

Long-term results of treatment for avascular necrosis of femoral by using Spiron-short stem total hip replacement

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Summary

Objective: To evaluate long-term results of treatment for avascular necrosis of femoral head in late stages by using Spiron total hip replacement. **Subject and method:** From 2012 to 2016, 68 patients who are not older than 50 with stage IV, V, VI of avascular necrosis (According to Steinberg classification) were treated by 90 Spiron hips replacement in the Institute of Trauma and Orthopedic - 108 Military Central Hospital. Study method: Prospective, cross-sectional description, longitudinal, no-controls. **Result:** Harris score pre-operative was 45.2 ($\pm$ 2.4) points. The average time follow-up was 52.3 months, the shortest was 24 months, the longest was 73 months, average Harris score at the last time examination was 89.6 ($\pm$ 2.5). The results included: 63.3% hips were excellent, 24.4% were good, 10.0% hips were average, and 2.3% hips were poor. **Conclusion:** Treatment for avascular necrosis of femoral head by using Spiron total hip replacement provided good results with average time follow up.

Keywords: Spiron short stem, avascular necrosis of femoral head.

1. Background

Recently, short stem artificial hip joint for first hip replacement surgery has been used in young patients as a solution to reduce the difficulty of revising hip replacement. In 1999, in Germany, Birkenhauer B. created a new type of short stem total hip replacement called the Spiron total hip replacement [1], which was fixed in femoral neck. We perform this study with the following objective: *To evaluate long-term results of treatment for avascular necrosis of femoral head in late stage by using Spiron total hip replacement.*

2. Subject and method

2.1. Subject

Subject of the study: 68 patients were treated with 90 Spiron hips replacement at the Institute of

Trauma and Orthopedic - 108 Military Central Hospital from February 2012 to July 2016.

Selection criteria: Patients who are from 18 - 50 years old with stage IV, V, VI of avascular necrosis of femoral head (According to Steinberg classification). The shape and quality of femoral neck is good and not deformed, the magnetic resonance imaging (MRI) from the femoral neck has no focal necrosis.

Exclusion criteria: Remove patients with follow-up time of less than 24 months, no medical records or no follow-up appointment.

2.2. Method

Prospective, cross-sectional, longitudinal, no-control study.

2.3. Evaluation of result

We examined and assessed hip function based on Harris W.'s scale 100. Evaluation time: Preoperative, 3-month postoperative and final examination. The results are classified into four

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categories: Very good (90 - 100 points), good (80 - 89 points), average (70 - 79 points), poor (< 70 points).

The data was input and processed by program SPSS 15.0, calculated on average ($\bar{X}$), standard deviation (SD), and p-value.

3. Result

3.1. Common ground

The mean age of the study group was 41.3 years old, the oldest was 50, the youngest was 25 and the group from 41 - 50 years old accounted for 59.7%.

Only two patients were under 30, accounted for 2.9%. The ratio of male to female was 34 : 1. We mostly had stage IV injury which accounted for 46.7%, stage V with 44.4%, stage VI only made up of 8.9%.

Surgical position: There were 22 patients having surgery on both sides, accounting for 32.4%. Among those patients, there were two patients had both sides replacement at one-time case surgery. Among 46 patients having surgery on one side, there were 20 patients on the right (29.4%) and 26 on the left (38.2%).

Table 1. Preoperative Harris Hip Score by stage of the lesion (n = 90)

Stage	IV (1)	V (2)	VI (3)	$\bar{X} \pm SD$
Harris Hip Score	48.3 $\pm$ 2.2	44.2 $\pm$ 2.1	41.0 $\pm$ 2.1	45.2 $\pm$ 2.4
p	p<0.05			

Comment: Harris scores decreased with the increasing of lesion stages. The conflict had statistical significance with p<0.05. The average preoperative Harris hip score was 45.2 points.

3.2. Features of artificial joints

3.2.1. Features of acetabulum

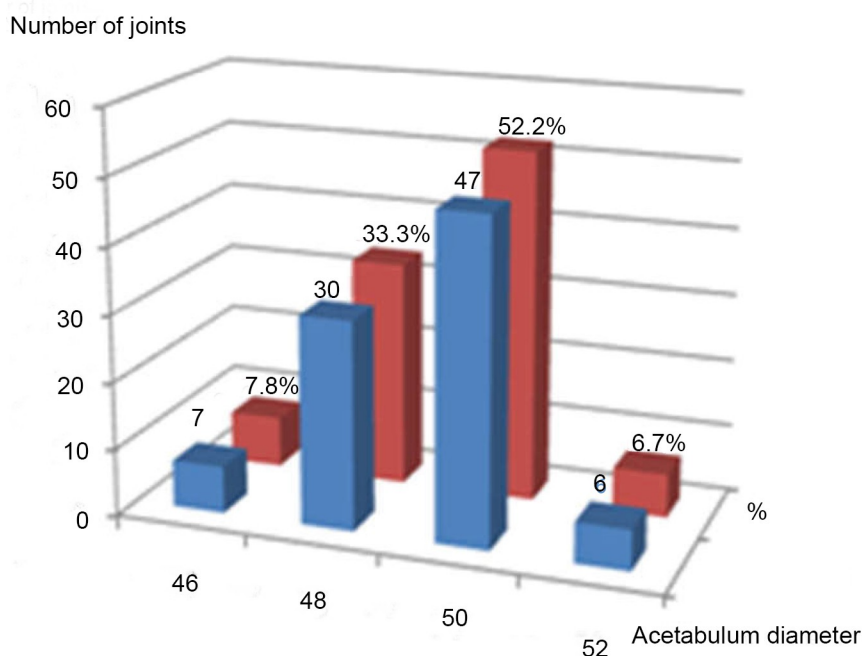


Figure 1. Acetabulum diameter (n = 90)

Acetabulum had four sizes: 46, 48, 50 and 52mm, in which the 50mm diameter was the most commonly used with 47 joints, accounting for 52.2%. The 52mm diameter was the least commonly used with 6 joints, accounting for 6.7%.

3.2.2. Features of stem

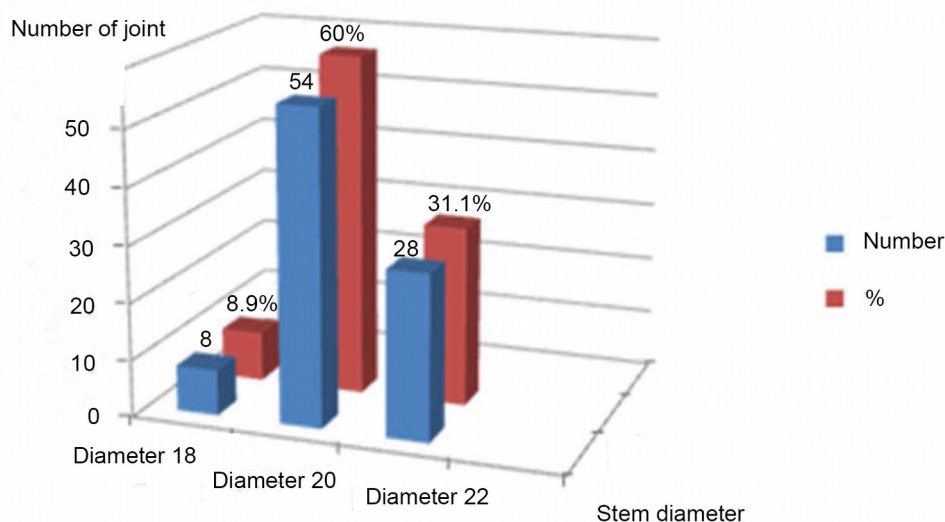


Figure 2. Stem diameter (n = 90)

Stem diameter had 3 types: 18, 20, 22mm. The most commonly used stem was diameter 20 with 54 joints, accounting for 60%.

Table 2. Length distribution of stem (n = 90)

Stem length (mm)	45	50	55	60	Total
Number of joints	28	49	11	2	90
Proportion %	31.1	54.4	12.2	2.3	100

Stem length had 4 sizes: 45, 50, 55, and 60mm. 50mm stem was the most commonly used with 54.4%. There were 63 stems which cover with Bonit accounting for 70.0%, 27 stem of non-covered Bonit accounting for 30.0%.

3.3. Surgical results

Time distribution for patients on final examination as following:

Table 3. Quantity distribution of joints on final examination (n = 90)

Time (month)	24 - (< 36)	36 - (< 48)	48 - 73	Total
Joints				
Number	2	12	76	90
%	2.3	13.3	84.4	100
Average	$\bar{X} = 52.3$, SD = 11.4			

The average follow-up time was 44.5 months, the shortest was 24 months, and the longest was 73 months. There were 78 cases in which follow-up time was more than 48 months, accounting for 84.4%.

Table 4. Long-term results classification according to Harris (n = 90)

Classification	Joints	Number	Proportion (%)
Very good		57	63.3
Good		22	24.4
Average		9	10.0
Poor		2	2.3
Total		90	100

According to Table 4, there were 57/90 joints classified as of very good, accounting for 63.3%, 22/90 good, accounting for 24.4%, 9/90 average making up 10.0% and 2/90 poor with 2.3%.

Table 5. The relationship between outcome and disease stage (n = 90)

Result	Stage	IV	Rate (%)	V	Proportion (%)	VI	Rate (%)
Very good		28	49.1	27	47.4	2	3.5
Good		8	36.4	10	45.5	4	18.1
Average		5	42.8	2	28.6	2	28.6
Poor		1	50.0	1	50.0	0	0.0
p	>0.05						

The group which had very good result in stage IV accounted for the highest number of patients (In 57 very good joints, group IV had 28 joints (49.1%), in 42 joints of group IV had 28 very good joints (66.7%). Group VI had the least number of very good patients (2/57 very good patients, 2/8 patients of group VI). The difference in results among the groups had no statistical significance with $p > 0.05$.

Table 6. Comparison of Harris score on final examination with postoperative and preoperative

Time	Preoperative (1) (n = 90)	Postoperative (2) (n = 90)	Final examination (3) (n = 90)
Harris score			
$\bar{X} \pm SD$	45.2 $\pm$ 2.4	92.1 $\pm$ 2.1	89.6 $\pm$ 2.5
p	$p_{1-2} < 0.001, p_{1-3} < 0.001, p_{2-3} > 0.1$		

Harris score on final examination was higher than the preoperative one, the difference had statistical significance. Harris score on long-term result was lower than postoperative, but this difference had no statistical significance.

In addition:

There was no case of late bacterial infection, deep venous thrombosis, cracking, and ruptured

femoral neck. There were not any case of hip fracture.

There were 4 cases of common peroneal nerve injury, 3/4 of which were completely recovered. Yet one case of light numbness in instep was 38-month postoperative.

There were 15 cases with light fringe around the stems in the X-ray film on the last examination,

accounting for 16.7%, 12 of which were over 2mm of displaced stems, accounting for 13.3%. All of the 12 cases were medical angulation of distal fragment.

4. Discussion

In Germany, Birkenhauer B (2003) [1] replaced 38 Spiron hip prosthesis implants for 34 patients, Harris score in the preoperative time was 51 (24 - 76), after one year follow-up of 20 patients, Harris score was 94 points (86 - 100). Lugender A (2012) [3] replaced 28 Spiron hips for 26 patients, Harris score was 55.4 before surgery, after 3 months of testing was 90.5 points.

In Vietnam, from 8/2011 to 5/2013, Nguyen Van Thach (2013) [4] replaced 26 Spiron hip joints for 22 patients with excellent and good results (97.2%). Bui Hai Nam (2015) [5] studied 60 Spiron hip joints, an average of Harris score was 58.78 ± 8.87 before surgery. After an average follow-up of 21.31 months, Harris scores increased to 89.37 ± 6.73 , 98.3% of patients have good and very good results.

Therefore, during short-term follow-up, Spiron joints had a good results, however, these studies only had a small quantity of patients with short follow-up time. There have been no studies on the outcomes of short stems hip replacement with longer follow-up time.

We studied on 90 Spiron hip joints, Harris score was 45.2 ± 2.4 before surgery and increased to 92.1 ± 2.1 after surgery. At the last examination (average was 44.5 months), Harris score was $89.6 (\pm 2.5)$. Specifically, there were 57/90 excellent joints (63.3%), 22/90 good joints (24.4%), 9/90 medial joints (10.0%), 2/90 bad joints (2.3%).

Because of the different age of patients studied, kind of diseases, patient caring conditions, it is difficult to accurately compare our results with the authors. But clearly, our research has good result.

Nevertheless, compared with average follow-up time which was 27.5 months (on 92 Spiron joints) [6], the rate of very good patients significantly reduced (from 77.78% to 63.3%), the number of

medial and bad patients increased. At average follow-up time of 27.5 months, there was 3.33% of medial type, 0% of bad type. At an average follow-up time was 44.5 months, there was 10.0% of medial type, 2.3% of bad type. At an average follow-up time of 27.5 months, there were two cases that had to be replaced soon (2.17%) [6]. From that time until the average follow-up which of 44.5 months, there are no cases requiring hip replacement surgery.

There are 15 cases of having light around the joints in the X-ray film at the time of final examination, (16.7%), among which 12 cases of joint displacement more than 2mm (13.3%) (at an average follow-up time of 27.5 months, the rate was 8.89% [6]), all of which were angulations. The phenomenon of arthrokata-dysis and medical angulation of distal fragment is very noticeable for short stem. In 2013, Banerjee S [7] reported on the medical angulation of distal fragment rate in general which is 1.4% (0 - 7%). Based on the outcomes of using Spiron total hip replacement, Stulberg SD [8] concluded that the rate of angular complications was higher; this was a particular concern for short-term hip replacement. However, it has not been shown to affect clinical results. Short stem total hip replacement lacks the extension to the diaphysis. Therefore, it is impossible to facilitate the exact orientation of the stems. In the future, it is necessary to study and create a tool to reduce this relatively high angulate fragment rate. Lastly he wrote: "Short stem total hip replacement with no cement cannot avoid complications, such as: Medical angulation of distal fragment, arthrokata-dysis, and fragment around stems as all other joints. However, it's essential to study further for the rate and causes of the complication. Finally, follow-up time is needed to assess the fatigue life of the stem [8]. Hence, our medical angulation of distal fragment rate is higher than other cases and increases with follow-up time. It is needed to monitor closely. Therefore, it is important to observe the medical angulation of distal fragment rate with short stem total hip replacement time.

5. Conclusion

Based on a study of 90 Spiron hip joints, an average follow-up time of 44.5 months, we concluded:

Harris's score was 45.2 (± 2.4) before surgery. At the final examination time Harris's score was 89.6 (± 2.5). The rate: Very good (63.3%), good (24.4%), average (10.0%), weak (2.3%).

4 cases of common peroneal nerve injury, 3/4 of which were completely recovered, 15 cases (16.7%) had bright edges around the joints, in which 12 cases of displacement of the joints more than 2mm (13.3%), all of which were angulations. The rate of angulate fragment rate increased time by time which require attention to these cases and this rate in the future.

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