



## Comparison between single stage and two stage bilateral total hip replacement-our results and review of literature

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**Bilateral total hip replacement (THR) is a common procedure nowadays. Staging of surgery is still a matter of debate. We performed a study to compare single stage and two stage bilateral THR and discuss the peri-operative and post-operative advantages and complications.**

**This was a retrospective study. 48 patients underwent single stage and 56 patients underwent two stage bilateral THR. The average follow up period was 64 months and 70 months respectively.**

**The hospital stay was 5.6 days in single stage and 9.0 days in two stage bilateral THR. The total blood loss was 280 ml and 440 ml ; average blood transfusion was 1.6 units and 2.2 units and walk without support was started at 42 days and 58 days respectively. No difference in complication rate was seen.**

**Single staged bilateral THR is a safe procedure. The definite benefits are short hospital stay, lower cost and early rehabilitation.**

**Keywords :** bilateral hip replacement ; arthroplasty ; post-operative complications ; cost-benefit analysis.

bilateral hip pathologies making their life miserable. Different degrees of deformities are often associated bilaterally and proper pre-operative planning becomes important for good results. Staging of bilateral total hip replacement (THR) has been under debate over a period of time. Patients requiring bilateral THR accounts 15% to 25% of all THR surgeries (9). Since 1976, when Ritter and Randolph (17) presented the first detailed study of the functional outcome of simultaneous bilateral THR, there has been ongoing debate over advantages and disadvantages of one stage over two stage procedure. Literature is also biased and both pros and cons of bilateral THR in single stage and two stages had been reported.

Concerns about single stage THR include : increased mortality and morbidity in the peri- and post-operative period, increased blood loss, deep vein thrombosis and periarticular heterotrophic ossification (PHO) (11,12,18). On the contrary, the

### INTRODUCTION

Total hip replacement (THR) is a now a time tested surgery giving good functional outcome (13,15, 21,22). With the newer implants, better understanding of hip biomechanics and reduced risk of anesthesia and peri-operative complications, indications of THR are increasing. Very often patients have

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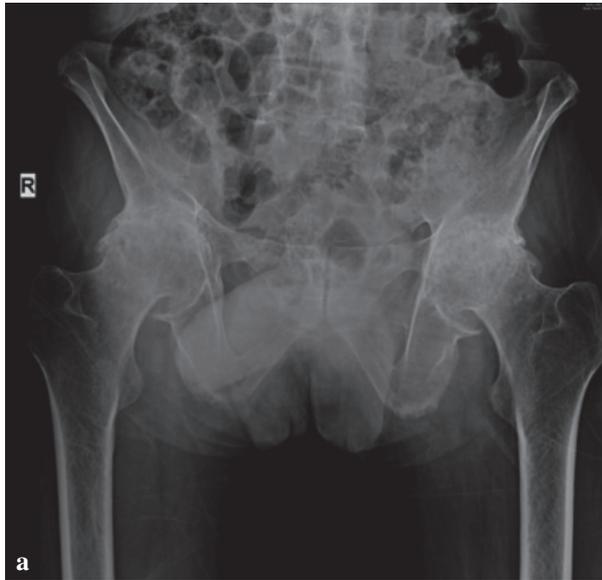
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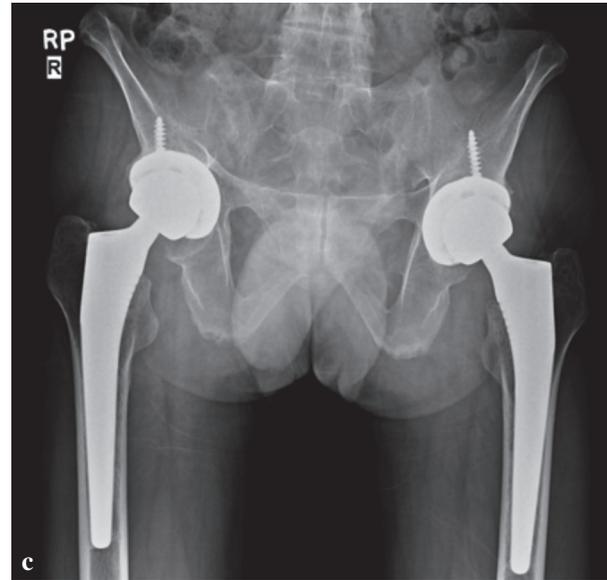
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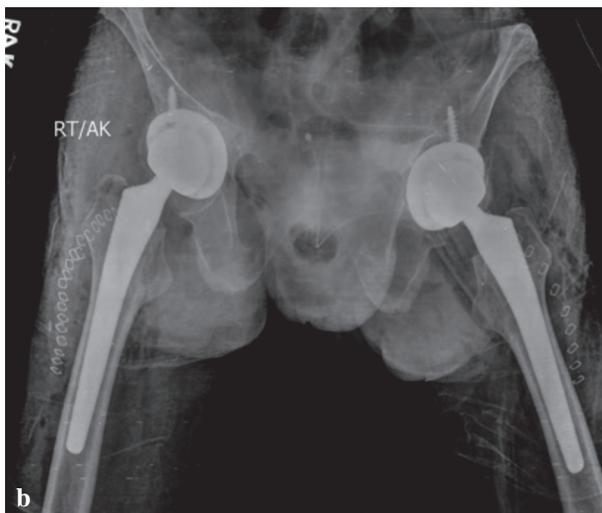
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*Fig. 1a.* — Pre-operative X-ray with osteo-arthritis of both hip.



*Fig. 1c.* — 3 years Post-operative X-ray of same patient



*Fig. 1b.* — Post-operative X-ray after Single stage bilateral THR.

advantages include single anaesthetic risk, shorter hospital stay, early rehabilitation of the patient and lower cost of surgery (5,10,16).

Although many authors support single stage bilateral THR and have reported their advantages. Very scant literature is available on the comparison study between single stage and two stage bilateral THR. We conducted a comparative study on pa-

tients undergoing bilateral THR in single stage and in two stages. The purpose of this study was to discuss the results of peri-operative and post-operative advantages and complications between the two.

#### MATERIALS AND METHODS

This was a retrospective study, performed between March 2008 and August 2015. We included patients with low risk of anaesthesia that is grade 1 and 2 of American Society of Anaesthesiologist (ASA) grading system (4). Two groups were made. 48 patients whom underwent single stage bilateral THR were included in group 1 and 56 patients with two stage bilateral THR were included in group 2. All patients were operated by senior orthopaedic surgeon. The average age of the patients in group 1 was 52 years (range 16 to 68 years) comprising of 28 females and 20 males. The average age of the patients in group 2 was 54 years (range 22 to 72 years) comprising of 30 females and 26 males. Diagnoses in all patients were avascular necrosis of hip in 20 patients in group 1 and 20 patients in group 2, bilateral developmental dysplasia of hip in 8 patients in group 1 and 10 patients in group 2, rheumatoid arthritis in 8 patients in group 1 and 11 patients in group 2 and bilateral osteoarthritis hip in 12 patients in group 1 and 15 patients in group 2. Demographic variables of all patients were comparable in both the groups (Table I). All patients were operated with their informed consent about the nature of surgery and compli-

cations and the decision for single stage and two stage surgeries were solely made by the patient.

The procedures were carried out in a laminar airflow operating room under combined spinal and epidural anaesthesia. In both the groups the decision of cemented or cementless fixation was made depending upon the quality of the bone stock and the age of the patient by the senior operating surgeon. Postero-lateral approach was used in all patients for performing the surgery. Patients were positioned laterally and the more symptomatic side was operated first. In group 1 after completing the first hip, the position was changed and the contralateral side was then operated. In group 2 patients the average time gap between stage 1 and stage 2 surgery were 4.2 days (range, 2-10 days).

Any intra-operative and pulmonary complications were recorded in both the groups. Anaesthesia time was recorded in all the surgeries. Intra-operative blood loss was estimated by measuring the volume of blood in the suction bottles deducting the volume of irrigation fluid and weighing the mops used. Suction drain was not used in any of the case. Numbers of blood units transfused per-operatively and post operatively were also recorded in both the groups.

Intravenous antibiotics were administered for 3 days postoperatively. Subcutaneous LMW heparin and pressure stockings were given to all patients as a prophylaxis for deep vein thrombosis. Patients were made to stand on day 1 following surgery. Full-weight-bearing walk was started from day 2 in all patients, except those with peri-operative complications.

Post-operatively, the hemoglobin levels were recorded on the first and third post-operative days. Post-operatively early complications like periprosthetic fractures, dislocation, pulmonary embolism, phlebitis, superficial wound infection, deep wound infection and limb length discrepancy were noted. Total length of hospital stay and the total hospital cost were reviewed. The length of hospital stay was calculated from the day of operation until discharge. All patients were regularly followed at one, 3, 6 and 12 months and yearly thereafter. The average follow up period in our study was 64 months (range, 36-72 months) in group 1 and 70 months (range, 40-82) in group 2.

Patients were assessed for clinical and radiological evaluation preoperatively and at every follow up visit. For clinical evaluation Modified Harris hip scoring system was used (108). Time taken by the patients for walk without support and use of public transportation was also recorded. Any complications like anterior thigh pain, dislocation, fracture were recorded. Radiologically hips

were evaluated for the fixation of components, osteolysis, loosening and heterotrophic ossification. Loosening was defined as progressive axial subsidence of more than 3 mm or a valgus or varus shift of more than 3 mm (8,23). Loosening of acetabular component was diagnosed with a change in the component by more than 2 mm vertically, medially or laterally or a continuous radiolucent line of more than 2 mm on both anteroposterior and lateral radiographs was seen (8,23). The site of osteolysis in the acetabulum was recorded according to the classification of Delee and Charnley<sup>3</sup> and those in the femur by the classification of Gruen *et al* (6).

## RESULTS

The mean total anaesthesia time was 208 minutes (range, 188-220 minutes) in group 1 and 162 minutes (range, 150-178 minutes) in group 2 in our study. The changeover time between first hip and second hip ranged in group 1 patients were between 20 and 25 minutes. The anaesthesia time in group 1 patients was more than in group 2 but much less than the combined anaesthesia time of both surgeries in group 2 patients. None of the patients had postoperative systemic complications like pulmonary embolism and deep vein thrombosis in any group or any significant anaesthetic problem.

The mean intraoperative blood loss was 280 ml (range, 220-540 ml) in group 1 and 220 ml (range, 150-400 ml) in group 2 in each surgery. The total intraoperative blood loss in group 2 patients would be twice of 220 ml that is 440 ml. The mean hemoglobin level preoperatively was 12.9 mg/dl (range, 11.4-14.1 mg/dl) in group 1 and 12.1 mg/dl (range, 10.6-14.0 mg/dl) in group 2. The mean hemoglobin level at day 1 postoperatively was 10.3 mg/dl (range, 9.6-13.1 mg/dl) in group 1 and 10.9 mg/dl (range, 9.8-13.6 ml/dl) after second surgery in group 2 patients. An average of 1.6 units of blood were transfused with 1.2 units (range, 0-3 units) intra-operatively and 0.4 units (range, 0-3 units) post-operatively in group 1 patients. In group 2 an average of 2.2 units of blood were transfused with 1.6 units (range, 0-3 units) intra-operatively and 0.6 units (range, 0-2 units) postoperatively for both surgery. Patients of group 2 had more total blood loss intra-operatively and thus required significantly higher blood transfusion than group 1.

Table I. — Table showing demographic comparison between group 1 and group 2

|                                   | Group 1                         | Group 2                         |
|-----------------------------------|---------------------------------|---------------------------------|
| Total Patients                    | 48                              | 56                              |
| Male: Female                      | 20 males: 28 females            | 26 males: 30 females            |
| Average Age                       | 52 years (range 16 to 68 years) | 54 years (range 22 to 72 years) |
| Bilateral Osteoarthritis          | 12 (25%)                        | 15 (27%)                        |
| Avascular Necrosis                | 20 (41%)                        | 20 (36%)                        |
| Rheumatoid Arthritis              | 8 (17%)                         | 11 (19%)                        |
| Bilateral Developmental Dysplasia | 8 (17%)                         | 10 (18%)                        |

The mean length of stay in hospital was 5.6 days (range, 4-8 days) in group 1 and was 9.0 days (range, 8-12 days) in group 2. The total cost ratio between group 1 and group 2 patients was 1 :1.4 that is 40% more (Table II).

Transient sciatic nerve palsy was seen in two patients with single stage and one patient with two stage THA. It recovered in all patients after an average period of 2 months. Peri prosthetic fracture of femur was observed in two patients, one in each group. Reduction and internal fixation was done in them. Both fractures united uneventfully. One patient in each group had local complication of superficial stitch abscess, which was treated with aseptic dressings and antibiotics. There was no case of deep infection or dislocation in our study. Limb length discrepancy postoperatively was an average of 1.0 cms (range, 0-2 cms) in group 1 and 0.9 cms (range, 0-2 cms) in group 2 (Table III).

Mean pre-operative Harris hip score was 48.2 (35-60) in group 1 and 47.8 (32-62) in group 2. It

increased post-operatively to 92.3 (85-96) in group 1 and 90.8 (82-94) in group 2 (Table II).

Walk without support was started after an average period of 42 days (32-64 days) in group 1 and 58 days (40-78 days) in group 2 patients. Use of public transportation was started at 3 months in both the groups.

Radiographic evaluations were done for all patients. The mean angle of abduction of the cup was 47.2° in group 1 and 46.9° in group 2. The alignment of the femoral stem in AP and Lat radiographs was similar in both groups. None of the patients had heterotrophic ossification. None of the patients had signs of osteolysis or loosening till the latest follow up.

## DISCUSSION

Total hip replacement has become a time tested procedure. With newer designs and material, longevity of the implant has increased significantly,

Table II. — Table comparing the results in patients of group 1 and group 2

|                                 | Group 1   | Group 2   |
|---------------------------------|---|---|
| Total Operative Time            | 208 minutes (range, 188-220 minutes)                                  | 162 minutes (range, 150-178 minutes)                                  |
| Total Intraoperative Blood Loss | 280 ml (range, 220-540 ml)  | 440 ml (range, 300-800 ml)  |
| Average Blood Transfused        | 1.6 units (1.2 units intra-operatively and 0.4 units postoperatively) | 2.2 units (1.6 units intra-operatively and 0.6 units postoperatively) |
| Length Of Stay In Hospital      | 5.6 days (range, 4-8 days)  | 9.0 days (range, 8-12 days)   |
| Average Follow Up Period        | 64 months (range, 36-72 months)                                       | 70 months (range, 40-82)  |
| Pre-Operative Harris Hip Score  | 48.2 (35-60)  | 47.8 (32-62)  |
| Post-Operative Harris Hip Score | 92.3 (85-96)  | 90.8 (82-94)  |



**Fig. 2a.** — Pre-operative X-ray with Ankylosing Spondylitis both Hip.

therefore raising the indications of THR, especially in younger populations. Bilateral THR are becoming increasingly a common procedure, but staging of the surgery is still controversial.

Mean anaesthesia time in our study was 208 minutes in single stage bilateral THR. It is comparable with other studies. In *Welters et al* (7) study it was 228 minutes and in a study by *Bhan et al* (2) it was 207.42 minutes. *Shih et al* (20), in their study had shorter operative time of 148 minutes. Many authors have documented increased risk of respiratory morbidity, anaesthetic complications and DVT in single stage bilateral THR. In our study, we noted that although the anaesthesia time with single stage THR was higher than two stage procedure, significant post-operative complications were not noted. We used spinal anaesthesia in our series to minimize the systemic anaesthetic and post operative complications as supported by *Agins HJ et al* and *Salvati et al* (19). We also believe that complication rate can be minimized by proper nursing care, early mobilization and shorter hospital stay.

Also selection of the patient is very important in performing single stage bilateral THA as we included only low risk group patients (ASA grade 1 and grade 2 patients) in our study. In our study operative



**Fig. 2b.** — 4.5 years Post-operative X-ray with Bilateral THR done in 2 stages.

site infection was similar in single and two staged THR.

Various authors have different opinion about blood loss in single stage and two stage bilateral THR. *Bhan et al* (2) noted less blood loss in single stage surgery compared to two stage surgery. *Salvati et al* (19) in their study reported mean blood loss higher in single stage surgery and *Shih et al* (20) had no significant difference in blood loss between the two groups. In our study we found that the mean total blood is less in single stage bilateral THA than two stage surgery group. Also in two stage group there was increased blood transfusion rate as compared with single stage group in our study. We believe that performing single stage bilateral THA makes us familiar with the specific changes in the patient's hip anatomy and thus operating time and blood loss is less in the second replacement.

The limb length discrepancy and the implant positioning are similar in both the groups. Early Functional recovery is seen in single stage group patients as compared to two stage group. They started walking early without support and regained comparative range of movement earlier. This could

Table III. — Table comparing intra- and post- operative complications in both the groups

|                                    | Group 1 | Group 2 |
|------------------------------------|---------|---------|
| Periprosthetic fracture femur      | 1       | 1       |
| Periprosthetic fracture acetabulum | none    | None    |
| Transient sciatic nerve palsy      | 2       | 1       |
| Superficial wound infection        | 1       | 1       |
| Deep wound infection               | none    | None    |
| Pulmonary complications            | none    | None    |
| Anaesthetic complications          | none    | None    |
| Deep vein thrombosis               | none    | None    |
| Dislocation                        | none    | None    |

be because in two stage group, patients were bed ridden for more time after two surgeries. They also were not able to stand and walk properly immediately after the first surgery, as other side was usually painful and deformed. Modified Harris hip score is however similar at 3 months of surgery till the latest follow up. The time to use public transportation was similar in both the groups.

Two stage THR group patients spend more time in the hospital and the total cost of surgery was significantly higher than single stage group patients. Antibiotic were also given to more number of days and increased duration of pain management was required in two stage group. The patients and the family members took more number of days off from office and home. Thus the family members were more comfortable with single stage surgery. In our study 5.6 days of hospital stay was required in single stage group. In a study by Bhan *et al* (2), mean hospital stay was 7.25 days. McBryde *et al* (14) had mean hospital stay of 11 days in their study. Welters *et al* (7), in their study had a mean hospital stay of 17.5 days.

Long term results were similar in both the groups in our study with comparable modified harris hip score and range of movement of hip and knee. On radiological evaluation none of the patients had incidence of heterotrophic ossification. No implant loosening or change in the component position was seen in any patient till the latest follow up.

Although many publications with advantages of two stage bilateral THR are available. Very few

literatures are available on the comparison of bilateral single stage THR and two stage bilateral THR. This study clearly suggests that single stage bilateral THA is better in terms of early rehabilitation and recovery of patients. There is significant low cost of the surgery. The return to normal routine activities of patient and family is also earlier. The blood loss and blood transfusion rate is also lower in single stage group. However the implant positioning, late functional results, systemic complications and infection rate was found to be similar in both the groups.

Weakness in our study was that we did not take any comorbidities of the patient into consideration for evaluating the result. However our study compared low risk group population (ASA grade 1 and 2) and so in both groups, patients were relatively healthy and comparable. The total number of patients in our study is less to make definite recommendations about single stage THA and also we did not included high risk group patients (ASA grade 3 and grade 4) in our study.

## CONCLUSION

We concluded that single staged bilateral THR is a safe and effective procedure when a proper patient selection is done. There is no increased risk of intra operative and post operative complications. The definite benefits are in terms of short hospital stay, lower cost and early rehabilitation.

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