

Outcomes of Conversion from Failed Hemiarthroplasty to Total Hip Arthroplasty.

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ABSTRACT

Objective:

To define the clinical and radiological results of converting a failed hemiarthroplasty to a total hip arthroplasty (THA).

Background:

Hemiarthroplasty of the hip is a short-timed intervention in active patients and cannot be considered a bone-maintaining procedure as a high rate of acetabular and femoral deficiencies were found despite a short period after the primary hip surgery.

Patients and methods:

This is a prospective work done on 20 individuals, who presented to Menoufia University Hospitals and El-Helal Insurance Hospital during the period from April 2019 to May 2021. Patients were subjected to Pre-operative, intraoperative, and postoperative evaluation, The HHS score was applied to all patients, and their outcomes were tabulated.

Results:

The mean age of the patients was about 64 years with a range between (52- 73) years. There were 11 males and 9 females. Acetabular erosion and stem loosening were the main reasons for the conversion surgery, acetabular erosion alone was found in 4 patients (30%), component loosening alone was found in 3 patients (15%), infection in 6 patients (30%), prosthetic dislocation found in two patients (10%), broken prosthesis found in three patient (15%), the periprosthetic fracture was found in two patient (10%). Cementless cups were used in nine patients (45%). The cemented cup was used in eleven cases (55%). A Cemented Dual mobility cup was used in seven patients (35%) and a cemented acetabular cup with UHMWPE was used in four cases (20%). It was necessary to use bone graft in three cases (15%) presented with type IIIB acetabular bone defect, Kerboull cross plate was used in three patients (15%) to augment acetabular defect in patients presented with type IIIB acetabular bone defect. Impaction Bone Grafting (IBG) was used in five cases. Cementless stems were used in four patients (20%) however, long revision stems were necessary for sixteen (80%) patients either cemented or cementless type to overcome the femoral bone defect. Long-revision cemented stems were used in five patients (25%), and long-revision cementless standard stems were used in eleven cases (55%). Cerclage wires were used in ten cases. It was used for the reduction and fixation of the femur after extended trochanteric osteotomy. In the postoperative follow-up after 3 months, there was significant improvement of HHS to a mean of 85.88 (\pm 6.43STD), ranging from 75-95. The grades were excellent in 6 patients (30%), good in 9 patients (45%) and 5 patients were fair (25%). In the last follow up the HHS improved to a mean of 88.44 (\pm 5.28 STD), ranging from 78-95. The grades were excellent in 6 individuals (30%), good in 12 individuals (60%), and in 2 individuals were fair (10%).

Conclusion:

Conversion arthroplasty was found to be an excellent operative decision for symptomatic failed hemiarthroplasty regarding pain relief, hip function restoration, and movement as close as feasible to the level before the injury.

Keywords:

Conversion arthroplasty, Hemiarthroplasty.

INTRODUCTION:

Hemiarthroplasty (HA), whether it is Unipolar or Bipolar, is a frequently conducted surgical procedure in older patients who have intracapsular displaced fractures of the femoral neck. This operation has shown positive outcomes in terms of pain alleviation, the ability to resume

activities, and reduced morbidity and death rates in the short term. The purpose of Bipolar arthroplasty was to enhance the long-term outcomes of hemiarthroplasty by addressing the issue of low-grade wear at the metal-cartilage interface. This was achieved by introducing an additional interface (metal-polyethylene) inside

the bipolar head. However, research contrasting bipolar to unipolar hemiarthroplasty indicates there are no variations among both procedures regarding morbidity, mortality, or functional results. THA is the optimal treatment option for cognitively competent, relatively healthy, active, and independent elderly individuals (aged 60-75 years) with intracapsular fractures of the femoral neck, who have a long life expectancy.

(1) Hemiarthroplasty may lead to long-term consequences such as gradual loss of the acetabular cartilage, resulting in groin discomfort. Other issues include acetabular protrusion, loosening, and sinking of the femoral stem. Active patients may have particularly unsatisfactory outcomes. (2) THA is recommended for individuals who had a high level of physical activity before their fracture and have good physical function. This procedure offers great functional results and has a low chance of needing further surgery. HA is often advised for patients who have limits in physical activity before surgery. It may reduce both morbidity and mortality rates in cases with fractures of the femoral neck (3) Hemiarthroplasty has been reported to make good results in the elderly population. However, these reports although made on a large number of patients, the majority of these patients had departed by time of the latest follow up leaving a small number of cases to be evaluated. (4) The main indications for Hemiarthroplasty conversion to THA include acetabular cartilage erosions, acetabular protrusion causing groin discomfort, femoral stem loosening, and subsidence causing remarkable thigh pain with the typical “start-up” pain. Prosthetic dislocation, prosthetic fracture leading to function loss, peri-prosthetic fracture, and infections are other parameters for the conversion. (5) Conversion of hemiarthroplasty may be related to high complication rates like infection, dislocation, and loosening when compared with primary total hip arthroplasty. Many intraoperative problems should be dealt with such as acetabular and femoral defects, intraoperative periprosthetic fracture, and removal of cement and stem. (6) Previously several studies, however, reported on changing hemiarthroplasty to total hip arthroplasty as aggregates, without specifically addressing different previous diagnoses. (7)

This research aimed to assess the functional result, survivorship at short to mid-term follow-up, and potential complications following the conversion of HA to THA.

PATIENTS AND METHODS

This is a prospective work performed at Menoufia University Hospital and El-Helal Insurance Hospital. 20 patients included from April 2019 to May 2021 had signed a written consent form. Ethical approval was obtained from the Hospital Approval Ethical Committee. Preoptimization of all patients was performed before hospital admission.

Surgical procedures and prosthesis

All patients received epidural anesthesia. The posterior approach was the standard approach that was utilised in all instances in addition to Extended Trochanteric Osteotomy when necessary. Antibiotics were held until the specimens were harvested from the biofilm around the removed implant. 3 samples were sent for standard and extended culture evaluation. Each prosthesis utilised was from Zimmer Company (Zimmer, Warsaw, IN). When the acetabular bone was intact Dual mobility cups were inserted and Extended Trochanteric osteotomy was used. There were some osteoporotic cases therefore cemented acetabular cups were used. When the acetabular bone defect was type B or above according to AAOS classification Kerboul cross plate was used to compensate for the acetabular defect (Figure 1). Acetabular grafting using allograft (bulk) was performed on five individuals who had acetabular erosion and had cemented cups inserted (Figure 2) and (Figure 3). Cementless cups were used in 9 patients (45%) and cemented cups with UHMWPE in 4 patients (20%). The procedure of two-stage revision arthroplasty involves a full elimination of the prostheses and cement, followed by a meticulous debridement and the placement of an antibiotic-loaded spacer.



Figure 1: preoperative X-ray showing acetabular bone defect affecting right hip (type IIB according to AAOS classification).

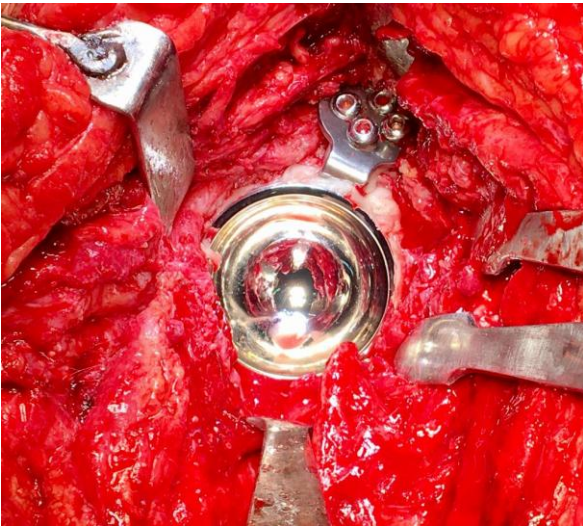


Figure 2: Intraoperative image showing THA of the right hip. impaction allograft and Kerboul cross plate were used to compensate acetabular defect



Figure: postoperative X-ray showing THA of right hip impaction allograft and Kerboul cross plate were used to compensate acetabular defect with ETO

Follow-up

We conducted a comprehensive assessment of all individuals, using both clinical and radiological methods, and closely monitored their progress over time to determine the potential reasons for treatment failure. The Harris Hip Score (HHS) is used to determine functionality before surgery, after surgery, and during follow-up evaluations. The higher score in the HHS indicated a lower level of debilitation. A score of 70 is seen as poor, but a score between 70 and 80 is considered fair. A score between 80 and 90 is regarded as good, while a score between 90 and 100 is deemed excellent. The participants had clinical assessments at 1 month, six months, 1 year, and then yearly after the conversion process and the second treatment in the 2-stage group. While the ultimate follow-up of 1 year included the HHS data for every individual, the 6-month HHS was utilised to assess the effectiveness of the conversion process in terms of

alleviating groin discomfort and enhancing functionality. Additionally, any extra complexities and specifics about the revision method were recorded.

Statistical analysis

The data were gathered, organised, and subjected to statistical analysis using an IBM-compatible personal computer equipped with the SPSS statistical program version 25. (SPSS Inc. Released 2015. IBM SPSS Statistics for Windows, version 23.0, Armonk, NY: IBM Corp.). The paired t-test has been employed for contrasting the preoperative recorded modified HHS to the variables recorded at the final follow-up exam. The data analysis was conducted by an impartial statistician who was unaware of the surgical results. Significance was set at $p < 0.05$.

RESULTS

The primary indications for conversion arthroplasty have been the presence of Acetabular erosion and stem loosening had been the main reason for the conversion surgery, acetabular erosion alone was found in 4 patients (30%), component loosening alone was found in 3 patients (15%), infection in 6 patients (30%), prosthetic dislocation found in two patients (10%), broken prosthesis found in three patient (15%), the periprosthetic fracture was found in two patient (10%). The mean length from the initial surgery to the onset of symptoms among individuals with isolated stem loosening had been 45 months (ranging from 7 to 89 months), 59 months for isolated acetabular erosion (ranging from 16 to 105 months), 32 months for a combination of stem loosening and acetabular erosion (ranging from 7 to 94 months), and 15 months for dislocated HA (ranging from 6 to 24 months). The mean duration from the start of symptoms until conversion was 2.4 years with a standard deviation of ± 3.5 . The mean duration from endoprosthesis replacement to conversion complete hip arthroplasty was 5.4 years with a standard deviation of ± 2.44 . The average duration of the operation was 153 minutes, with a range of 110 to 234 minutes. The average quantity of blood loss had been 522 mL, with a range of 300 to 950 mL. Six patients (30%) had infections. The mean preoperative HHS score had been 48.87 ± 9.86 in patients (ranged 38–74), acetabular erosion and protrusion were found in 55% of patients. Two patients had type IIIB acetabular defect, four patients had type IIB, and four patients with IA according to AAOS classification. Femoral defects were found in 20% of patients. One

patient had type I femoral defect according to AAOS classification, three patients had type II femoral defect. (Table 1)

Table1: preoperative complaints

Variable	NO.	%
Groin pain	12	60.0
Thigh pain	3	15.0
knee pain	2	10.0
Draining sinus	1	5.0
Limitation of movement	2	10.0

Table 1 shows the presenting complaints of patients. Groin pain was the main presenting symptom. It was found in 12 patients (60%), knee pain in 2 patients (10.0%), limitation of movement in 2 patients (10%), the inability to move in 6 patients (30%), and draining sinus was found in one patient (5%).

Postoperative complications

One patient was complicated by dislocation during the first three months postoperative, despite well-positioned components, closed reduction was not achievable. The patient underwent revision surgery and the dislocated prosthesis was reduced. The primary prosthesis for this patient was cemented bipolar hemiarthroplasty. The polyethylene liner was changed, the femoral neck and head were changed by the Extralong femoral neck and femoral head also and lastly, the unstable greater trochanter was fixed by cerclage wires and that hip remained stable afterward. Our research group did not observe any mortality associated with surgical procedures. No loosening had been seen in any of the instances over the follow-up period.

Clinical follow-up

The mean HHS preoperative was 48.78 ranging from (38-74). In the post-operative follow-up after 3 months, there was significant improvement of HHS to a mean of 85.88, ranging from (75-95). In the last follow up the HHS improved to a mean of 88.44 range from (78-95). The discrepancies between the preoperative HHS score and its subsequent evaluations showed considerable enhancement ($P = .0001$). The average value of the HHS score is displayed in (Table 2) according to the cause of hemiarthroplasties. Every patient exhibited impaired function before the operation and achieved outstanding function at the last follow-up. Out of 20 individuals who had isolated groin pain before undergoing revision surgery, 12 individuals (60%) reported a complete absence of pain after the operation, while the other individuals experienced just slight discomfort. Following the latest follow-up, 18 of the participants (90%) were able to walk without assistance, whereas two individuals (10%) required minor help from a walker to walk. The examination of survivorship, taking into account the adjustment of the HHS score, yielded a success rate of 89.1% at 12 months. Pain relief was reported by 82.6% of patients, while 78.3% reported improvement in their activity level. There were no documented difficulties affecting the systems throughout the follow-up period. There is a highly-significant difference in HSS between pre-operative, post-operative, and last follow-up data as p -value < 0.001 . and the significant improvement in postoperative HHS grades as shown in (Table 3)

Table (2): Difference between HHS preoperative and postoperative

Variable	pre-operative	post-operative	Last follow up	Test of significance	P value
HSS					
Mean \pm SD	48.78 \pm 9.86	85.88 \pm 6.43	88.44 \pm 5.28	40	<0.001**
Range	38.14 - 74.11	75.75 - 95.66	78.54 - 95.89		

Table (3): Grades of HHS preoperative and postoperative

HSS	preoperative		postoperative		Last follow up		Test of significance	P value
	NO.	%	NO.	%	NO.	%		
Excellent	0	0.0	6	30.0	6	30.0	55.143	<0.001**
Good	0	0.0	9	45.0	12	60.0		
Fair	2	10.0	5	25.0	2	10.0		
Poor	18	90.0	0	0.0	0	0.0		

DISCUSSION

The main findings of this investigation are that converted THA proved to be an effective therapeutic approach for individuals with failed HA and severe acetabular erosion. At a mean follow-up of 1.5 years, we observed significant advances in pain alleviation and functional recovery, with a minimal occurrence of complications. Studies have shown that HA effectively reinstates a functional level of physical activity. The prosthesis developed by Austin Moore and Thompson has met these requirements for many decades. Surgeons have refrained from using complete hip arthroplasty to treat fractures of the femoral neck owing to concerns about the potential for prosthesis instability and reduction in bone stock (8).

In this study groin pain was the main complaint for most patients. It has been found in 12 patients (60%) out of 20 although the mean duration of the symptom-free period was 2.92 years (\pm 2.45 STD). the cause of this pain was either the acetabular and/or femoral side. **Sierra & Cabanela (9)** reported 132 cases of failed hemiarthroplasties. The main complaint for them was groin pain as follows; Out of the total number of patients, 51 experienced severe pain, 52 experienced moderate pain, and 12 had little discomfort. However, the average duration from endoprosthetic replacements to conversion surgeries was 4.9 years (\pm 6.1 STD). The author noted that acetabular erosion was found to be the source of pain in the groin region in 100 patients (75.7%).

In this study, Acetabular erosion and protrusion were found in 55% of patients. Two patients had type IIIB acetabular defect, four patients had type IIB, and four patients with IA according to AAOS classification. That is although the mean period from the primary hemiarthroplasty to conversion surgery was 5.4 years (\pm 2.44 STD). **Soreid., et al. (10)** studied the development of protrusion in relationship to the follow-up time on 211 cases who underwent hip hemiarthroplasty. The acetabular protrusion was noted in 8.9% of patients in the follow-up after one year. The ratio noticed a rise to 28.2% in the 2nd year. Following 4 years of observation, 54.3% of these individuals had an acetabular protrusion, with protrusion exceeding 5 mm in almost half of these cases.

In this study, femoral defects were found in 20% of patients. One patient had type I femoral defect according to AAOS classification, three patients had type II femoral defect. A long femoral stem either cemented or cementless was necessary to be used to overcome bone defects. **Pankaj. et al.,**

(11) had a series on 44 failed hip hemiarthroplasties converted to THA, cementless long revision stem was indicated in 28 cases (63.5%). 5 cases had femoral deficiency at the proximal femur, especially at the calcar these cases had been treated with a calcar-replacing prosthesis. The remaining 23 cases had osteolysis of the proximal femur, and cortical erosion/perforations at the tip of the old prosthesis, a long revision femoral stem was so selected that it bypassed the defect by at least 5 centimeters.

Femoral loosening was an important cause of conversion. It has been found in 5 cases. This cause of conversion was correlated to an uncemented hemiarthroplasty. The chief complaint in patients with prosthetic loosening was "start-up" pain in the thigh after one year from their primary hip surgery which was an indication of loosening of the femoral stem. The failure was present as the implant's main stability was insufficient and there is no bone in-growth was observed around the stem which was usually associated with loss of femoral bone stock and caused the early failure. **Ebied A., (12)** noticed that 14 out of 16 (88%) failed Austin Moore hemiarthroplasty because of early stem loosening in the medullary canal and that was the specific mechanism of failure in Austin Moore. Intraoperatively the stems were totally loose and circumferentially covered with a membrane of fibrous tissue.

One patient was complicated by dislocation during the first three months postoperative, despite well-positioned components, closed reduction was not achievable. The patient underwent revision surgery and the dislocated prosthesis was reduced. The primary prosthesis for this patient was cemented bipolar hemiarthroplasty. The polyethylene liner was changed, the prosthetic femoral neck and head were changed by the Extra-long femoral neck and femoral head and lastly, the greater trochanter was fixed by cerclage wires and that hip remained stable afterward. **Sah & Estok., (13)** in their study on 89 cases with failed hemiarthroplasty there were twenty dislocations (21%), that took place on average, 5.0 months following the conversion procedure. The patients were monitored for an average duration of 3.8 years, with the range being from 2 to 10 years. Three patients out of 89 were converted due to instability problems and none of the 3 patients had a dislocation after the conversion surgery. That increase in the dislocation incidence after conversion arthroplasty has been attributed to the fact that the patients with hemiarthroplasty are used to the wider range

of motion associated with large head diameter, and sudden reduction of the femoral head size appears to play a role in the instability after conversion surgery. However, the change in the size of the head diameter was not the only reason responsible for the instability. Soft tissue deficiency, muscle weakness, and soft tissue fibrosis also play a role in the instability in these patients.

CONCLUSION

Conversion arthroplasty was found to be a very effective therapeutic approach for addressing the symptoms of a failed HA, providing significant relief from pain and restoring functioning and mobility to a level as close as feasible to the pre-injury state.

Limitation

The study was conducted in two centers and with different surgeons.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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