Zagazig University Medical Journal
www.zumj.journals.ekb.eg

DOI 10.21608/zumj.2019.11141.1154

ORIGINAL ARTICLE

Short Term Results of Cementless Total Hip Replacement In Patient With Ankylosing Spondylitis

Reda Ahmed Ali Rabha [I]*, Khaled Mohamad Hassan [I], El-Sayed El-Etwey Soudy [I], Mohamed El-Sadek Attia [I]

[I] *Department of Orthopedic Surgery, Faculty of medicine, Zagazig University, Egypt*

[*]**Corresponding author:**
Reda Ahmed Ali Rabha
Department of Orthopedic Surgery, Faculty of medicine, Zagazig University, Egypt
Email:
Redarabha79@gmail.com

Submit Date: 04-04-2019
Revise Date: 08-07-2019
Accept Date: 16-07-2019

ABSTRACT

Background: Ankylosing spondylitis (AS) is a chronic inflammatory disease of unknown etiology which primarily affects the sacroiliac joints, spine, hips and, less commonly, the knee joints, resulting in severe deformities and in combination with a stiff spine, leads to further deterioration in function. Cementless total hip replacement (THR) provides long-term pain relief in a large percentage of (AS) patients. This work aims to evaluate the short-term results of cementless total hip replacement in patients with (AS). **Methods**: A retrospective analysis of12 Ankylosing Spondylitis patients with hips involvement in 15 hips. The right hip was affected 4 patients, the left in 5 patients and bilateral in three patients treated by cementless THR. The patients were assisted clinically by Harris hip score preoperatively & postoperatively. Anteroposterior (AP) both hips X-ray was taken pre-operatively, immediate post-operative period and at follow-up. **Results**: This results showed highly significant improvement in total hip score points from average 25.47 ± 4.67 points(17-32) preoperatively to average 84.47±5.84 points (71- 93) postoperatively. **Conclusion**: The results of cementless THR in patients with AS are encouraging with risk of intraoperative complications needing great care and good perioperative management. Patients were satisfied with the functional outcome. So, the stable ingrowth postoperatively in our research recommends cementless implants in(AS) patients.

Keywords: Total Hip Replacement, Ankylosing Spondylitis

INTRODUCTION

Ankylosing spondylitis (AS) is a chronic inflammatory disease of unknown etiology which primarily affects the sacroiliac joints, spine, hips and, much less commonly, the knee joints [1][2]. The prevalence of AS is commonly believed to be between 0.1% and 1.4% globally; however there are geographic variations. AS typically affects younger adults, most frequently adult males (M:F=3:1) in their second through fourth decades[3][4].Hip involvement appear in 30-50% of patients with AS, and 90% patients amongst those with the affected hips have bilateral involvement.

It is deemed that the younger the age at the onset, the increased is the probability of hip involvement. Male, axial disorder and enthesitis are also considered as danger factors of hip involvement and the need for THR in AS[5]. Hip joint involvement in AS often consequences in extreme deformities and in combination with a stiff spine, leads to further deterioration in function. For patients with fixed kyphotic spinal deformities, hip involvement, and the subsequent development of flexion contractures limits their capability to walk and in addition compromises their posture leading to severe functional impairment in about 30% of patients[4]. Although a trend toward decreased need for hip replacement surgical operation has been proven on account that the introduction of TNF- α inhibitors, AS patients with end stage arthritis often require THR[6].]. Aseptic loosening remains the major cause for revision surgery in patients with AS. Active life-style and inflexible spines in younger patients with AS may be risk factors for increased stress on the prostheses; as a consequence resulting in early aseptic loosening[7][8]. Cementless THR provides

long-term pain relief in a large percentage of AS patients[9].

METHODS

Study design and settings

A retrospective analysis of 12 Ankylosing Spondylitis patients with hips involvement in 15 hips. The right hip was affected in 4 patients, the left in 5 patients and bilateral in three patients treated by cementless THAs was conducted between Dec 2015 and feb 2019 in Orthopedics and Traumatology Department, Faculty of Medicine, Zagazig University Hospital. With the help of a rheumatologist, the clinical diagnosis of AS was made using 1984 modified New York criteria[10]. The main indications for THA in these AS patients included intractable pain that failed to conservative treatment and loss of motion and poor posture that is unable to function independently.

Inclusion criteria

Ankylosing spondylitis patients with mean age of 31(28-48) years old, with loss of motion, poor posture and sever pain at presentation.

Exclusion criteria

Patients with floating hip injuries, patients not fit for surgery and patients with infected hip.

Methods

Preoperative data from archive were collected and from patients were called for outpatient visits for clinical and radiological evaluation.

Assessment

The patients were assed clinically by **Harris hip score**[11],The Harris hip score consists of many items as (pain, limp, support, distance walked, using stairs, squatting, sitting cross legged, using public transportation, absence of deformity and range of motion.

Surgical Technique

Under spinal or general anesthesia, all THAs were performed using Harding lateral approach[12].For patients without hip ankylosis, femoral neck osteotomy was carried out after hip subluxation or complete luxation gently, while for the rest of surgeries, a 2-step in situ osteotomy technique was performed after clearly identifying the boundary between the femoral head and acetabulum. The neck was resected under fluoroscopic guidance. No trochanteric osteotomy was performed. By using the foveal soft tissue as landmark for locating the original joint plane, the true acetabulum was exposed after removal of residual femoral head and surrounding soft tissue. Cementless prosthesis was used in all cases. Intraoperative radiographs and repeated trial reductions were performed to minimize the rate of prosthetic malpositioning. The transverse acetabular ligament and lesser trochanter were used for component orientation.An increased anteversion of the femoral component and a decreased anteversion of the acetabular cup were indicated for internal rotation, and a decreased anteversion of the femoral component and an increased anteversion of the acetabular cup for external rotation deformities. And a reduced inclination of the acetabular cup was indicated for adduction deformity.All layers of the incision were sutured after placing of drainage. Preoperative parenteral antibiotics and prophylaxis for deep vein thrombosis was used in all patients. In addition, these patients obtained oral indomethacin 25 mg three times a day for 14 days for prophylaxis against heterotopic ossification. Patients were mobilized out of the bed the third day after surgery after removal of the drain, and these with unilateral replacement were encouraged to walk non–weight-bearing the use of crutches and perform hip abductor and quadriceps knee exercises.Full weight-bearing were not allowed before 12 weeks.

Radiological evaluation

leg length Discrepancy, the horizontal center of rotation, the acetabular inclination, femoral stem position and assessment the fixation of cementless components.

Data management

Data was collected throughout history, basic clinical examination; laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences **(SPSS version 20.0)**[13]. According to the type of data qualitative represent as number

and percentage, quantitative continues group represent by mean ± SD, the following tests were used to test differences for significance. Differences between quantitative paired groups by paired t test. P value was set at <0.05 for significant results & < 0.001 for high significant result.

Ethical Considerations

Institutional Review Board(IRB) of the Faculty of Medicine, Zagazig University approved the study protocol(No.4381). An informed consent was obtained from all participants of this study and they were told about the aim of the study, and were informed that the data would be used for scientific purposes only.

An informed consent was obtained from all participants of this study and they were told about the aim of the study, and were informed that the data would be used for scientific purposes only. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage , quantitative continues group represent by mean ± SD , the following tests were used to test differences for significance;.. Differences between quantitative paired groups by paired t, . P value was set at <0.05 for significant results & <0.001 for high significant result.

RESULTS

The age of the studied patients ranged from 28 to 48 years old with mean age 40.75 years old. The average time for follow-up was 11 months, ranging from(8 to 14) months. The right hip was affected in 4 cases and the left in 5 cases and bilateral in 3 cases which was operated by lateral approach(Harding). The largest percentage of the studied patients had cup orientation within normal and neutral femoral stem **(Table 1)**.

Intraoperative complications which included avulsion of the greater trochanter in 1 hip(6.7%), and fissure fracture in the area of calcar of the femur in 2 hips (13.3%). Circulage wiring was used for stabilization of these fractures and these fractures healed completely, and did not affect the stem stability. Postoperative complications were seen and included superficial wound infection in 2 hips(13.3%), treated conservatively with parenteral antibiotics and repeated dressing, and sciatic nerve palsy in 1 hip(6.7%). The sciatic nerve injury was in common peroneal part only and recoveredat the final evaluation with ankle foot orthosis was used for six months. There were1 case (6.7%) of dislocation and closed reduction was successful. Heterotopic Ossification was seen in 2 (13.3%) of the patients and it was Brooker grade I ossification in 1 hip, grade II in 1 hip, but this ossification did not lead to reankylosis**(Table 2)**.

Radiolucency of 1 mm of acetabular component was seen in 2 zones in 2 hips (zones 1 & 2 in 1 hip , and zones 2 & 3 in 1 hip) and this lucency was nonprogressive. **Table 3:** showed the anlaytical results of (pain, limp, support, distance walked, Stairs, Put on shoes & socks, Sit cross legged, Range of motion, Use of public transportation and Absence of deformity) showed highly significant improvement in pain (p <0.001) from average Mean(18.67±3.52) points preoperatively to average Mean (37.87 ± 5.1) points posoperatively , highly significant improvement in limping (p <0.001) from average Mean(2 ± 2.53) points preoperatively to average Mean (8.4± 1.06) points postoperatively, highly significant improvement in support(p <0.001) from average Mean (1.93± 0.88) points preoperatively to average Mean (8.87± 2.45) points postoperatively, significant improvement in distance walked (p=0.002) from average Mean(1.6±0.83) preoperatively to average Mean(6.4 ± 3.31) points postoperatively, significant improvement in Stairs (p 0.003) from average(0.47 ± 0.52)points preoperatively to average

Mean(1.73 ± 1.03) points postoperatively, significant improvement in Put on shoes & socks (p =0.002) from average Mean (0) point preoperatively to average Mean (1.73 ± 1.03) points postoperatively , significant improvement in Sit cross legged (p =0.006) from average Mean (0) point preoperatively to average Mean(2.2±2.01) points postoperatively, significant improvement in Range of motion (p =0.004) from average Mean (0.8 ± 0.41) points preoperatively to average (2.4 ± 1.55) points postoperatively, significant improvement in absence of the deformity (P < 0.001) from average Mean (0) point preoperatively to average (3.2 ± 1.66) points postoperatively and significant improvement in Use of public transportation (p=0.014) from average Mean(0) point preoperatively to average Mea (0.4 ± 0.510) points postoperatively . There were statistically improvements in all HHS domains in the studied patients before and after operation **(Figure 1)**.

The analytical result of total points of the Harris hip score and show highly significant improvement in total hip score points (P < 0.001) from average 25.47 ± 4.67 points (17-32) preoperatively to average 84.47±5.84 points (71- 93) postoperatively **(Table 4 & Figure2)**

Table 5: revealed that majority were good 80.0% were excellent13.3% and lastly fair 6.7%

Table 1. Demographic characteristics & side of lesion of the studied patients & distribution of studied limbs

	Mean ± SD	**Range**
Age	**40.75 ± 5.79**	**28 – 48**
	N	**%**
Gender:		
Male	**12**	**100**
Female	**0**	**0**
Laterality of lesion:		
Unilateral left	**5**	**41.7**
Unilateral right	**4**	**33.3**
Bilateral	**3**	**25**
Side of lesions:		
Left	**8**	**53.3**
Right	**7**	**46.7**
Cup orientation:		
Vertical>50°	**1**	**6.7**
Within normal30°-50°	**14**	**93.3**
Femoral stem:		
Neutral	**11**	**73.3**
Valgus	**1**	**6.7**
Varus	**3**	**20**

Table 2. Complication distribution among studied groups

		N	%
Complication	**No**	**7/15**	**46.7**
	Avulsion of greater trochanter	**1**	**6.7**
	Dislocation	**1**	**6.7**
	Fracture in the area of calcar	**2**	**13.4**
	HO	**2**	**13.4**
	Sciatic nerve palsy	**1**	**6.7**
	Superficial infection	**2**	**13.4**

Table 3. Change in HHS score in the studied patients pre and postoperatively

	Preoperative	Postoperative	Wx	p
	Mean ± SD	Mean ± SD		
Pain	**18.67±3.52**	**37.87 ± 5.1**	**t (-10.498)**	**<0.001****
Limb	**2 ± 2.53**	**8.4 ± 1.06**	**-3.482**	**<0.001****
Support	**1.93 ± 0.88**	**8.87 ± 2.45**	**-3.440**	**<0.001****
Distance walk	**1.6 ± 0.83**	**6.4 ± 3.31**	**-3.149**	**0.002***
Stairs	**0.47 ± 0.52**	**1.73 ± 1.03**	**-2.923**	**0.003***
Put on shoes & socks	**0**	**1.73 ± 1.03**	**-3.127**	**0.002***
Sit cross legged	**0**	**2.2 ± 2.01**	**-2.762**	**0.006***
Range of motion	**0.8 ± 0.41**	**2.4 ± 1.55**	**-2.872**	**0.004***
Use of public transportation	**0**	**0.4 ± 0.51**	**-2.449**	**0.014***
Absence of deformity	**0**	**3.2 ± 1.66**	**-3.464**	**0.001****

t paired sample t test
Wx Wilcoxon signed rank test
*p<0.05 is statistically significant
**p≤ 0.001 is statistically highly significant

Table 4. Change in total HHS in the studied patients pre and postoperatively

	Preoperative	Postoperative	t	P
	Mean ± SD	Mean ± SD		
HHS	**25.47 ± 4.67(17-32)**	**84.47 ± 5.84(71-93)**	**-31.601**	**<0.001****

t paired sample t test
**p≤ 0.001 is statistically highly significant

Table 5. Total Result distribution among studied group

		N	%
Result	**Excellent**	**2**	**13.3**
	Good	**12**	**80.0**
	Fair	**1**	**6.7**
	Total	**15**	**100.0**

DISCUSSION

Patients with bony AS need exclusive analysis because these patients present with exceptional features and need THA even in the absence of pain. Several recent reports have demonstrated excellent survivorship of THA in young patients complaining of hip affection in AS with high patient satisfaction[14][15]. Few studies reported on cementless THA in patients with bony hip AS. The major concerns regarding THA in these young

patients involve choice of implants, the technical difficulties of performing THA, ensuring optimum positioning of components, heterotopic ossification, and recurrence of reankylosis, pain, and loss of movements[16].

Indications for THA in these patients are disabling pain, severe deformity, and functional limitation. The preference of implant is in particular essential for long-term fixation and hip function, as well as durability in this particularly young and active group of patients wheredecreased mobility of the spine may additionally result in increased forces at the hip joint[17] .Use of cementless implants with potential for biologic ingrowth can also increase thelongevity and decrease failure rates in particular in younger patients [18].Significant debate has focused on the superiority of cementless or cemented components in AS patients[18][19][20][21]. Some authors have indicated that cemented prostheses may be advantageous in AS patients, as the serious osteoporosis typically observed in affected patients makes it difficult to achieve sufficient osseointegration between bone and prosthesis[14][15]. In contrast, proponents of a cementless component suggest that bone ingrowth will increase the lifespan of the implant, and reduce the difficulty of future revisions necessary in the young AS population[19][20].

Some technical details should be in mind during surgery. Both patient as properly as component positioning is extraordinarily difficult and error prone. External rotation deformity of the femur and exaggerated femoral anteversion provide special problems. In patients with external rotation deformity sacrificing 2 to three mm of the posterior acetabular wall, dissecting anterior to the abductors or performing the neck osteotomy under image intensifier control with patient in supine position are some of the choices available. Often, the bone is osteoporotic due to disuse, and overreaming can also compromise the acetabular bone stock. Great effort must made to depart a spike of bone at the superolateral acetabular margin, and this was preserved during the reaming as it supplied purchase to the cementless cup[17] . **Tang and Chiu**[14] have suggested the hyperextension at the hip in patients with AS, which is evident as the exaggerated longitudinal dimensions of the obturator foramen on plain standing radiographs. They postulated that this anatomic abnormality may also lead to greater anteverted and vertical inclination of the acetabular cup, which may additionally predispose the prosthesis to anterior dislocation.

This study agree with the findings of these authors and dislocation of the hip occurred in one patient of our patients was anterior.. Other reasons for the tendency of these prostheses to dislocate anteriorly may be abnormal, exaggerated femoral anteversion often seen in these patients as well as frequently preexistent external rotation deformity with the contracture of soft tissues. In our work, measuring the femoral anteversion preoperatively was not practical in the present study because of deformities of the hips bilaterally prevented positioning of the patients in CT scan. Aggressive correction of leg-length discrepancy may put the patient at risk of nerve damage. It is generally recommended that limb lengthening should be not more than 4 cm to avoid this complication[22]. In our retrospective review, there were 1 case (6.7%) of nerve damage, successfully treated conservatively. AS patients may be at additional risk for nerve damage due to the increased dissection necessary to correct the soft-tissue adhesions secondary to the disease[18].

About 40% to 76% High rates of heterotopic ossification have been reported in the patients with AS[17][19][22][23]. Presence of bony ankylosis can also point out further propensity to form excessive

bone because high rates of heterotopic ossification (65%-100%) have been mentioned after a second procedure when heterotopic bone developed after the arthroplasty of the first hip[24][25]. class III and IV Heterotopic ossification, which denote clinically important portions of bone, has been mentioned in 11% to 36%.

In the current study heterotopic ossification was seen in **2** hips(13.3%) of the patients and it was Brooker grade I ossification in **1** hip, grade II in **1** hip, but this ossification did not lead to reankylosis. We believe that the lower overall incidence of heterotopic ossification in this study would possibly be due to the prophylactic therapy for heterotopic ossification given to all patients. 2 weeks' duration of prophylaxis Indomethacin was selected because minimum side effects with short duration of prophylaxis, and it is cost-effective[26].

In the current work we mentioned progressive loss of range of motion without any evidence of heterotopic ossification in two patients but without reankylosis. We recommend that the surrounding capsule and muscular tissues around these hips gradually turn out to be nonpliable, which may be a precursor for reankylosis It is important to follow up the patients more time and asking about possible loss of motion and even reankylosis.

In the current study we depend mainly on clinical assesment(Harris hip score) due to short period duration of follow up only 2 years up to 3 years and the radiological assessment needs long period duration of follow up to detect changes in vertical or horizontal center of rotation, in inclination angle of acetabular component, or appearance of significant lucency.

From the results obtained, it was demonstrated that there is marked improvement in relieving pain, decreasing the severity of limping, increasing the duration of walk, increasing the ability of walk without crutches, increasing the abilities in using public transportation, using the stairs and putting the shoes alone and finally increasing the range of motion of the hip joint, and there is highly significant improvement in the total points of the Harris hip score($P<0.001$) from average31.60 points(17-32) preoperatively to average 83 points (71- 93) postoperatively.

The main limitations of this research are as follows: first, the length of follow-up may have been too short(range 25to36) months Second, the number of cases might be too small 12 Patients (15THAs), although the completeness of all clinical and radiographic data supports the findings of our study. Furthermore, our findings should be further validated using a well-powered prospective study.

CONCLUSION

The results of cementless THR in patients with AS are encouraging with risk of intraoperative complications needing great care and good perioperative management. Patients were satisfied with the functional outcome. So, the stable ingrowth postoperatively in our research recommends cementless implants in AS patients.

Conflict of Interest: Nothing to declare.
Financial Disclosures: Nothing to declare.

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Rabha, R., elsadek, M., soudy, E., HASSAN, K. (2019). Short Term Results Of Cementless Total Hip Replacement In Patient With Ankylosing Spondylitis. *Zagazig University Medical Journal*, Jully. 2020 Volume 26 Issue 4 (534-541), -. doi: 10.21608/zumj.2019.11141.1154