

**RESEARCH ARTICLE**

# Clinical Outcomes of Total Hip Arthroplasty in Patients with Ankylosed Hip

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*Research performed at Sina hospital, Tehran University of Medical Sciences, Tehran, Iran**Received: 11 January 2014**Accepted: 23 February 2014***Abstract**

**Background:** Hip ankylosis includes the limitation of hip motion and hip arthroplasty is the recommended treatment. This study aimed to evaluate the clinical and radiographic outcomes in the treatment of ankylosis of the hip joint by the Harris Hip Score (HHS).

**Methods:** This interventional study was performed on patients with ankylosis in one or both hip joints, who were referred to Sina Hospital, Tehran, Iran from 2011-13. Electromyogram and nerve conduction studies were taken from the hip abductor muscles before surgery and HHS was calculated. Type of surgery and prosthesis, osteotomy required for the neck and trochanteric region of the femur, periprosthetic fracture and the need to restore the acetabulum were studied in the patients. Postoperative complications such as infection and dislocation at 3, 6 and 12 months after surgery were examined and then the HHS was calculated.

**Results:** Seventy-seven patients (42 m/35 f) with a mean age of  $36.71 \pm 11.78$  years underwent total hip arthroplasty. Most causes of hip joint ankylosis in the patients were elderly osteoarthritis (20 cases) and avascular necrosis (13 cases). Electromyogram and nerve conduction studies showed high and low velocity conduction in 12 and 65 patients, respectively. We used the posterior approach in 55 patients (71.4%) and lateral approach in 22 patients (28.6%). Periprosthetic fracture occurred in two patients and 12 patients needed acetabular reconstruction. Standard prosthesis was used in 83.1% of patients. Six patients were excluded after six month and two patients were excluded after 12 month due to surgery complications. The mean HHS of patients before surgery was  $48.53 \pm 6.28$  and it progressed to  $88.22 \pm 3.78$  after 12 month ( $P < 0.001$ ).

**Conclusions:** Total hip arthroplasty for patients with ankylosed hip can improve the range of joint motion, especially in the long-term follow-up. However, good results should be considered in the absence of pre- and post-operative complications.

**Key words:** Harris Hip Score, Hip ankylosis, Hip range of motion, Total hip arthroplasty

**Introduction**

**H**ip ankylosis definition includes restrictions on the movement of hip flexion, extension, and rotation less than 10 degrees and they may be achieved spontaneously or after surgery. Ankylosis of the hip joint is usually painless and the joint is stable, but in the long term, degeneration changes and pain will occur in the lower back of the hip and knee, especially when the hip joint has poor functional status. Total hip arthroplasty (THA) is recommended to halt the degenerative process in adjacent joints (knees and spine) (1-2). About 30 years ago, hip arthrodesis was one of the most common treatments for septic arthritis and severe osteoarthritis,

especially in young patients. Provided surgery was a success, higher performance was achieved for a prolonged period, as well as the delaying of lower back pain or other joint complaints for about 20 years (3-6).

Nowadays, the preferred treatment for an ankylosed hip is THA. It is very effective in cases with one joint involved and severe degenerative change in the ipsilateral knee joint (7-9). Affected items to consider in the outcome of total hip arthroplasty include: primary joint disease, previous surgery on the bone and soft tissue, atrophy of the muscles around the joint and surgical techniques (10-12).

This study was performed to evaluate the clinical and

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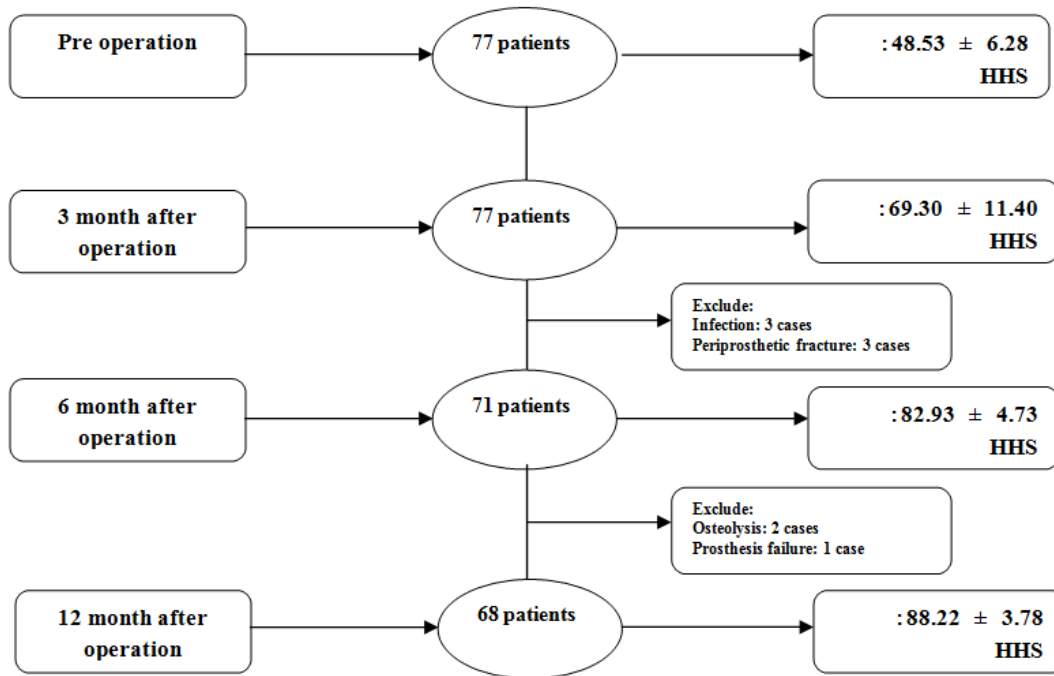


Figure 1. Flow chart of patients.

radiographic outcomes of total hip replacement in the treatment of hip joint ankylosis. HHS was used to assess treatment outcomes.

### Materials and Methods

This was a prospective study performed on 77 patients. Convenient sampling was performed and all patients who had an ankylosed or fused hip were selected. Electromyogram (EMG) and nerve conduction velocity (NCV) testing was performed to evaluate the gluteal

muscles of the patients. Also, radiography was done to assess the greater trochanter of the femur, and then range of motion of the joint and HHS were calculated.

Since quality of life and hip function after surgery are issues considered to be important to the patients and their family, the HHS was used to measure outcomes after hip replacement surgery. In the HHS, questions are classified into four groups: group I - pain; group II - daily activity; group III - joint mobility; group IV - clinical examination. Patient scores were calculated for

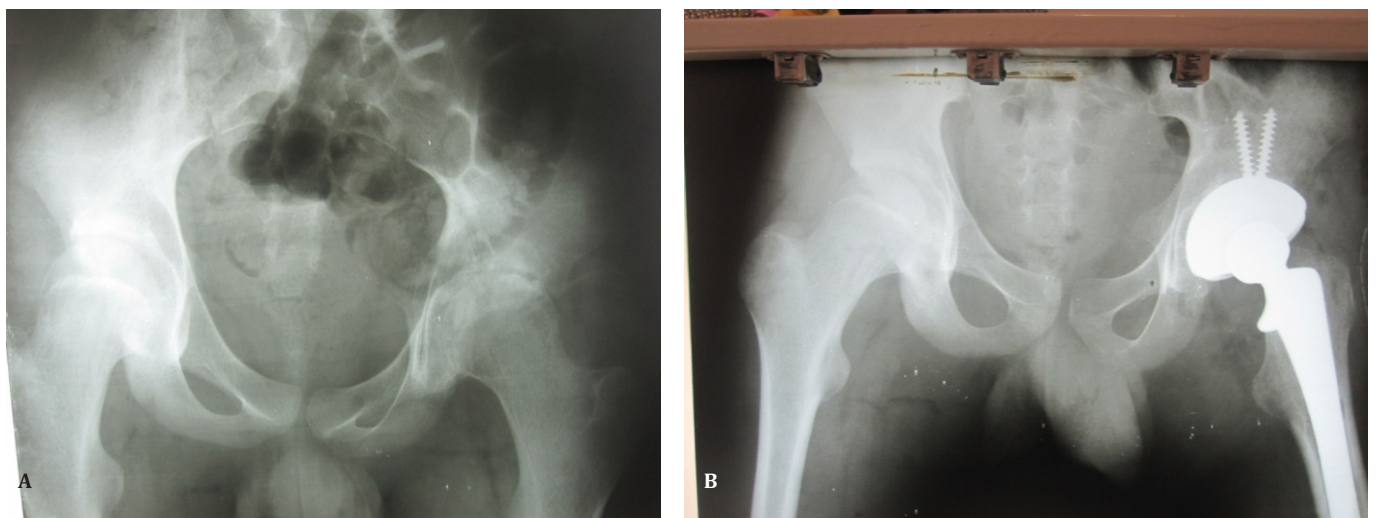


Figure 2. (A) Preoperative anteroposterior (AP) radiograph showing ankylosed hip on the left side. (B) Post-operative X-ray, one year follow-up.

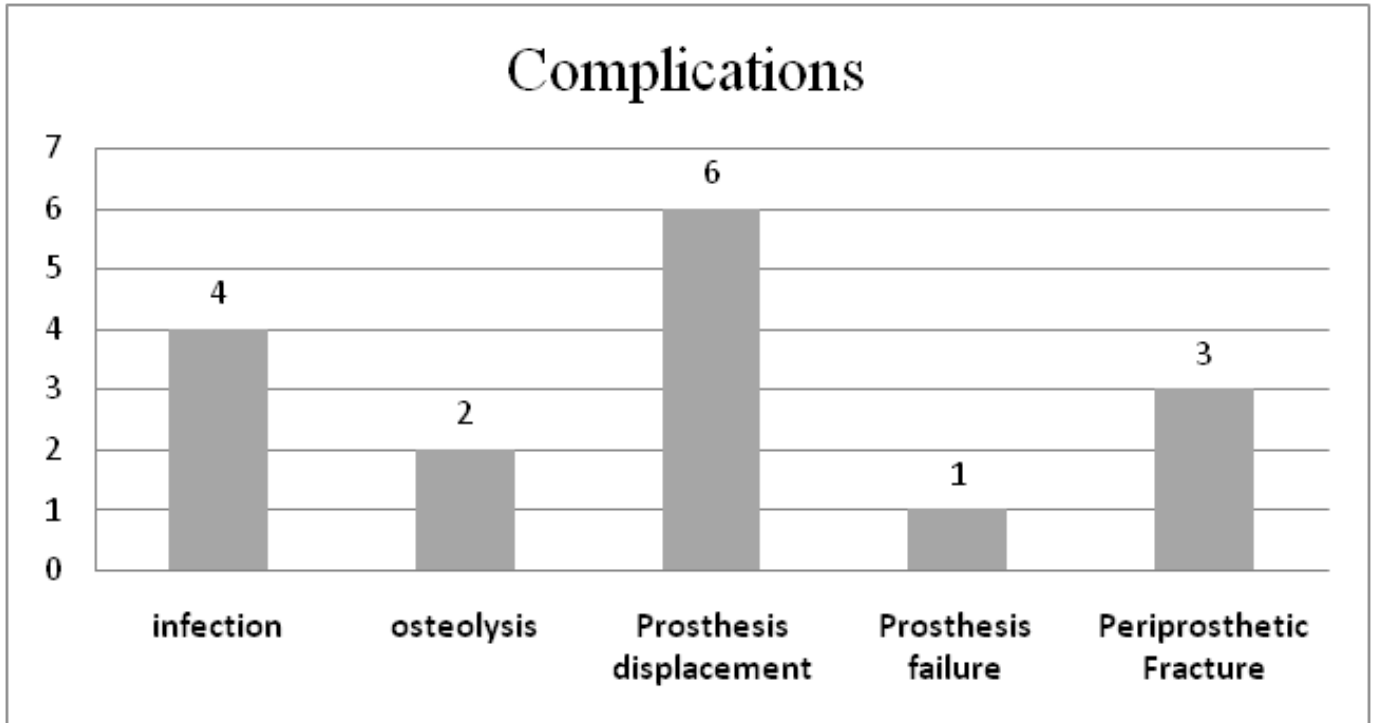


Figure 3. Long term complications in the patients.

each section and then they were judged based on the following categories: excellent (90-100); good (80-89); average (70-79) and poor (less than 70) (13).

Further examination was performed to determine a more exact description immediately after general anesthesia when the patients became relaxed. The color and quality of abductor muscle contraction were assessed during surgery. Type of surgery and prosthesis, osteotomy required for the neck and trochanteric region of the femur, periprosthetic fracture and the need to restore acetabular were also studied.

The patients were monitored after surgery for early postoperative complications (such as fat embolism and hemoglobin decreasing). Other complications such as infection, dislocation, limited range of motion, heterotopic ossification (HO) and shortening were assessed every week up to two months after surgery. The HHS and range of motion were studied at the third, sixth and twelfth month. Analyses were performed using SPSS software for Windows, version 19. The data are presented as proportion, mean and standard deviation.

We used ANOVA, Chi-square, Fisher's exact test and repeated measures for quantitative and qualitative variables. A value of  $P < 0.05$  was considered as significant.

## Results

Seventy-seven patients (42 males and 35 females) with a mean age of  $36.71 \pm 11.78$  years underwent total hip arthroplasty and were followed-up for 12 months (Figure 1).

Most causes of hip joint ankylosis in patients were

elderly osteoarthritis (20 cases) and avascular necrosis (13 cases). Electromyogram and nerve conduction studies showed high and low velocity conduction in 12 and 65 patients, respectively. We used the posterior approach in 55 patients (71.4%) and lateral approach in 22 patients (28.6%). Periprosthetic fracture occurred in two patients and 12 patients needed acetabular reconstruction. Three types of constrained prosthesis were used in this study. Standard prosthesis was used in 64 cases (83.1%) and so it was the most common type of prostheses used. Long Stem and modular prosthesis were used in 10 and 3 cases, respectively (Table 1; Figure 2).

Short-term and long-term complications were studied after surgery. No short-term complication such as fat embolism and hemoglobin decreasing were observed in our patients. Evaluation of long-term complications after surgery showed that 16 patients (20.8%) had complications. Displacement of prosthesis (6 cases; 7.8%) and infection (4 cases; 5.2%) were prevalent long-term complications in the patients (Figure 3).

Three patients due to periprosthetic fractures were excluded six months after surgery. Also, two patients with osteolysis and one patient with device failure were excluded from the study.

We used the HHS and ROM of hip joint measurement to evaluate surgery outcome. These values that were acquired at 3, 6 and 12 months after surgery were compared with the preoperative values. The range of motion of the hip joint was evaluated in different directions before and after surgery. The mean of the

**Table 1. Characteristics of the patients and surgical specificity**

Variable	Data
Age (Mean ± SD)	36.71 ± 11.78
Sex (n=77) (%)	Man
	woman
Hip joint (n=77) (%)	Left
	Right
	Both
	Senile Osteoarthritis
Underlying Disease (n=77) (%)	Avascular Necrosis
	Post traumatic Osteoarthritis
	Dysplasia of Hip
	Ankylosing spondylitis
	Infection
	Rheumatoid arthritis
	Post traumatic device failure
History of Knee Injury (n=77) (%)	Positive
	Negative
History of Spine Injury (n=77) (%)	Positive
	Negative
EMG-NCV (n=77) (%)	Strong
	Weak
Surgical approach (n=77) (%)	Posterior
	Anterior
Acetabular Reconstruction (n=77) (%)	Positive
	Negative
Prosthesis Kind (n=77) (%)	Long Stem
	short Stem
	Modular

HHS of patients before surgery was  $48.53 \pm 6.28$  and it progressed to  $88.22 \pm 3.78$  after 12 month ( $P < 0.001$ ) (Table 2).

### Discussion

In this study, the patients' life changes and joint functions were assessed by the HHS. This Score has three parts. The first part is as follows: questions related to pain, distance traveled while walking, limping, wearing socks and shoes, climbing stairs, sitting and using public transportation. In the second part, differences in limb length and joint movement are assessed. In the third part, flexion, abduction, adduction and external rotation of the hip joint are examined. The final score is the sum of the scores allocated for each part. In this study, the third section was analyzed separately in addition to the overall rating. The HHS survey in patients after surgery compared with before surgery in this study showed

considerable progress has been made in the hip joint function, so that the HHS mean of 45 was elevated to 90 after one year. Kim *et al*'s study in their three year follow-up of patients with bilateral hip joint ankylosis who underwent replacement surgery reported that the HHS mean of 55.4 reached 82.3, which was similar to the data obtained in this study (14). Also, in a survey conducted by He Bangjian *et al*, the HHS of 15.21 before surgery increased to 86.25 post-op (15).

Our results showed that sex and the surgical approach are effective in achieving appropriate treatment outcomes, so women and cases with posterior approach surgery had a higher HHS than others.

In some studies, the status of the gluteal muscles was emphasized before surgery (15-17). In this study, EMG-NCV was performed on all of the patients before surgery and the HHS were explained based on results. Patients, based on the results of EMG-NCV assessment, were

**Table 2. Range of motion of Hip and Harris hip score (Mean ± SD) ( $P < 0.001$ )**

Range of Motion & Harris hip Score	Pre operation (N=77)	3 month after operation (n=77)	6 month after operation (n=71)	12 month after operation (n=68)	P value*
Flexion (°)	2.14 ± 1.71	72.03 ± 5.07	73.70 ± 4.91	92.47 ± 8.14	$P < 0.001$
Abduction (°)	3.92 ± 1.40	8.92 ± 0.79	12.64 ± 1.51	15.89 ± 2.35	$P < 0.001$
Adduction (°)	3.94 ± 1.46	8.90 ± 0.77	8.95 ± 0.76	8.97 ± 0.76	$P < 0.001$
Ext Rotation (°)	3.90 ± 1.50	8.90 ± 0.77	8.95 ± 0.76	8.97 ± 0.76	$P < 0.001$
Harris hip score (points)	48.53 ± 6.28	69.30 ± 11.40	82.93 ± 4.73	88.22 ± 3.78	$P < 0.001$

\* Data were analyzed by Repeated Measures Analysis. P value less than 0.05 was significant

divided into two groups: strong and weak. The HHS in the strong group was higher than the weak group; however, this difference was not statistically significant. EMG-NCV assessment of abductor muscles showed that the patients in the strong group had better function. Similar results were obtained in other studies (14-16).

Also, abductor muscle strength was examined depending on the range of motion of the joint in abduction. The results showed significant difference in range of motion in abduction between the strong and weak groups, in month 6 and 12 after surgery ( $P < 0.05$ ).

Kilgus *et al* examined patients' range of motion in the flexion position and their results were largely consistent with our study (10). In most cases, pelvic muscle strength improved and patients had relief from pain for at least two years after surgery.

Intra- and post-operative complications can affect treatment results. In the present study, age and damage history in the pelvic area were predictive factors for inter- or postoperative complications.

In this study, the overall relative frequency of complications for patients was 20.8% and this was consistent with another study. Kilgus *et al* reported post-operative complications in 9 of 38 patients: sepsis (4 cases), femoral stem loosening (4 cases), acetabular component dislocation (1 case) (10). Kim *et al* operated on 12 patients with two-sided hip ankylosis and reported three cases of femoral stem loosening and two cases of osteolysis (14).

In our study, the most common side effects were prosthesis displacement, infection and periprosthetic fracture. Six and three patients in month 6 and 12 respectively were excluded due to the severity of surgical complications. These complications included: infection (3 cases), periprosthetic fracture (3 cases), osteolysis (2

cases) and prosthesis failure (1 case). Complications in some patients prevented us from using the HHS so they were excluded from the study.

There is a probability of complications in any surgery, but the frequency of these complications is different according to the type of surgery, its complexity and the surgeon's skill level. Moreover, prevention of surgical complications or prosthesis failure can contribute to improved treatment outcomes and consequently improve patient and physician satisfaction.

### Conclusions

According to the findings of the study, total hip arthroplasty in patients with ankylosis can improve hip function. Furthermore, the occurrence of severe complications such as prosthesis failure and osteolysis may cause failure of the surgery and the patient may be at risk of reoperation.

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