

Cementless one-stage bilateral total hip arthroplasty in osteoarthritis patients: functional outcomes and complications

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Abstract

Total hip arthroplasty (THA) is one of the successful and cost-benefit surgical treatments. One-stage bilateral THA (BTHA) has a large number of advantages, although there are concerns about the higher complications in this procedure. Aim of our study was to evaluate the complications and outcomes of cementless one-stage BTHA in osteoarthritis patients. A total of 147 patients from 2009 till 2012, underwent one-stage BTHA in Milad and Erfan hospitals, Tehran, Iran. A prospective analysis of the functional outcomes and complications of one-stage BTHA through Hardinge approach in patients with osteoarthritis was performed. We evaluated all patients clinically and radiologically with serial follow-ups. A clinical hip score based upon the modified Harris Hip Score (MHHS) was performed preoperatively and again postoperatively. During the period of study 89 men (60.5%) and 58 women (39.4%) with a mean age of 54.67 ± 7.08 years at the time of presentation were recruited. The mean surgical time was 2.8 ± 0.25 hrs. The mean hospital stay was 3.83 ± 0.65 days. Hemoglobin level decreased significantly after operation ($P=0.038$). There was two deep venous thromboses, one superficial infection and one temporal pronal palsy but no pulmonary embolism, dislocation, periprosthetic fracture or heterotrophic ossification. The mean preoperative MHHS score was 41.64 ± 5.42 in patients. MHHS score improved to 89.26 ± 4.68 in the last follow-up ($P=0.0001$). Our results recommended the use of cementless one-stage BTHA through Hardinge approach in patients with bilateral hip osteoarthritis.

Introduction

Total hip arthroplasty (THA) is among

successful and cost-beneficial surgical treatments, which has been shown to improve and decrease complications in patients with advanced arthritis.¹⁻³ Osteoarthritis (OA) of the hip joint had an estimated prevalence of 7.7% in the adult population older than 65 years and 4.4% in the population older than 55 years in 2 studies.⁴ Total Hip Arthroplasty is considered as one of the most effective and definitive treatments for OA⁵ and many other hip joint pathologies, such as rheumatoid arthritis, ankylosing spondylitis, and osteonecrosis.⁴ Approximately 20% of all patients with THA undergo surgery of the contralateral hip at some point.⁶ In the USA and Europe, numerous physicians suggest that bilateral THA (BTHA) should be performed simultaneously.^{6,7} One-stage BTHA offers the benefits of one-session anesthetic risks, a shorter recovery period, which is important to younger patients, and diminished costs.^{8,9} However, there are concerns about the safety of the procedure, since higher complications have been reported.¹⁰ Other studies have indicated that one-stage BTHA is effective in pain alleviation and restoration of the function of patients affected by bilateral hip arthritis without any significant increase in risks for patients.^{7,9,11-14}

Many approaches have been described for total hip arthroplasties, yet, there should be an attempt for safer and improved THA surgery procedures.¹⁵ Despite the successes of THA reported over multiple decades, there is a constant push to refine the technique to allow improvement in patient outcome and complication rate, and increase efficiency in surgical throughput.¹⁶ While some studies have found statistical associations between approach and outcome, most consider the individual surgeon's comfort and proficiency with a single approach as most important.¹⁷ In 1982 Hardinge described the direct lateral approach,¹⁵ which is also referred to as lateral, Hardinge's or trans-gluteal approach. The Hardinge approach is a modified version of Bauer's approach¹⁸ that can enable an easy insertion of the components of hip prosthesis with an excellent acetabular cavity and femoral proximal end exposure. Additionally, posterior hip structures are preserved, thus turning postoperative prosthesis dislocation is difficult.¹⁹

There are currently very few orthopedic centers worldwide that routinely perform one stage BTHA, and published literature regarding the outcome of one stage BTHA is rare.²⁰ The aim of this study was to evaluate the morbidities and outcomes of one-stage BTHA for patients with osteoarthritis.

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Materials and Methods

Patients

A total of 169 patients from March 2009 to August 2012 underwent one-stage BTHA at Milad and Erfan hospitals of Tehran, Iran. A prospective analysis of the functional outcomes and complications of one-stage BTHA through Hardinge approach in patients with osteoarthritis was performed. Other inclusion criteria included significant bilateral flexion contracture, and patient willingness to have both hips replaced during one procedure. Plain radiography was obtained for each patient preoperatively (Figure 1). Twenty-two patients were excluded due to exclusion and inclusion criteria; 15 patients because of no follow up accessibility, 5 patients for not providing consent for the one-stage procedure, and 2 patients due to drop-out during follow-up.

The study population consisted of 147 patients including 89 males (60.5%) and 58 females (39.4%) with a mean age of 54.67 ± 7.08 years (range 45 to 60 years) at the time of presentation, with bilateral primary or secondary osteoarthritis of the hip. Patients in American Society of Anesthesiologists (ASA) categories 1 and 2 were included in the study. Overall, 114 patients (77.5%) were recognized with grade 2 ASA and 33 patients (22.4%) with grade 1 ASA. Medical contraindications for

surgery were assessed according to ordinary local routines. Patients with history of hip fusion and grade 3 and 4 ASA or greater were excluded from the study.

Surgical procedures and prosthesis

The standard direct lateral Hardinge approach was used for all of the patients. One surgical team and the same head surgeon (senior author of the article) performed the hip replacements (Figure 2). General anesthesia was used for 98 patients (66.6%), spinal anesthesia for 38 patients (25.8%), and epidural anesthesia for 11 patients (7.4%). Pelvic radiograph was obtained at the end of each procedure. Preoperative prophylaxis against infection was administered to all patients (cefazolin 1 g, intravenously, before the surgery followed by 1 g 3 times daily during the first day). Subcutaneous low molecular weight heparin (40 mg once daily) starting on the day of surgery was given to all patients for 14 days in addition to antiembolism stockings, as prophylaxis against deep vein thrombosis (DVT). Early mobilization was used both to prevent DVT and to facilitate functional recovery. Full weight bearing was allowed from the day after surgery with walker onwards in all cases. They used a walker for the first 3 weeks and physiotherapy was performed as part of outpatient care during the first week. In all patients cementless acetabular cup and stems were used.

Follow-up

All patients were evaluated clinically and radiologically with serial follow-ups to examine the complications. The following

data were monitored for all patients: hospital stay length, operative time, preoperative and postoperative hemoglobin levels, vital status, and complications (such as pulmonary embolism, surgical site infection, dislocation, and revision), and other intra-operative and postoperative complications. Data were recorded in detail, including estimated blood loss, duration of the procedure, and other information. Recording and analysis of perioperative medical and surgical complications were performed. Complications were evaluated during follow up and hospital stay, and patients were followed closely for a period of 3.89 ± 0.31 years.

Complications local to each joint including fracture, dislocation, superficial wound infection, deep wound infection around the prosthesis, and incidence of heterotopic ossification. Systemic complications including cardiac, gastrointestinal complications, cerebrovascular accidents, phlebitis/pulmonary embolism, and urinary tract infection were also noted. Other complications and the details of any revision procedure were also recorded. Patient assessment was undertaken preoperatively and postoperatively using a clinical hip score, based upon the modified Harris Hip Score (MHHS).²¹ A group of independent examiners (not the operating surgeon) conducted the clinical and functional assessment for this study. Patients were asked whether they would choose the same surgical procedure and if they would recommend it to others. Patients' satisfaction evaluation was used as a factor to distinguish the procedure from others.

Statistical analysis

Descriptive statistical analyses were used to present mean and standard deviation of quantitative variables. Paired sample *t* test, independent *t* test, and Chi Square test were used with 95% confidence limits. For all analyses, the SPSS software was used (SPSS 21.0 for Windows; SPSS Inc. Chicago, IL, USA). P value less than 0.05 were considered significant.

Ethics

All ethical issues for patient's information and procedures were considered, based on ethical committee of Tehran branch of Azad University and ethical statements. Informed consent was obtained from each individual prior to surgery, and patients were fully informed of the potential benefits and complications.

Results

Demographic data

The mean surgical time was 2.8 ± 0.25 hours (range 1.5 to 3 hours). The mean hospital stay was 3.83 ± 0.65 days (ranged from 2.5 to 4 days). Hemoglobin level decreased significantly after the operation, the preoperative values of 14.8 ± 3.1 mg/dL decreased to postoperative values of 12.4 ± 2.2 mg/dL ($P=0.038$). There was no significant correlation between hemoglobin level and ASA grade ($P=0.052$).

Postoperative complications

There was no patient with perioperative death, pulmonary embolism, dislocation,

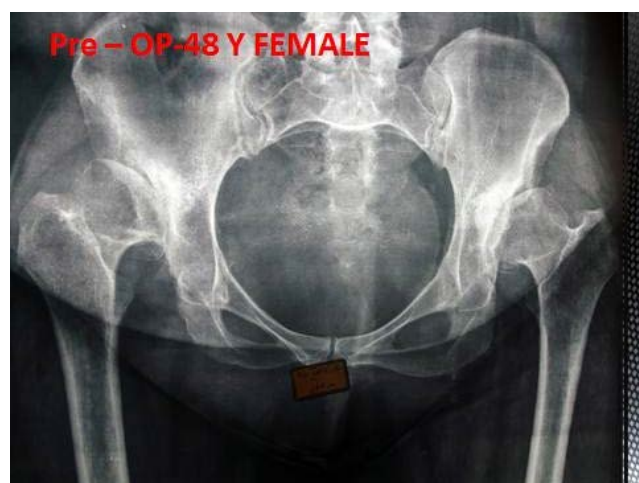


Figure 1. Plain radiography; one of the bilateral osteoarthritis hip cases.



Figure 2. Postoperative plain radiography of the bilateral total hip replacement case with cementless prostheses.

periprosthetic fracture or heterotrophic ossification. No patient required reoperation. There were 2 patients with DVT, who received suitable treatment and recovered then after. There was only one patient with superficial infection. Also, one patient developed unilateral, temporary peroneal nerve palsy, which resolved after 3 months.

Clinical and radiographic follow-up

The mean preoperative MHHS score was 41.64 ± 5.42 in patients (ranged 35 to 57). The MHHS score improved to 89.26 ± 4.68 (ranged 85 to 95) in the last follow-up ($P=0.0001$). There was no significant correlation between MHHS score and ASA grade ($P=0.48$). There was no radiographic evidence of loosening or periprosthetic dislocation in any THA studied. The mean range of flexion significantly improved from 45° (range, 35° to 75°) to 110° (range, 90° to 119°) after the operation ($P=0.002$). Postoperatively, all patients (100%) reported satisfaction with the surgery, showed increased function, and reported either no pain or a small amount of pain; there was no compromise in activities and all of them (100%) said they would recommend the surgery procedure to others with similar problems.

Discussion

The BTHA was described in the 1970s and was presented as an option for younger, healthier patients, who could bear a larger surgery.²² 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.^{23,24}

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,²⁵ 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,²⁶ in this study, such complication was not found. The outcomes of our results were similar to other studies, including Aghayev *et al.*,²⁷ Saito *et al.*,²⁸ and Kim *et al.*²⁰ Baker and Bitounis,²⁹ compared the Hardinge's direct THA, the Dall-modified direct THA,³⁰ and the posterior approach. They concluded that the direct THA might lead to abductors weakening compared to the posterior approach. Dall³⁰ proposed the modification of the lateral approach. This study found one-stage BTHA through Hardinge approach as a valid alternative to 2-stage BTHA, since safety profiles of the patients were good. Despite arguments about the pulmonary embolism rate and risk of death,^{10,20,28,31} a 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.^{32,33}

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.³⁴

In the current study, there were only 2 patients with DVT, 1 patient with superficial infection, and 1 patient with temporary peroneal nerve palsy, 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,^{35,36} In the literature there was no increase in complications associated with the one-stage BTHA procedure,²⁰ while there was a report of fewer complications.²⁸ No death was reported in the studied patients. The risk of death in one-stage BTHA was not significantly higher than two-stage BTHA.^{27,36} 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.¹⁰ However, the findings of the current study were similar to that of Saito *et al.*²⁸ and Kim *et al.*,²⁰ which found no increase in complication rates with one-stage BTHA com-

pared to two-stage bilateral THA. Aghayev *et al.* also reported fewer complications with the one-stage procedure.²⁷ Various previous reports found an increase in the relative risk of death after one stage BTHA compared to unilateral THA,³⁵⁻³⁷ yet others did not.²⁰ The risk of death after one stage BTHA may not be higher than the cumulative risk of death associated with two-stage bilateral THA.²⁷ Based on these results, it was indicated that one stage BTHA should be reserved for ASA 1 and 2 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.⁴ 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.^{35,37} 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.³⁸

Our study confirmed the excellent functional outcomes after one stage BTHA in patients with osteoarthritis, consistent with the data reported by Charnley and Jaffe.³⁹ 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,²⁵ and decrease the rehabilitation time³⁹ and the management cost.⁸ 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.⁴⁰

Conclusions

Despite the absence of a control group and lack of cost evaluations, the results recommend the use of one-stage BTHA through the Hardinge approach in osteoarthritis patients with ASA grade 1 and 2. The one-stage BTHA through the Hardinge approach can be a good alternative to two-stage BTHA in patients with

ASA stages 1 or 2 with lower complications. The main morbidity was DVT.

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