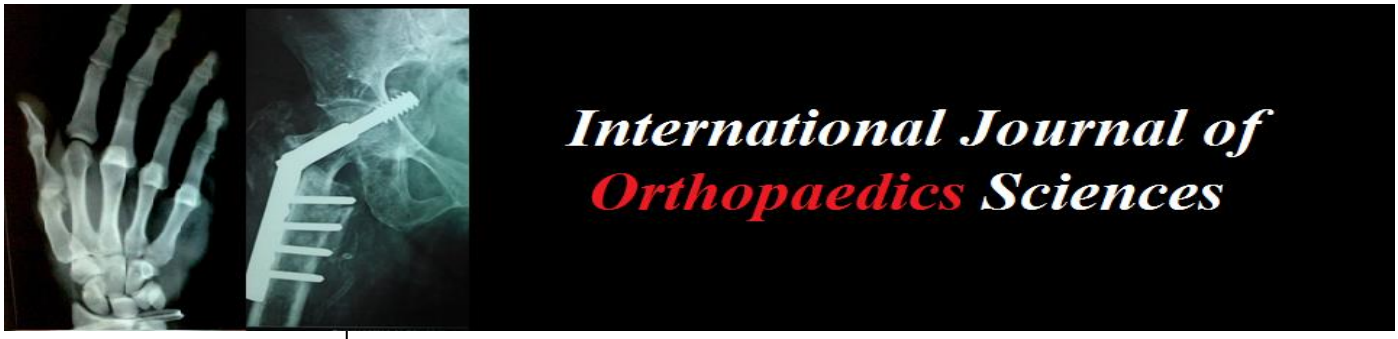

ISSN: 2395-1958
IJOS 2018; 4(2): 935-938

www.orthopaper.com
Received: 12-02-2018
Accepted: 13-03-2018

Dr. Faisal Masood
Associate Professor, FCPS Orthopaedics, Department of Orthopaedic Surgery and Traumatology, Unit-I King Edward Medical University/ Mayo Hospital, Lahore, Pakistan

Dr. Ranjit Kumar Sah
Resident, MS Orthopaedic Department of Orthopaedic Surgery and Traumatology, Unit-II King Edward Medical University/Mayo Hospital, Lahore, Pakistan

Dr. Ahmad Humayun Sarfraz
Senior Registrar, MS Orthopaedics, Department of Orthopaedic Surgery and Traumatology, Unit-II King Edward Medical University/ Mayo Hospital, Lahore, Pakistan

Correspondence
Dr. Ahmad Humayun Sarfraz
Senior Registrar, MS Orthopaedics, Department of Orthopaedic Surgery and Traumatology, Unit-II King Edward Medical University/ Mayo Hospital, Lahore, Pakistan

Comparative study of simultaneous and staged bilateral non-cemented total hip replacement in young active adults in terms of cost effectiveness and improvements in Harris hip score

Dr. Faisal Masood, Dr. Ranjit Kumar Sah and Dr. Ahmad Humayun Sarfraz

DOI: https://doi.org/10.22271/ortho.2018.v4.i2n.132

Abstract
Objective: To compare the outcome of simultaneous versus two staged Non-cemented Total hip Arthroplasty (THA) in terms of cost effectiveness and improvement in Harris Hip Score (HHS)
Material and methodology: This comparative prospective study was conducted from 2008 to 2012. Total 100 patients with 200 hips fulfilling the inclusion and exclusion criteria was included in this study. Non-cemented THA was performed in all these patients. Fifty patients each were placed in group A and B who were managed with simultaneous bilateral THA and staged bilateral non-cemented THA respectively. Patients in both the groups were matched. Duration of surgery, preoperative and postoperative HHS, duration of stay in hospital, time to return to work and complications were the main variables that were evaluated.
Results: The mean preoperative and postoperative HHS in group A was 53.08±8.178 (36-69) and 92.62±2.26 (90-97) respectively with p-value <0.0001. Similarly mean preoperative and postoperative HHS in group B was 57.04±5.08 (45-68) and 91.58±2.43 (87-96) respectively with p-value <0.0001. Mean hospital stay in group A was 6.48±0.84 days (5-9 days) while that in group B was 14.2±1.84 days (11-18 days) and this difference was statistically significant. Though the duration to return to work in both the group was not significantly (6.32±0.82 versus 6.54±0.97 months, P-value >0.05) different but that interval of 3 months between the bilateral THA placed extra time loss from work in group B patient adding to extra financial burden to these patients.
Conclusion: It can be concluded that simultaneous bilateral THA is cost effective with same level of functional outcome when compared to staged bilateral THA. However, the long-term outcome, the effect of the simultaneous and staged procedure on psychological condition of the patient and family needs further study.

Keywords: Staged THA, simultaneous THA, cost, Harris hip score

Introduction
Osteoarthritis of the hip presents as bilateral disease in 42% of patients [1]. A substantial proportion of patients undergoing unilateral total hip arthroplasty require a contralateral treatment thereafter [2, 3].
Simultaneous have its own advantages over the staged THA and vice-versa. Concerns with simultaneous bilateral THA are the increased incidence of deep-vein thrombosis [4], heterotopic ossification [5], a reduced range of movement [5], a suboptimal gain in walking ability [6], and the mortality and morbidity in patients with medical problems [7]. Improvements in anesthetic and surgical techniques and postoperative care have resulted in improved outcomes in 1-stage bilateral THA. One-stage bilateral THA offers benefits that include faster recovery, easier rehabilitation, shorter hospital stay, lower procedure cost, and 1-session anesthetic risk [8, 9].
There has been an ongoing discussion regarding benefits and disadvantages of one-stage versus two-stage procedures. A number of articles report advantages of simultaneous operations, or at least similar results of one-stage versus two-stage procedures [10-14].

The objective of this study was to compare the clinical outcome and cost effectiveness of simultaneous bilateral THA with staged bilateral THA in young active adults presenting to our center.

Material and Methods

This prospective comparative study was conducted in Department of orthopaedic surgery and traumatology, unit-I of Mayo hospital from June 2008 to June 2012. Total of 100 patients (200 hips) with bilateral primary or secondary osteoarthritis with age less than 50 from either gender were included in this study after receiving approval from institutional review board. The American Society of Anesthesiologists of the entire patient were less than III and were divided into two groups after approval from the institutional review board. Informed consent were taken from everyone. Patient in the group A was managed with simultaneous bilateral non-cemented THA while the patient in group B were managed with staged bilateral non-cemented THA with an average interval of 3 months between the procedure. All the patients were operated by same surgical team via lateral Harding approach with same preoperative, intraoperative and post-operative antibiotics protocol. All these patients were age, sex, ASA, body mass index (BMI) and types of prosthesis matched. Those patients with active infection locally or systemically and ASA more than or equal to III were not included in this study. All the patient were admitted one day prior to surgery and were discharged once there was no pain at wound site with no sign of surgical site infection. The dose and duration of intravenous antibiotics were same in both the patients group. However, the dose and duration of painkiller was adjusted according to the patient requirement.

Low molecular weight heparin was give subcutaneously once daily and was discontinued after the mobilization of the patient.

The patients in both the groups were offered the same rehabilitation protocol as follow: A pillow was placed between the patient's legs until they are awake in the recovery room. A knee brace was used for the first 24 hours and ambulation with assistance begun the next day. For the first 6 weeks, patients begun with crutch walking, progressing to full weight bearing as tolerated. Patients generally were released from physiotherapy and the use of a cane at 3 months was allowed to progress to full activity.

The information on follow-up was gathered on a predesigned proforma.

Duration of surgery per joint, preoperative and postoperative HHS, duration of stay in hospital, duration to return to work and complications were the main variables that were evaluated.

Surgical Procedure

The patient was placed in the full lateral position on the operating table. A straight lateral skin incision was made midway between the anterior and posterior border of the greater trochanter centering on the tip of the trochanter. The fat and fascia lata are incised in line with the skin incision and retracted with a self-retaining retractor. At the proximal part of the fascia lata, gluteus maxius insertion to the fascia lata is encountered, which is split in line with the fascia lata. The trochanteric bursa was incised to demonstrate the anterior and posterior borders of the gluteus medius and the vastus lateralis. Blunt dissection was used to split the anterior third of the gluteus medius. The split was not extended more than 3 cm cephalad to the insertion of the trochanter to protect the inferior branch of the superior gluteal nerve.

Next, distal blunt dissection was carried out through the anterior part of the vastus lateralis passing down to the bone for about 3 cm. The ascending branch of the medial circumflex artery and the transverse branch of the lateral circumflex artery in the vastus lateralis are encountered and can be easily cauterized. The now split portion of gluteus medius is connected to that of vastus lateralis over the greater trochanter at the junction of anterior third with posterior 2/3rd.

With sharp dissection, elevate a flap consisting of the anterior part of the gluteus medius muscle with its underlying gluteus minimus and the anterior part of the vastus lateralis muscle. A plane was developed between capsule and the glutei up to the acetabular rim. The flap was retracted with a self-retaining retractor and the patient's leg is externally rotated to visualize the full length of the capsule with its overlying iliofemoral ligament.

A 'T' shaped incision was made on the anterior capsule with the vertical limb of the 'T' along the intertrochanteric line and the horizontal limb across the anterior surface of the capsule to the acetabular rim. At this stage, the head of the femur was dislocated by flexion, adduction and external rotation. The head of the femur was removed.

The capsule was retained and retracted using two Steinman pins, one placed at 11 o'clock and the other at 2 o'clock position on the outer aspect of the limbus.

For acetabular preparation, a Hohmann retractor was placed in the acetabular notch beneath the transverse acetabular ligament. Rarely was a posterior rim retractor required.

The limbus was excised throughout the circumference of the acetabulum. The transverse

acetabular ligament was divided and excised. The acetabulum was prepared in the usual fashion.

For femoral preparation, the leg was held perpendicular to the floor. Care was taken while preparing the femoral shaft as it is not uncommon to damage the posterior fibers of the gluteus medius with the rasp. This was avoided by retracting this muscle with a blunt Hohmann retractor. Generally recreation of normal anatomy; that is, approximately 15° of acetabular anteversion and 5-10° of femoral anteversion was desired. When proper soft tissue tension was achieved, stability of the joint was tested on flexion, adduction and internal rotation.

The wound was closed in layer with repair of capsule, conjoint tendon of gluteus medius and minimus and vastus lateralis over a suction drain with suction drain in situ.

Results

The mean age of the patient in group A was 43.12±3.90 years (36-50 years) while that in group B was 42.42±3.89 years (34-49 years). Group A had 52% (26) females and 48% (24) male with female to male ratio of 1.08. Group B had 58% (29) female and 42% (21) male with female to male ratio of 1.38. The mean follow-up in group A was 5.64±1.24 years (4-8 years) and that in group B was 5.48± 1.11 years (4-8 years). The mean preoperative HHS in group A was 53.08±8.178 (36-69) and that in group B was 57.04±5.08 (45-68). Postoperative HHS in group A was 92.62±2.26 (90-97) which was statistically better than Preoperative HHS of the same group with P-value <0.0001. Similarly postoperative HHS in group B was 91.58±2.43 (87-96) which was better than preoperative HHS of the same (P-value <0.0001). There was no statistically significant difference between the postoperative HHS of the two groups with P-value of 0.70. Mean hospital stay in group A was 6.48±0.84 days (5-9 days)

while that in group B was 14.2±1.84 days (11-18 days) and this difference was statistically significant. Though the duration to return to work in both the group was not significantly (6.32±0.82 versus 6.54±0.97 months, P-value >0.05)different but that interval of 3 months between the bilateral THA placed extra time loss from work in group B patient adding to extra financial burden to these patients.

Table 1: Clinical details and outcome of the patients

Total hip Arthroplasties (N= 200 joints)			
Characteristics	Simultaneous bilateral [Group A] (N= 50 patients, 100 joints)	Staged bilateral [Group B] (N= 50 patients, 100 joints)	P-value
Patients			
Age in years (mean ± SD)	43.12± 3.90	42.42± 3.89	>0.05
Female: male	1.08	1.38	>0.05
Preoperative HHS (mean± SD)	53.08± 8.18	57.04± 5.08	>0.05
Duration of Hospital stay in days (mean± SD)	6.48±0.84	14.2± 1.84	<0.0001
Surgery			
Surgery time in minutes (mean± SD)	185.34±5.84	205.48±4.11	<0.0001
Intraoperative blood loss in ml. (mean± SD)	946.60±37.40	1324.00±45.62	<0.0001
Outcome			
Time to return to work after surgery in months (mean± SD)	6.32±0.82	6.54±0.97	>0.05
Postoperative HHS (mean± SD)	92.62±2.26	91.58±2.43	0.70

Table 2: Complications in the patients

Complications	Simultaneous group N=50	Staged group N= 50	p-value
Superficial infection	6	4	<0.05
Deep infection	2	2	<0.05
UTI	2	3	<0.05

Discussion

Osteoarthritis of hip often requires bilateral THA with the demand for a THA of the contralateral hip being approximately 15 times higher than in the general population [15]. Lindberg and Sjöstrand (1972) estimated that approximately one-third of patients with primary osteoarthritis of the hips would need bilateral surgery [16]. This suggests the considerable importance of the comparison of one-stage versus two-stage bilateral THA.

It remains controversial whether it is better to do bilateral THA in 1 or 2 stages. One-stage bilateral THA may be associated with a higher incidence of medical and surgical complications [5-7]. The possible higher morbidity and mortality rate of 1-stage bilateral THA may inhibit some surgeons from advocating this procedure [5].

Recently, several studies have indicated that 1-stage bilateral THA is an effective procedure without significantly increasing the risk for the patients [10-19]. One-stage bilateral THA offers the benefits of a 1-session anesthetic risk, a shorter disability and recovery period, and a shorter cumulative hospitalization. Additionally, 1-stage bilateral THA costs less than 2-stage bilateral THA [8, 9]. These studies included patients younger than 63 years and recommended 1-stage bilateral THA to be safe for younger and healthy patients [17].

In addition, 1-stage bilateral THA confers a potential benefit of greater postoperative hip functions because contralateral hip disabilities do not adversely affect the replaced hip [25].

We compared the outcome of simultaneous and staged THA in young active adults in terms of cost and improvement in HHS.

Eggli *et al*. in their study concluded that patient undergoing one stage bilateral THA has 5-6 days less hospital stay than those undergoing two stage procedure. In addition to this, use of operating room only once, results in reduction of overall hospital costs by more than 30% when using 1 stage procedure [3].

Reuben *et al*. stated that bilateral simultaneous sequential joint replacement can save more than $10,000 for each total knee patients and more than $8,000 for each total hip patients [9].

In study by Bhan *et al*. who performed a RCT in Asian population comparing one or two staged THA, concluded significantly less estimated blood loss in patient who had undergone one-stage procedure than those who has undergone two-stage procedure. In addition, the duration of hospital stay was shorter in one-stage group than two-stage group. They concluded one stage procedure to be safe and appropriate in Asian population [12]. In our study, the amount of blood loss was also significantly less in simultaneous bilateral THA group than staged bilateral THA group. In addition, duration of cumulative stay in hospital was significantly less in simultaneous group than staged bilateral THA group.

In a study by Emin Aghayev *et al*. where he compared the complications and outcome in simultaneous versus staged procedure concluded that simultaneous bilateral THA have superior outcome and fewer complications than two-stage procedures. Among the three groups, mean postoperative HHS was better in group that were managed with simultaneous bilateral THA than those managed with early and delayed staged THA [10]. Complying to this study, the mean postoperative HHS was better in simultaneous bilateral THA than in staged bilateral THA but difference between the two were statistically insignificant in our study.

Saito *et al*. study concluded that hospital cost in staged bilateral THA was higher than simultaneous bilateral THA due to 2 anaesthesia, separate rehabilitations, and markedly longer cumulative hospital stays. In the 1-stage group, operative time, intraoperative blood loss and hospital stay were significantly reduced compared with the 2-stage group. Therefore they concluded that 1-stage bilateral THA is a safe and effective option for patients with significant arthritic disease of both hips [18]. Our results were in accordance to this study.

Though the rate of complications in forms of deep SSI was more in simultaneous group than in staged group most likely

due to increased duration of surgery in single go, the outcome in terms of improvement in HHS postoperatively were comparable in two groups. Simultaneous group had added advantage of less duration of hospital stay and rehabilitation along with early return to work leading to less financial burden.

Conclusion

Increased duration of hospital stay and longer duration to return to work for the patients managed with staged THA adds extra financial burden to the hospital administration and the patient. It can thus be concluded that simultaneous bilateral THA is cost effective with same level of functional outcome in terms of improvement of HHR when compared to stage bilateral THA. However, the long-term outcome, the effect of the simultaneous and staged procedure on psychological condition of the patient and family needs further study.

Conflict of Interest

The authors declare that they have no conflict of interest.

Funding: There is no funding source.

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Informed Consent: Informed consent was obtained from all individual participants included in this study.

References

1. Tepper S, Hochberg MC. Factors associated with hip osteoarthritis: data from the first national health and nutrition examination survey (NHANES-1). American journal of epidemiology. 1993; 137(10):1081-8.
2. Alfaro-Adrian J, Bayona F, Rech J, Murray D. One-or two-stage bilateral total hip replacement. The Journal of arthroplasty. 1999; 14(4):439-45.
3. Eggli S, Huckell C, Ganz R. Bilateral total hip arthroplasty: one stage versus two stage procedure. Clinical Orthopaedics and related research. 1996; 328:108-18.
4. Salvati EA, Hughes P, Lachiewicz P. Bilateral total hip-replacement arthroplasty in one stage. J Bone Joint Surg Am. 1978; 60(5):640-4.
5. Ritter MA, Randolph JC. Bilateral total hip arthroplasty: a simultaneous procedure. Acta Orthopaedica Scandinavica. 1976; 47(2):203-8.
6. Wykman A, Olsson E. Walking ability after total hip replacement. A comparison of gait analysis in unilateral and bilateral cases. Bone & Joint Journal, 1992, 74(1):53-6.
7. Shih Ch, Ho Wb. One-stage versus two-stage bilateral autophor ceramic total hip arthroplasty. Clinical Orthopaedics and related research. 1985; 193:141-5.
8. Lorenze M, Huo MH, Zatorski LE, Keggi KJ. A comparison of the cost effectiveness of one-stage versus two-stage bilateral total hip replacement. Orthopedics. 1998; 21(12):1249-52.
9. Reuben JD, Meyers SJ, Cox DD, Elliott M, Watson M, Shim SD. Cost comparison between bilateral simultaneous, staged, and unilateral total joint arthroplasty. The Journal of arthroplasty. 1998; 13(2):172-9.
10. Aghayev E, Beck A, Staub LP, Dietrich D, Melloh M, Orljanski W *et al*. Simultaneous bilateral hip replacement reveals superior outcome and fewer complications than two-stage procedures: a prospective study including 1819 patients and 5801 follow-ups from a total joint replacement registry. BMC musculoskeletal disorders. 2010; 11(1):245.
11. Berend KR, Lombardi AV, Adams JB. Simultaneous vs staged cementless bilateral total hip arthroplasty: perioperative risk comparison. The Journal of arthroplasty. 2007; 22(6):111-5.
12. Bhan S, Pankaj A, Malhotra R. One-or two-stage bilateral total hip arthroplasty. Bone & Joint Journal, 2006; 88(3):298-303.
13. Simon JP, Robbens E, Maes M, Bellemans J. Single-stage bilateral total hip arthroplasty in patients less than 35 years. Forty arthroplasties with 5-17 years follow-up. Acta Orthopaedica Belgica. 2009; 75(2):189-99.
14. Parvizi J, Tarity TD, Sheikh E, Sharkey PF, Hozack WJ, Rothman RH. Bilateral total hip arthroplasty: one-stage versus two-stage procedures. Clinical orthopaedics and related research. 2006; 453:137-41.
15. Henrik Husted SO, Laursen JO, Hindse K. Need for bilateral arthroplasty for coxarthrosis. Acta Orthop Scand. 1996; 67(5):421-3.
16. Lindberg L, Sjöstrand L The future needs of hip surgery. Prognosis for Lund 1972-1980. Lakartidningen. 1972; 69(37):4109-12.
17. Berend ME, Ritter MA, Harty LD, Davis KE, Keating EM, Meding JB *et al*. Simultaneous bilateral versus unilateral total hip arthroplasty: an outcomes analysis. The Journal of arthroplasty. 2005; 20(4):421-6.
18. Saito S, Tokuhashi Y, Ishii T, Mori S, Hosaka K, Taniguchi S. One-versus two-stage bilateral total hip arthroplasty. Orthopedics, 2010, 33(8).