

The initial results of ankylosing spondylitis treatment by total hip arthroplasty

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Summary

Objective: To evaluate the initial results of ankylosing spondylitis treatment by total hip arthroplasty. **Subject and method:** This is a clinical descriptive study, with vertical follow-up and no control group study. 10 male patients with ankylosing spondylitis including 13 hips were operated with non-cemented total hip arthroplasty at the Joint Surgery Department of 108 Military Central Hospital from May 2018 to May 2022. The age range was 21 to 58 (average 35.6). The mean follow-up period was 33 months (ranged from 6 to 56 months). **Result and conclusion:** Complications include: 1 case of femoral neck fracture, 8/13 cases of thigh pain 12 months after operation, 3 cases of leg-length discrepancy, 2 cases of heterotopic ossification, 1 case of rapid subsidence. The average score according to the Merle d'Aubigné-Postel scale improved significantly (17.55 ± 0.76 points after 12 months compared with 2.33 ± 1.15 points before surgery, $p < 0.05$).

Keywords: Ankylosing spondylitis, total hip arthroplasty.

1. Background

The chance of Ankylosing spondylitis (AS) patients with peripheral hip injuries was high, 26% at onset stage, 96% at prodromal stage [1]. Peripheral hip lead to complications such as severe pain, limited or complete loss of motor function, disabling patients' movement and turning them into burden of the society.

Hip arthroplasty restores the function, consequently improve the quality of life for AS patients with peripheral hip injuries [2]. To review and enhance the quality of treatment, our objective is to *evaluate the initial results of ankylosing spondylitis treatment by total hip arthroplasty*.

2. Subject and methodology

2.1. Subject

10 male patients who suffered from AS (Exclude cases of progressive ankylosing spondylitis). 13 hips

underwent total hip arthroplasty using cement-less cup from May 2018 to May 2022 at the Joint Surgery Department of 108 Military Central Hospital.

2.2. Method

This is a clinical descriptive study with vertical follow-up and no control group study.

2.3. Research criteria

Complications during surgery

Femoral fracture, ilium fracture, deep vein thrombosis.

Early complication

Bleeding, infection, dislocation, sciatic nerve injury.

Late complication

Loosening protheses, hip pain and femoral neuralgia, bone resorption, heterotopic ossification.

Hip function assessment

Hip function assessment according to Merle d'Aubigné-Postel was based on three criteria: Intensity of femoral pain, ROM, cup stability. Classification was based on the following score range: 17-18 points: Excellent, 15-16 points: Good, 10-12 points: Average, ≤ 9 points.

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Merle d'Aubigné-Postel score was used to assess and compare at pre-op checkpoint and 3, 6, 12 and 24 months after operation.

Quality of life assessment using SF-12

This is a tool to assess the quality of health comprised of 12 closed-end question to assess the quality of life, both on physical and mental health.

SF-12 score was used at pre-op checkpoint and 3, 6, 12 and 24 months after operation.

2.4. Data handling and analysis

Data was handled using SPSS 16.0 software to calculate the actual statistics: Mean, standard deviation and quantity correlation.

The value $p < 0.05$ was considered to be a statistical significance.

3. Result

All patients were male. Age at the time of operation ranged from 21 to 58 years old (mean was 35.6 ± 13.7 years old).

The follow-up period ranged from 6 to 56 months (mean was 33.8 ± 18.6 months).

13 hips with followed-up period of 6 months after operation, 12 hips with followed-up period of 12 months after operation, 11 hips with followed-up period of 24 months after operation.

3.1. Complications during surgery

Femoral fracture: 1 case.

Ilium fracture, deep vein thrombosis: none.

3.2. Early complication

In our study, no early complications such as bleeding, infection, dislocation, sciatic nerve injury were encountered.

3.3. Late complication

Table 1. Late complication

Late complication	Number	Total
Femoral neuralgia (T3)	8	13
Stem subsidence (T3)	1	13
Limb-length discrepancy	3	13
Heterotopic ossification (T24)	2	11

Femoral neuralgia were the most common complication three months after operation (8 cases). Additionally, 3 cases suffered from limb-length discrepancy, 2 heterotopic ossification, 1 stem subsidence. No case suffered from loosening protheses and iliac or bone resorption.

3.4. Hip function assessment

Hip and femoral Pain intensity assessment using Merle d'Aubigné-Postel.

Table 2. Hip and femoral pain intensity

Checkpoints	Pain intensity				Total
	No pain	Mild pain	Moderate pain	Severe pain	
Pre-op	2	2	7	2	13
3 months	5	3	5	0	13
6 months	9	2	2	0	13
12 months	11	1	0	0	12
24 months	10	1	0	0	11

Significant differences in pain intensity were found at pre-op, 3, 6 and 12 months after operation checkpoints with $p < 0.05$. No differences in pain intensity were found at 12 and 24 months after operation checkpoints with $p > 0.05$.

Hip ROM assessment using Merle d'Aubigné-Postel

Table 3. Hip Range of Motion

Hip ROM	< 35°	35° - 50°	50° - 70°	70° - 90°	≥ 90°	Total
Pre-op	11	1	1	0	0	13
3 months	0	1	2	4	6	13
6 months	0	1	1	4	7	13
12 months	0	0	1	4	7	12
24 months	0	0	1	4	6	11

Significant differences in mean ROM at pre-op and 3 months after operation checkpoints with $p < 0.05$. No differences in ROM at 3 months after operation checkpoint compared to later checkpoints were statistically significance with $p > 0.05$.

Mean of movement ability assessment using Merle d'Aubigné-Postel

Table 4. Mean of movement ability assessment

Checkpoints	$\bar{X} \pm SD$	Min-Max	Total
Pre-operation	2.2 ± 1.79	0-5	13
3 months	5.4 ± 3.2	4-7	13
6 months	6.8 ± 0.9	5-7	13
12 months	6.79 ± 0.39	5-7	12
24 months	6.5 ± 0.5	5-7	11

The mean of movement ability pre-operation was 2.2 ± 1.79 (0-5 points), 24 months after operation was 6.5 ± 0.5 (5-7 points).

Mean of hip function using Merle d'Aubigné-Postel

Table 5. Mean of hip funtion

Checkpoints	$\bar{X} \pm SD$	p	Total
Pre-operation	2.33 ± 1.15		13
3 months	15.11 ± 0.81		13
6 months	16.26 ± 0.82		13
12 months	17.55 ± 0.76		12
24 months	17.45 ± 0.33		11
3-10 months	13.55 ± 2.32	<0.05	
6-3 months	2.25 ± 0.66		
12-6 months	2.32 ± 1.35		
24-12 months	0.41 ± 0.15	>0.05	

Significant differences in hip movement at 3 months, 6 months and 12 months compared to earlier checkpoints were found with $p < 0.05$. No differences at 24 months after operation checkpoint were found compared to 12 months after operation checkpoint, with $p > 0.05$.

Hip function assessment using Merle d'Aubigné-Postel

Table 6. Hip function general assessment

Results	Checkpoints				
	Pre- operation	3 months	6 months	12 months	24 months
Very poor	12	0	0	0	0
Poor	1	0	0	0	0
Moderate	0	1	1	1	1
Good	0	4	3	3	1
Excellent	0	8	9	8	9
Total	13	13	13	12	11

Pre-operation: 12/13 very poor, 1/13 poor. 12 months after operation, 11/12 at good and excellent condition, 1/12 at moderate condition.

3.5. Quality of life assessment using SF-12

Quality of life score using SF-12

Table 7. Quality of life score (n = 10)

Checkpoints	X ± SD	Min - Max	p	
Pre-operation	25.05 ± 2.99	24-31	<0.05 (3 months-pre- operation)	
3 months	40.06 ± 2.64	33-44		> 0.05 (6 months-3 months)
6 months	42.12 ± 2.59	35-46	<0.05 (12 months-6 months)	
12 months	42.40 ± 2.66	35-46		> 0.05 (24 months-12 months)
24 months	42.07 ± 2.85	35-46		

With $p < 0.05$, differences in quality of life using SF-12 in comparisons: 3 months post-operation compared to pre-operation, 12 months post-operation compared to 6 months post-operation were found. No significant differences in comparisons: 6 months post-operation to 3 months post-operation, 24 months post-operation to 12 months post-operation with $p > 0.05$ were found.

4. Discussion

4.1. Complications during surgery

In our study, 1 case suffered from femoral neck fracture. This 18-year-old patient suffered from IV grade BASRI - h left hip injury, grade C femur during rasping process due to thin cortical. The femoral neck in this case was stabilized using cerclage. During follow-up, the hairline fracture recovered well and did not affect the function of cup.

Complications such as cracked iliac, embolise or anesthetic complication were not encountered. According to Hatim Abid (2014), 2 case were diagnosed with deep vein thrombosis among 61 hips (15 non-cemented, 46 cemented cups) [4], Wanchun Wang (2014) had 3/26 cases with neck and shaft femoral fracture.

AS patients tend to have bone degradation and osteoporosis which lead to femoral fracture during surgery. Some patients were born with the disease which caused deformities in the femoral neck, resulting in incompatibility with normal cup, therefore caused femoral neck fracture during the rasping process.

4.2. Complications after surgery

In our study, early complications such as bleeding, infection, dislocation and sciatic nerve injury were found.

Late complications include: 8 femoral neuralgia, 3 limb-length discrepancy, 2 heterotopic ossification, 1 stem subsidence.

Femoral neuralgia was the most commonly researched complication by surgeons. This complication directly affects the motor function of cups, therefore affect the patients' quality of life post-operation. 3 months after operation, among 13 cups being operated, 8/13 cases had femoral neuralgia. Patients felt mild pain when walking or during change of climate. 5 cups had moderate pain which occasionally were treated with painkillers. The chance of no pain pre-op was 2/13, 3 months after operation was 5/13. This chance increased at 6 and 12 months after operation checkpoints, to 9/13 and 11/12, respectively. This had statistical significance with $p < 0.05$, but caused no differences at 12 and 24 months after operation checkpoint with $p > 0.05$. Therefore, it can be concluded that along with the recovery of function, the pain intensity was reduced, though did not completely disappear. It can be explained that the initial stabilization of the cup was on a degraded femur, this led to higher chances of femoral neuralgia at 3 months after operation checkpoint. After that, the bone recovery process created a biological stabilization, reducing the chance of femoral neuralgia at 12 months after operation checkpoint.

Higher chance of heterotopic ossification had been widely acknowledged among AS patients who underwent total hip arthroplasty. This explained the ossification of soft tissues around the hip, which was an unique characteristic of AS. The higher chance of heterotopic ossification was reported in studies of authors such as Mark R. Brinker (1996): 43% (5/13 hips at I and II stage) [3]; Jiss Joseph Panakkal (2014): 14.8% during the mean time of 6.3 years (ranged 1 - 10 years) in a total of 47 hips [5]; Hatim Abid (2014): 4.92% (3/61 hips) [4]; Wanchun Chang (2014): 26 cups during mean time of 128.4 months: 11.5% stage I and II [7]. In our study, heterotopic ossification occurred to 2/11 cups, both at stage I and II.

Stem subsidence was found in a young patient (19-year-old), femur type C, after six months showing no sign of extra subsidence. 3 cases with limb-length discrepancy (17-year-old patient, C

grade femur; 43-year-old patient, B grade femur with peripheral knee injury and spinal deformities).

4.3. Hip function

The movement of cup was one of the determinant factors of the surgery. The larger the ROM was, the better the movement of patients would be. When the ROM of cup is over 90° , patients can normally perform tasks and move around.

In our study, 12 months after operation checkpoint, 7/12 cups had the ROM over 90° , 11/12 had moderate ROM (over 70°). The differences can be considered statistical significance with $p < 0.05$. The differences of mean ROM at 3 months after operation checkpoint and pre-op were considered statistical significance with $p < 0.05$. The differences in mean ROM at 3 months after operation checkpoint and later checkpoints did not mean a statistical significance with $p > 0.05$, meaning that there was not significant improvement to the ROM later. It can be explained that since the injuries caused by AS to the soft tissues had been calcified, other injuries in spine, iliac and femur would be left unimproved.

The initial assessment of cup function using Merle d'Aubigné-Postel was as followed: 12/13 in Very Poor pre-op, 1/13 Poor, mean was 2.33 ± 1.15 . At 12 months after operation checkpoint: 11/12 in Good and Excellent condition, 1/12 at Moderate, no cups were at Poor and Very Poor condition, the mean score was 17.55 ± 0.76 points.

According to Hatim Abi (2014), the mean score was 16.57, 90% were in Good and Excellent condition [4], which was the same with Mark R. Brinker (1996) [3]. According to Jian Li (2013), among 76 operated cups, 88.37% were in Good and Excellent condition [9]. Therefore, the results were similar to other studies with positive initial outcome.

4.4. Quality of life

Hip arthroplasty improves the motor function of patients diagnosed with hip injuries and AS. In chronic phase, AS patients suffered from severe pain and loss of hip motor function, or even bedridden. Hip arthroplasty helps improve the motor function,

thus enhance the quality of life on both physical and mental aspects.

We evaluated the change of life quality using SF-12 pre-op and post-op. The mean pre-op was 25.05 ± 2.99 (ranged 24-31) points, 3 months after operation: 40.06 ± 2.64 (ranged 33-44) points, statistical significance with $p < 0.05$. The quality of life also enhanced at 12 months after operation checkpoint with $p < 0.05$, however, no differences were found at later checkpoints with $p > 0.05$.

Hip arthroplasty can be a major change to Ankylosing spondylitis patients with hip peripheral injuries, enabling them to move normally again. The most noticeable change was the change on the mental aspect. Patients before surgeries were often desperate with their situation. It can be explained that most of them are male, diagnosed with the disease since young age. The loss of motor function caused by AS turned them into burdens of their families, which negatively impacted their mentality. After undergoing hip arthroplasty, patients were able to move at their will, taking the role of the men of their families to work like others.

5. Conclusion

In our study with 13 hips underwent total hip arthroplasty from May 2018 to May 2022, the mean follow-up time was 33.8 ± 18.6 months. We come up with the following conclusions:

Complication during surgery 1 femoral fracture, did not affect the hip function.

The most common complication was femoral neuralgia at the 3 months checkpoint, occurred to 8/13 cases.

ROM pre-operation: All had the range of motion under 70° , 11/13 had ROM under 35° . At 3 months checkpoint: 6/13 cups had ROM over 90° , 10/13 cups had ROM over 70° .

The hip function was assessed using improved Merle d'Aubigné-Postel, the mean score pre-operation was 2.33 ± 1.15 points, 12 months after operation was 17.55 ± 0.76 points (statistical significance with $p < 0.05$).

Quality of life assessment using SF-12, the mean score pre-operation was 25.05 ± 2.99 (ranged 24-31

points), 3 months after operation was 40.06 ± 2.64 (ranged 33-44 points) (statistical significance with $p < 0.05$).

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