderly low-demanding patients, the benefit of this procedure in younger populations has also been well documented; thus, long-term results have increasingly improved over the last decades[4],[5],[6]. However, the consequences of bearing surface wear, including osteolysis and aseptic loosening, have been a leading reason of late revision THA, especially in younger and more active patients. Therefore, extended longevity of bearing can meet the increasing demand among younger and more active patients requiring hip replacement; such demand is increasingly becoming an important issue.. Any disease / trauma involving hips primarily affects locomotion, disables the Individual's activity of daily living.

Primary THA is indicated in clinical conditions like Primary Osteoarthritis, Inflammatory Arthritis (without Complications), and Secondary osteoarthritis (Perthes disease, Avascular Necrosis). With the evolution surgical techniques and Instrumentation, the clinical indications for THA has been expanded to include patients who were previously considered not eligible for THA. Such Complex indications include Dysplastic Hips, Ankylosed hips, Neuromuscular Disorders, failed osteosynthesis (Previous bony procedures around hip), skeletal Dysplasia and Severe soft tissue contractures around hip.

The surgical techniques employed to restore the Normal Centre of rotation of the Hip joint in complex cases or unique to each case. The assessment of outcome of surgical procedure is done by Modified Harris Hip Scoring.

This study is a prospective analysis of functional outcome and complication of simultaneous bilateral total hip arthroplasty the study based on Cases operated in Our Institute during the Period July 2020 to June 2022.

Total hip arthroplasty (THA) is evolving continuously and is one of the most successful orthopaedic surgeries around the world. There has been a lot of debate about performing simultaneous bilateral hip arthroplasty with relation to its intra operative and post-operative complications. A bilateral THA is required in around 15-25% of patients. The optimal timing of surgery in patients requiring surgery is controversial. In spite of the considerable number of studies regarding bilateral THA, controversy has prevailed and many surgeons are concerned about major perioperative complications. Bilateral THA as a single staged procedure has been described. But concerns have been expressed about the increased incidence of deep-vein thrombosis heterotopic ossification, a reduced range of movement, a suboptimal gain in walking ability, and the mortality and morbidity in patients with medical problems. If a controlled study comparing patients with bilateral total hip replacements as a single operation and patients with unilateral total hip replacements were to demonstrate little or no increase in morbidity, mortality or the duration of postoperative rehabilitation with the simultaneous procedure, then that operation would seem to be a reasonable choice for patients with bilateral hip disease. Here we conducted this study of simultaneous bilateral procedure to compare and deduce the complications, benefit and functional outcomes of the surgery

MATERIALS AND METHODS

Study Design

A prospective study was done to evaluate the functional outcome and complication of simultaneous bilateral total hip replacement in 30 patients who underwent primary Total Hip replacement and to analyze the results.

Study Group:

The study group consists of 30 Patients who underwent primary Total Hip replacement between Jul 2020 to June 2022 at the new medical college hospital, govt. medical college Kota. The study was done with clearance from Hospital ethical committee.

Those who fulfilled the inclusion criteria given below, were invited to participate in the study. Informed consent was obtained from all the patients willing to take part in the study

Inclusion Criteria:

1) AVN bilateral hip
2) Ankylosed Hip without bony ankylosing.
3) Osteoarthritis bilateral hip

Exclusion Criteria:

1. 4 OR HIGHER GRADING OF AMERICAN SOCIATY OF ANAESTHESIOLOGIST(ASA) GRADING SYSTEM
2. BONY ANKYLOSING
3. SEVERE DEFORMITIES IN BILATERAL HIPS, SIGNIFICANT KNEE AND/OR SPINE INVOLVEMENT.

METHODS:

The recording of data begins on admission of patient and continues for 6 months postoperatively. The protocol for our study is

1) Pre-operative clinical proforma
2) Pre-operative Xray pelvis with both hips- AP and lateral view, special views
3) Operative proforma
4) Complications proforma
5) Postoperative Xrays
6) Monthly follow up for 1,st 3 months, and 6 months.

Surgical Techinques

After approaching the hip joint by Posterio-Lateral approach, the femoral head is dislocated out of the joint socket. Neck osteotomised based on preoperative templating.

Cementless Femoral Component
Reaming done through the Pyriformis fossa of the osteotomised femoral neck until firm cortical reaming is felt. Femoral broaching done sequentially to a point where it is stable axially. Neck cut as determined by pre-operative templating. With trial implants in place, the stability is assessed by Shuck test. Limb length can be altered by varying denominator. Original implants are now inserted.

Cemented Femoral Component
Initially medullary canal is identified by tapered reamer. Serial broaching is done in 15 degrees of anteversion, maintaining the axial alignment. Canal preparation is done. In contrast to the cementless stem, excess reaming is avoided. Cement centralizes when introduced 2cm distal to the proposed stem size. Original implants cemented into medullary canal, with cement mantle thickness of 2 – 2.5 mm proximally and 2mm distally.

Implantation of Acetabular components
Acetabulum is exposed all around 360 degrees by complete excision of the labrum.Abnormal osteophytes all around except the superolateral aspect are removed with osteotomes. Reaming of acetabulum is done with 40 degree abduction angle and 15 degrees anteversion. Serial reaming is done till subchondral bone is exposed. Acetabular component is inserted either using a cement or screws in uncemented cups. The safe zone for screws is the posterosuperior quadrant.

Pre- Operative Evaluation:
A detailed clinical examination and radiological assessment was done to assess the nature of deformity, bone stock, functional impairment and component sizes. Pre-operative templating is routinely done in all cases.Pre-operative clinical evaluation was done using Modified Harris Hip Scoring.

Postoperative Protocol
In all cases, prophylactic intravenous antibiotics started with the night before surgery and 3 doses post-operatively. The postoperative management varies for each case of hips based on the procedure done. Drain removal done at 48hrs and Postoperative Xray Pelvis with both hips- AP is taken. DVT prophylaxis is administered to vulnerable cases. Postoperative rehabilitation is as follows

1) Active and Passive mobilization on first POD
2) UN Cemented THA full weight bearing from day 2 as tolerated by the individual, with or without crutches
3) Rest the limb in abduction and avoid hyperflexion
4) Routine breathing exercises and static quadriceps, gluteal exercises
5) Physiologically Older patients may require walking stick life long
6) Monthly follow up for 1st 3 months, once in 6months.
7) Post operative Harris Hip Scoring to evaluate the Clinical and Functional outcome
8) Complications are categorized into early and late based on duration following total hip arthroplasty.

9) COMPLICATIONS

EARLY	LATE
Nerve injury	Loosening of implants
Vascular injury	Infection
Hematoma	Periprosthetic fractures
Deep vein thrombosis Infection	Heterotopic ossification
Limb length discrepancy	
Dislocation	

OBSERVATIONS AND RESULTS
The following observations were made in our study.

The Mean age of the patients was 40 years ranging from 23 to 56 years? Nearly 27% patients belong to 3rd decade followed by 4th decade (40%). 87% of the patients belong to less than 50 years.

Males dominated our study group with a ratio of 2: 1 All the patient was operated by postero-Lateral approach.

The average surgical time was 120 minutes ranging from 60 minutes to 3 hours. Complications encountered in our study were superficial infection, limb length discrepancy, and DVT. Statistical analysis was done using R programming software. The mean age of patients undergoing bilateral total hip replacement was 40±2.5 (range 23 to 56) (Table 1). The 23-year-old patient had AVN of hip and the 56 year-old had bilateral osteoarthritis of hip joint. Male female ratio was 2:1. There were no significant differences between hemoglobin level and ASA grade postoperative.

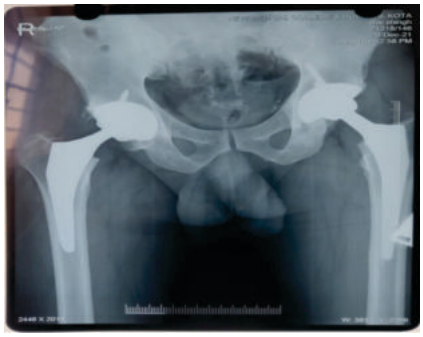
Table 1: Pre, intra and post-operative parameters of study patient

Parameters studied		
	Mean	Standard Deviation
Age of patient (in years)	40	±2.5
Duration of surgical Procedure (in minutes)	120	±5.12
Pre-operative haemoglobin Level(g/dl)	13.83	±0.3
Intra-operative blood loss(in ml)	900	±75
Post-operative blood loss in drain(in ml)	260	±20
Post-operative hemoglobin level(g/dl)	10.83	±0.3
Mean pre-operative MHHS score-Right hip	51.96	±5.33
-Left hip	51.40	±5.33
Mean post-operative MHHS score-Right hip	91.40	±2.47
-Left hip	94.23	±2.47

There was no reported patient with perioperative death, pulmonary embolism, dislocation, periprosthetic fracture or heterotrophic ossification. No patient required reoperation. However, 2 patients, developed deep vein thrombosis, and two patient developed superficial wound infection which healed on oral antibiotics in 2 weeks after suture removal. All the complications occurred while the patients were still admitted in the hospital. There were no patients with pulmonary embolism. The mean duration of hospital stay was 7 days post op. The mean preoperative MHHS score was 51.96±5.33 and 51.40±5.33 of right and left hip respectively. MHHS score improved to 91.40±2.47 and 94.23±2.47 of right and left hip respectively by the last follow-up. There were no significant differences between MHHS score and ASA grade (p=0.76). There was no radiographic evidence of loosening or periprosthetic dislocation in any THA studied. The mean range of flexion was improved from 55º to 110º after operation. Postoperatively, all patients (100%) reported satisfaction with the surgery, increased function and reported either no pain or a small amount of pain but no compromise in activities. All of them (100%) would recommend the surgery procedure to others with similar problems.

Case Illustration

Image 1. Pre Op Xray Of 40yr/m Oa B/l Hip



Post Op Xray

DISCUSSION

The BTHA was first described in the 1970s and was presented as an option for younger, healthier patients, who could bear a larger surgery[7]. When compared with the single procedures at that time, the duration of surgery in the one-stage procedure was not quite doubled, while the blood loss was increased by about one-third and the length of stay by about one week. However, the total length of stay at the hospital was reduced by about one half in comparison with single-admission 2 stage replacements, and the incidence of local and systemic complications was similar across the groups, as were the clinical and radiographic results. This seemed to be favorable at that time, and judicious use of the technique also helped reduce hospital costs associated with 2 admissions, 2 anesthetics, and 2 trips to the operating room for the patient[8][9]. The current study indicated that clinical and radiological outcome of one-stage BTHA is good and comparable to that of unilateral THA. There was a significant difference in the functional outcome of bilateral THA, (as evaluated by the MHHS and range of movement) when compared to those of unilateral THA. The results were in line with the study of Wykman and Olsson[10], who found suboptimal gain in the range of movement and improvement in gait in patients undergoing bilateral THA. Although it has been reported that there is an increased rate of heterotopic ossification in patients, who underwent the one stage procedure[11], in this study, such complication was not found. The outcomes of our results were similar to other studies, including Aghayev et al[12]., Saito et al[13]., and Kim et al[14]. Baker and Bitounis[15], compared the Hardinge´s direct THA, the Dall-modified direct THA[16], and the posterior approach. They concluded that the direct THA might lead to abductors weakening compared to the posterior approach. Dall[16) proposed the modification of the lateral approach. Despite arguments about the pulmonary embolism rate and risk of death[13][17],and significant increase in the risk of major complications associated with the surgery procedure was not indicated. In this study the medium-term results with use of cementless components were comparable to several publications on cemented components used in patients with osteoarthritis[18][19]., The results showed significant improvement of motion in patients after one-stage BTHA.

This was similar to the results of Yoshii et al. They suggested that postoperative improvement of motion in hip flexion was significantly greater in patients treated with simultaneous procedures compared to patients with osteoarthritis treated with 2- stage THA and unilateral THA for bilateral disease[20]. In the current study, there were only 2 patients with DVT, 2 patient with superficial infection, yet, no pulmonary embolism was found in this study. As it is known, DVT and pulmonary embolism were the most common complications of THA procedures in previous evaluations[21][22]. In the literature there was no increase in complications associated with the one-stage BTHA procedure, while there was a report of fewer complications[13]. No death was reported in the studied patients. The risk of death in one-stage BTHA was not significantly higher than two-stage BTHA[12][22]. Our results were in contrast with that of Berend et al., who reported a higher pulmonary embolism rate among 450 patients managed with one stage BTHA, yet, their comparison group composed of patients, who underwent unilateral THA and not two-stage bilateral THA[23]. However, the findings of the current study were similar to that of Saito et al[13]. and Kim et al[24]., which found no increase in complication rates with one-stage BTHA compared to two-stage bilateral THA. Aghayev et al. also reported fewer complications with the one-stage procedure. Various previous reports found an increase in the relative risk of death after one stage BTHA compared to unilateral THA[17], yet others did not. The risk of death after one stage BTHA may not be higher than the cumulative risk of death associated with two-stage bilateral THA. Based on these results, it was indicated that one stage BTHA should be reserved for ASA 1 to 3 osteoarthritis patients with lower complications.

This study found a significant decrease in postoperative hemoglobin levels. Romagnoli et al. also showed that blood loss was greatly and significantly higher in BTHA than unilateral THA group, and postoperative Hb loss was consistent with this observation. According to recent studies, there should be significant increases in homologous blood transfusion rates (in the scale of 20% to 40%) after one-stage BTHA. Preoperative erythropoietin treatment and iron supplementation are the measures, keeping the homologous blood transfusion rate below 20%. Significant decrease in the need for homologous blood transfusion would be achieved by autologous blood transfusion in the immediate postoperative period. Our study confirmed the excellent functional outcomes after one stage BTHA in patients with osteoarthritis, consistent with the data reported by Charnley and Jaffe[25]. Patient satisfaction is an important item, and 100% of the patients said they would be willing to advice this procedure to another people. One-stage BTHA needs to be considered in 2 situations, namely, incapacitating bilateral hip disease with normal hip position and with bilateral abnormalities in hip position. In patients, who have incapacitating bilateral hip disease with normal hip position, one-stage BTHA can optimize the functional outcomes, and decrease the rehabilitation time and the management cost. Similar to our results, according to the study of Schiessel, patients prefer the simultaneous procedure because they undergo the process of operation, mobilization, and rehabilitation only once[26]. In our study we exclude patient of ASA grading 4 or more

The outcomes of bilateral THA are less explored. Hence we reviewed outcomes of bilateral THA in 30 patients (60 hips) with mean age of 40 years, operated by posterolateral approach and found significant improvement in mean pre-operative HHS of 51.96 ± 2.97 and 51.40 ± 2.31 for right and left hip to 91.40 ± 3.32 and 94.23 ± 12.53 respectively after 6 months of bilateral THA suggesting excellent outcome. Goyal et al suggested cemented implants over uncemented implants as cemented implants are cheaper and provide painless and early full weight-bearing compared to uncemented implants . Mäkelä et al compared the survival of cemented and uncemented hip replacement prosthesis in patients older than 55 years and concluded that cemented implants have better survival than uncemented implants. Zimmerman et al concluded no statistically significant differences in clinical or functional outcomes between cemented and uncemented prostheses till 12 months' post-surgery . We used both implants, with uncemented implants in 56 hips and cemented in 4 hips. The results were statistically insignificant on comparison of both the groups. Other complications in our series were leg length discrepancy (LLD) was seen in 2 cases, the incidence of which is acceptable and comparable to other studies. In our study, we tried to reduce the influence of confounding variables by selecting a homogeneous and undiversified cohort of patients who received the similar type of uncemented total hip prosthesis and all were operated on by a single surgeon. The study is limited by shorter follow up and small number of patients. Our results indicated that clinical outcome of one stage BTHA is comparable to that of unilateral THA . We found that there was significant difference in the functional outcome of bilateral THA, [as evaluated by the MHHS and range of movement] when compared to those of unilateral THA. Our results are similar to the report by Wykman and Olsson who found suboptimal gain in the range of movement and improvement in gait in patients undergoing bilateral THA. Although it has been reported that there is an increased rate of heterotopic ossification in patients who underwent one stage procedure, in this survey, we did not reported any such complication. Baker and Bitounis[27], compared the Hardinge´s direct THA, the Dall-modified direct THA [28] and the posterior approach. They concluded that the direct THA may lead to abductors weakening compared to posterior approach. Dall proposed the modification of the lateral approach. Despite of arguments about the pulmonary embolism rate and risk of death , we didn't found any significant increase in the risk of major complications associated with the surgery procedure. We reported neither vein thrombosis nor pulmonary embolism in our study, as they are the most common complications of THA procedures in previous evaluations. In literature there wasn't any increase in complications associated with one-stage BTHA procedure, while there was a report of fewer complication rates . No death was reported in our studied patients. The risk of death in one-stage BTHA isn't significantly higher than two-stage BTHA .Ever since Charnley first implemented one-stage bilateral THA, many studies have been conducted to address the controversial risks and benefits of one-stage bilateral THA about complications and higher transfusion rates. Our results indicated that clinical outcome of one stage bilateral THA is comparable to that of unilateral THA.[29]

We had all three ASA grades of patients in our study, and none of them had any systemic complications intraoperatively and immediate postoperative period. Alfaro-Adrian et al[30] reported a higher incidence of peri- and post-operative complications in patients with significant co-morbidities (ASA grade 3 and grade 4) whether the operation was staged or conducted as a single procedure. The time of surgery for single stage bilateral THA was much less as compared to staged bilateral THA as mentioned by the study of Bhan et al the time was 217 mins. According top Bhan et al the intraoperative blood loss

totally in single stage bilateral THA (1473 ml) was less than staged sequential bilateral THA (1997)[31] Our study results showed a total intraoperative blood loss of 900 ml which is lesser than the Bhan et al study.[32] We transfused one unit of whole blood component regardless of the hematocrit value, whereas further transfusions were decided depending upon the post op hematocrit values. Observations made by Salvati et al and AlfaroAdrian et al showed that the transfusion requirements were less in staged bilateral THA than in simultaneous THA[33] We found that there was significant difference in the functional outcome of bilateral THA, [as evaluated by the MHHS and range of movement] when compared to those of unilateral THA in patients with bilateral hip disease. [34] Our results are similar to the report by Wykman et al who found suboptimal gain in the range of movement and improvement in gait in patients undergoing bilateral THA. There has been evidence of increase in rate of heterotropic ossification in patient who underwent single stage bilateral THA, by study of Ritter and Vaughan, but our study population did not show any such complications.[35] A study by Linda et al showed that there was 5.8% incidence of superficial infection in simultaneous bilateral THR, whereas Houtari et al showed that there was no significant difference between unilateral and bilateral THA in terms of infection.[36,37] In contrast to the current study, some previous studies have demonstrated a higher incidence of thromboembolic events in patients who underwent simultaneous bilateral THA.[38] Recently, Otte et al demonstrated a high complication rate (22%) after simultaneous bilateral THA.18 There was a significant increase in rates of reoperation, pulmonary problems in single stage bilateral THA as shown by two studies, i.e., Berend et al.[39) This study also concluded that the rehabilitation programme for these patients were to be difficult. A study by Glait et al compared the unilateral and single stage bilateral THA and found that risk of thromboembolic events and the duration of hospital stay were higher in simultaneous procedures. Hip diseases have been one of the major treatable cause of productivity loss. The time required for the gain in quality of life is increased in staged bilateral THA than in Single stage bilateral THA. Shorter duration of hospital stays and lesser rehabilitation time is the main advantage to a patient from an upper middle and lower class of family, especially when the patient himself is the only earning person in family.

One major concern for health care is how to reduce productivity loss and other economic consequences attributable to hip disease. Longer sick leave is associated with decreased return to work, and this supports single stage procedure.

CONCLUSION

Despite the absence of a control group and lack of cost evaluations, the results recommend the use of one-stage BTHA through the POSTERIO-LATERAL approach in patients with ASA grade 1 TO 3. After completion our study we have been able to reach the following conclusions:

1. All potential candidates for bilateral simultaneous THR should undergo a detailed anaesthetic assessment pre operatively, as the evidence for the safety of this procedure is largely based on the patient's ASA grade. ASA grades 1 to 3 are the safest for bilateral simultaneous THR.
2. Elderly patients are not by defintion excluded from bilateral simultaneous THR, as age is not per se a contraindication.
3. Higher blood transfusion requirements are expected following bilateral simultaneous THR than staged THR or unilateral THR, because of total cumulative loss in one sitting. We therefore strongly suggest that autologous blood transfusion, whether by pre-operative donation or by intra operative blood salvage, be considered.
4. The risk of DVT or pulmonary embolism is not increased in bilateral simultaneous THR, provided that appropriate prophylactic measures are taken. The risk of dislocation is not increased in bilateral simultaneous THR.
5. The length of hospital stay is shorter after a bilateral simultaneous THR.
6. In carefully selected patients, bilateral simultaneous THR is more cost-effective.
7. There is no difference in blood loss between cemented and uncemented bilateral simultaneous THR.
8. There is not enough evidence to allow safe conclusions on the risk for thromboembolic complications after cemented and uncemented bilateral simultaneous THR.
9. As the findings of our study are mostly based on investigations performed in specialist arthroplasty centres, we recommend that bilateral simultaneous THR be ideally undertaken in tertiary referral hospitals experienced in major hip surgery.

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