Investigation of functional and radiographic results and complications in patients with type A2 intertrochanteric fracture who underwent different surgical approaches in Shahid Madani Hospital, Karaj

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ABSTRACT

In this study, we intend to compare the functional, radiographic, and postoperative complications using different surgical approaches in patients with type A2 intertrochanteric fractures who underwent surgery in 1400 at Karaj Madani Hospital.

This study was conducted as a retrospective cohort. Demographic information, type of surgery and fixation device, functional results including joint range of motion and weight bearing of the patient were recorded using Harris Hip Score. Complications after surgery were also considered, including the rate of infection, failure and non-union after surgery. The patients were followed up at intervals of 6 weeks and 3 months later. Statistical analysis was done using SPSS software version 26.

A total of 150 people including 55 (36.7%) men and 95 (64.3%) women were included in the study. The pain level of patients in the time periods of 6 weeks after surgery and 3 months after surgery and the level of Haris Hip score of patients 2 months after surgery are significantly better in patients treated with cephalomedullary nailing method.

The treatment method of cephalomedullary nailing can be considered as the method of choice, due to the lower amount of pain according to the VAS criterion during six weeks and three months after surgery, higher scores in the Haris hip test in the period of two months after surgery and the overall failure rate as a method. Considered preferable for these patients.

Keywords: Haris Hip score, cephalomedullary nailing, DHS, intertrochanteric fracture, femoral plate.

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Introduction

Hip fractures are a very hot topic all over the world. (1, 2) The prevalence of these fractures is high in the elderly and due to the increase in average age and life expectancy, the prevalence of these types of fractures is also increasing. In recent studies, it is predicted that by 2050, more than half of hip fractures will occur in Asia, which is due to the aging of the population in this region. (3) The increase in the prevalence of these fractures has led to the fact that the treatment of this type of fracture become a challenge among orthopedic trauma surgeons. (4)

Most of the hip fractures are due to osteoporosis and falls during daily life activities with a fourfold prevalence in women. (4) Hip fractures include two major groups of femoral neck fractures with a prevalence of 40% and trochanteric fractures with a prevalence of 60%. (5) Hip fractures occur mostly in the elderly and unstable pre-trochanteric fractures (31-A2) are the most common types of these fractures, which include sixty to seventy percent of femoral trochanteric fractures. (5)

The treatment of hip fractures includes internal fixation (with the method of plating and intraosseous nailing) or joint replacement. (6) Currently, most surgeons prefer to use cephalomedullary devices to fix unstable intertrochanteric fractures. (7)

Recent studies prefer the sliding hip screws (SHS) method for the treatment of type A1 fractures (8, 9) and the intramedullary nailing method (IMN) for type A3 fractures. (10, 11) But regarding the preferred treatment method in A2 type fractures are still controversial. (12)

In this study, we intend to compare the functional, radiographic, and post-surgical outcomes using femoral plate, nailing, and DHS in patients with type A2 intertrochanteric fractures who underwent surgery in Shahid Madani Hospital of Karaj in 1400. Considering that Shahid Madani Hospital of Karaj is the trauma center in Alborz province and a significant number of patients with hip fractures refer to this hospital, the implementation of this project is possible in this hospital and could be so informative.

Methods

This study was conducted as a retrospective cohort. All patients with intertrochanteric fractures who were classified as AO/OTA in type 31A2 (based on radiographs and CT Scan analyzed by orthopedic resident and confirmed by corresponding attending) referring to Shahid Madani Hospital of Karaj in the period of March to May 2021 who were hospitalized in this hospital and were treated, participated in the study, and their information was collected from their medical records.

Inclusion criteria included patients with type A2 intertrochanteric fracture of femur, age over 18 years, the patients who treated with one of the three methods of femoral plate, intermedullary nailing or DHS.

Exclusion criteria also include fractures other than A2 type intertrochanteric femoral fracture, patients less than 18 years old, the patient has not been treated with one of the three methods of femoral plate, intermedullary nailing or DHS, and co-existence of diseases that affect hip flection (such as musculoskeletal diseases, history of stroke and limb paralysis, etc).

The work process in the hospital was that by designing the appropriate software, each patient was assigned an ID that includes their national code and was unique. Demographic information of the patients, including age, sex, occupation, mobility and daily activity, height and weight, as well as the mechanism of the fracture and whether the fracture is open or not, were recorded, then the radiographic imaging or initial CT scan was uploaded. Next, the date of treatment and type Surgical or non-surgical treatment, type of surgery, and the fixation device that were used were entered. Then the performance measures, which included the joint range of motion and the patient's weight bearing, were determined using the Harris Hip Score. Complications after surgery were also considered, including the rate of infection, failure and non-union after surgery.

Patients were followed up at intervals of 1 week, 3, and 6 weeks, 2, and 3 months after surgery, and the patients' information was recorded in the application.

Patients were examined at intervals of 1 week, 3, and 6 weeks, 2, and 3 months, and hip flexion strength was evaluated and recorded in these patients. On the other hand, the occurrence of infection was checked and recorded with the history and clinical examination of the patients at these intervals. The level of pain was obtained using VAS questionnaire and Harris scoring rate (HSS). The VAS questionnaire was filled by the patients at the end of the therapeutic intervention based on their personal perception of pain. Checking the occurrence of infection or its non-occurrence after surgery is done by clinical examination (observing infectious discharge from the wound site, erythema at the site of surgery, fever, etc.) and confirming it with a positive culture from the discharge site.

The pain level of patients was measured using VAS score right after the surgery, and at the intervals of one week, 6 weeks, and 3 months. The HHS was obtained for before incident and after 2 months. Occurrence of infection was evaluated 3 weeks after operation, and non-union was evaluated 6 months after operation.

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Using the patient data registry application in Shahid Madani Hospital of Karaj, patient information and the results of their treatment and follow-up were collected. The data was entered into SPSS software and the mean, standard deviation and frequency percentage were used to describe the data. Chi-square test, one-way analysis of variance and analysis of variance for repeated data were used to analyze the data. A significance level of 5% is used.

Results

A total of 150 participants including 55 (36.7%) men and 95 (64.3%) women were included in the study. The average age of the patients in the group treated with femoral plate was 67.16 ± 12.79 years, in the group treated with cephalomedullary nailing it was 66.16 ± 12.74 years and in the group treated through DHS was 68.64 ± 12.20, which does not indicate a significant difference between the three groups (p-value = 0.613). (Table-1)

In the investigations conducted on the level of pain of patients in the period of one week after surgery, the average pain level of patients who were treated with femoral plate method was equal to 6.9, patients who were treated with cephalomedullary nailing method was equal to 7. 0, and patients who were treated with DHS was equal to 7.12, which did not show a significant relationship with the type of treatment (p-value = 0.439).

The average pain level of patients treated with femoral plate method in 6 weeks after surgery was 4.60, patients treated with cephalomedullary nailing method was 4.36, and patients treated with DHS It was equal to 5.00, which indicates the existence of a significant difference among the three groups (p-value = 0.014).

In examining the pain level of patients in the period of 3 months after surgery, the average pain level of patients who were treated with the femoral plate method was 3.52, the patients who were treated with the cephalomedullary nailing method was 3.02, and the patients who were treated with DHS was equal to 4.14 and pain was significantly less in patients who were treated with cephalomedullary nailing method (p-value < 0.001).

Regarding the Haris Hip scores, before referral, among the patients who were treated with the femoral plate method, 24 had a good score and 26 had an excellent score, among the patients who were treated with the cephalomedullary nailing method 23 had a good score and 27 had an excellent score, and among patients who were treated with DHS, 21 had a good score and 29 had an excellent score, which showed no significant difference between the treatment groups (p-value = 0.828).

But the Haris Hip score of patients 2 months after surgery, in patients who were treated with femoral plate method, one patient had a failed score, 11 patients had a poor score, 26 patients had an average score, and 12 patients had a good score. Of patients were treated with the cephalomedullary nailing method, 7 patients had a poor score, 17 patients had an average score, 22 patients had a good score, and 4 patients had an excellent score, and in the patients who were treated with DHS, 6 patients had a poor score, 27 patients with an average score, and 17 patients with a good score. Based on this, this score is significantly higher in patients treated with cephalomedullary nailing (p-value = 0.027).

The number of postoperative infection cases in patients who were treated with femoral plate method was equal to 5, in patients who were treated by cephalomedullary nailing method, it was equal to 7, and in patients who were treated with DHS, it was equal to 6, which indicates the difference is not significant (p-value = 0.827).

The rate of non-union in patients who were treated with the femoral plate method was 11, in patients who were treated with cephalomedullary nailing, it was 4, and in patients who were treated with DHS, it was 7. This case also does not show a significant difference between the three groups (p-value = 0.127).

The number of treatment failure cases in patients who were treated with femoral plate method was equal to 15, in patients who were treated by cephalomedullary nailing method, it was equal to 6, and in patients who were treated with DHS, it was equal to 16. with the cephalomedullary nailing method has been significantly higher (p-value = 0.038).

Discussion

In this study, which was conducted as a retrospective cohort in Shahid Madani Hospital, Karaj, the results of three different treatment methods, including the use of femoral plate, cephalomedullary nailing, and DHS, were compared in patients with type A2 intertrochanteric fractures.

Based on the obtained results, the three investigated treatment methods do not show a significant difference in pain one week after surgery, the rate of post-operative infection in the period of three weeks after surgery, and the rate of non-union cases. However, the treatment method of cephalomedullary nailing can be considered according to the lower amount of pain based on the VAS criteria during six weeks and three months after surgery, higher scores in the Harris hip test in the period of two months after surgery and the overall failure rate as considered the preferred method for these patients.

In the study by Ioannis Aktselis and colleagues, published in 2013, two treatment methods, intramedullary nail and sliding hip screw, were compared in patients with intertrochanteric fractures of type A2.2 and A2.3.

A total of eighty patients were included in this study and were randomly treated with one of the two

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mentioned methods. Patients were followed up at one, three, six, and twelve months post-surgery for pain levels, mortality, Parker mobility score, Barthel Index, and EuroQol-5D (EQ-5D) score.

The results showed no statistical difference in the Parker mobility score between the groups. The intramedullary nail group had significantly higher Barthel Index and EuroQol-5D scores at 12 months compared to the sliding hip screw group. At the same time, the EQ-5D score in the intramedullary nail group had returned to preoperative levels, but not in the sliding hip screw group. There was no difference in mortality rates, radiation time, and hospital stay duration. The operation time, incision length, and incidence of hip pain were lower in the intramedullary nail group (13).

Chun-Wei Fu et al. aimed to compare the clinical outcomes of patients with unstable intertrochanteric fractures treated with either DHS+TSP or PFNA. It included 358 patients treated between June 2013 and April 2018, evaluating factors like operation time, blood loss, hemoglobin decrease, and functional status.

Results showed that DHS+TSP had shorter operation times and less postoperative hemoglobin decrease compared to PFNA. However, patients treated with DHS+TSP experienced more residual pain and implant irritation. Despite these issues, DHS+TSP provided surgical outcomes that were not inferior to PFNA, making it a viable treatment option for unstable intertrochanteric fractures. The study highlights the trade-offs between the two methods, with DHS+TSP offering quicker surgeries but more postoperative discomfort (14).

At an average follow-up of 17 months, all fractures healed with no significant difference in functional outcomes. However, PFN had a lower revision rate (17.2%) compared to DHS/TBPP (21.6%). PFN also had shorter operation times (43 vs. 61 minutes) and hospital stays (20 vs. 24 days). Additionally, 98% of PFN patients could bear full weight immediately post-surgery, compared to 81% for DHS/TBPP. Due to fewer complications, the study recommends PFN for treating unstable trochanteric fractures (15).

In conclusion the cephalomedullary nailing methods presents better outcomes compared to other surgical approaches and can be advised as preferred method.

Table 1 Comparison of patients' data

		DHS	Cephalomedullary Nailing	Femoral Palte	
Gender, n (%)	Male	(12.0) 18	(13.3) 20	(11.3) 17	0.818
	Femal	(21.3) 32	(20.0) 30	(22.0) 33	
Initial Mean VAS Score (Std)		68.64 (12.20)	(12.74) 66.16	(12.79) 67.16	0.613
Mean VAS Score after 1 week (Std)		7.12 (0.77)	(0.85) 7.0	(0.93) 6.9	0.439
Mean VAS Score after 6 weeks (Std)		5.00 (0.96)	(1.20) 4.36	(1.06) 4.60	0.014
Mean VAS Score after 3 months (Std)		4.14 (1.03)	(0.99) 3.02	(0.88) 3.52	0.000
Haris Hip Score before incident	Fail (Less than 60)	(0.0) 0	(0.0) 0	(0.0) 0	0.828
	Poor (60-69)	(0.0) 0	(0.0) 0	(0.0) 0	
	Fair (70-79)	(0.0) 0	(0.0) 0	(0.0) 0	
	Good (80-89)	(14.0) 21	(15.3) 23	(16.0) 24	
	Excellent (90-100)	(19.3) 29	(18.0) 27	(17.3) 26	
Haris Hip Score after 2 months	Fail (Less than 60)	(0.0) 0	(0.0) 0	(0.7) 1	0.027
	Poor (60-69)	(4.0) 6	(4.7) 7	(7.3) 11	
	Fair (70-79)	(18.0) 27	(11.3) 17	(17.3) 26	
	Good (80-89)	(11.3) 17	(14.7) 22	(8.0) 12	
	Excellent (90-100)	(0.0) 0	(2-7) 4	(0.0) 0	
Infection after 3 weeks	Yes	(4.0) 6	(4.7) 7	(3.3) 5	0.827
	No	(29.3) 44	(28.7) 43	(30.0) 45	
Non-Union	Yes	(6.7) 10	(2.7) 4	(7.3) 11	0.127
	No	(26.7) 40	(30.7) 46	(26.0) 39	
Failure	Yes	(10.7) 16	(4.0) 6	(10.0) 15	0.038
	No	(22.7) 34	(29.3) 44	(23.3) 35	

Ethical Issue

There was no ethical issue in this review.

Conflict of Interests

There was no conflict of interest in this study.

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