

# Evaluation the treatment outcomes of intracapsular femoral neck fractures with closed or open reduction and internal fixation by screw in 18–50-year-old patients in Isfahan from Nov 2010 to Nov 2011

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## Abstract

**Background:** There is conflict of interest in the treatment of intracapsular femoral neck fractures and the outcomes. The aim of this study was evaluation the treatment outcomes of closed and open reduction and internal fixation with screw in 18–50-year-old patients.

**Materials and Methods:** This clinical randomized study was conducted in Ayatollah Kashani Center in Isfahan from Nov 2010 to Nov 2011. In 42 patients selected in a randomized manner, fractures were reduced by closed reduction or open if necessary and C-ARM was controlled in AP and lateral plans. Movement range and femur pain severity were evaluated according to Visual analogue Scale (VAS) score at 3 and 6 months after surgery. Data were analyzed by SPSS 18. Chi-square, *t*-test, one-way analysis of variance (ANOVA), and descriptive statistics such as frequency distribution, mean, and mean deviation were used.

**Results:** Forty-two patients with femoral neck fracture were treated by open [31 patients (73.8%)] or closed reduction [11 patients (26.2%)] and also osteosynthesis. Their mean age was  $47.3 \pm 9.8$  years; 29 of them were males and 13 were females. Twelve patients had bad range of motion (ROM) (28.6%), 16 had intermediate ROM (38%), and 14 had good ROM (33.4%). After 6 months, 12 patients (28.6%) had bad ROM, 10 (23.8%) had intermediate ROM, and 20 (47.6%) had good ROM. There were 11 cases of non-union (35.5%) in the open reduction group and 4 in the closed group.

**Conclusion:** This study showed that femoral neck fracture is associated with several complications, especially if open reduction was necessary. So, the surgical method and necessary equipments such as radiolucent bed, C-ARM machine, and implant cannulated screw set should be considered.

**Key Words:** Complications, femoral neck fracture, treatment

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## INTRODUCTION

Femoral neck fracture is one of the most common orthopedic fractures for which the treatment and complications are associated with high costs and disabilities.<sup>[1-3]</sup> Femoral neck has an important role in weight bearing and movement. Therefore, it can affect the movement ability in human and needs enough care

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and suitable treatment to avoid making difficulties in the rate and the range of movement and also low the complications and allowing fast return to work. Improper treatment may affect the movement ability and the quality of life, and the patient's disability may cause many social and economic problems.<sup>[1,4,5]</sup>

Some studies on femoral neck dislocation fractures have shown that non-union is seen in 23–37% of the cases. These studies showed that fracture fixation can also affect osteonecrosis and non-union.<sup>[6]</sup> In other studies, the rate of non-union in dislocated femoral neck fractures has been reported to be 15%. In a meta-analysis of 564 patients of 15–50 years, non-union was 4.7% in closed reduction. The authors stated that this rate may reach 11.2% in open reduction.<sup>[7]</sup> There are various treatment methods for these fractures, such as arthroplasty and internal fixation, but there is conflict of interest about applying these methods and their results.<sup>[1,4,5]</sup> All patients under 40 years of age and also patients between 40 and 60 years of age without risk factors for osteoporosis and other risk factors can be treated by closed or open reduction and internal fixation. While patients between 40 and 60 years with risk factors for osteoporosis such as diabetes can be treated with total hip arthroplasty (THA), and patients between 40 and 60 years consuming alcohol are treated with a bipolar hemi-arthroplasty. In patients over 60 years, due to factors such as functional needs of the patient, the presence or absence of cognitive impairment, mobility of patients, and associated medical conditions, various types of arthroplasty can be used.<sup>[6]</sup>

The aim of this study is detecting the treatment outcomes of intracapsular femoral neck fractures with open or closed reduction and internal fixation with screw in 18–50-year-old patients.

## MATERIALS AND METHODS

This clinical trial study was done from Nov 2010 to Nov 2011 in Ayatollah Kashani Educational Center. The patients of age 18–50 years who have had intracapsular femoral neck fracture in 2010 and were referred to Ayatollah Kashani Center with no underlying disease and other kind of fracture or disorders were included. Excluded criteria were: patients with not willing to participate, patients with generalized local bone diseases such as osteogenesis imperfecta, and the patients who did not follow the plan and who had severe bone fracture. The sample was consisted of 42 patients who were selected in a randomized manner.

History about the kind of disease, disease process, expected results, and surgical method was taken from the patients with normal general medical conditions, who fulfilled the inclusion criteria, but only the satisfied ones were selected after clinical examination by cooperative resident and then the patients were transferred to the operation room. Applying general or spinal anesthesia, their fractures were reduced by closed or open method if necessary and C-ARM control was done in both AP and lateral plans.

Internal fixation was done as the neck fixation with three or four spongy screws, considering the screw length (16 mm screw which passed the fracture line) in a proper place.

The questionnaires were filled after surgery by the orthopedic resident and the cooperative intern. After 3–6 months, final evaluation was done on movement range and femoral pain severity, regarding the Visual analogue Scale (VAS) (pain severity is divided to 10 parts from low to disabling and the patients chose it on the basis of how they felt). Assessing values of the patient's movement range included clinical examination and six basic femoral joint movements during the follow-up, and its comparison with normal hip movements according to Hip "Harris" scale showed these values: Normal flexion, 140° and normal abduction, adduction, and internal and external rotation, 40°.<sup>[7]</sup>

So, the patients with the flexion of under 40°, under 10° for other movements, and who were disabled to do their work were categorized as "bad"; 40°–100° flexion and 10°–30° for other movements, with intermediate ability to do custom works and personal activities means "intermediate"; and those with higher than 100° for flexion and completely doing personal tasks and occupational activities were considered as "good."

Malunion or non-union was evaluated 6 months after surgery, though the rate of infection and avascular necrosis (AVN) was measured 1 year later.

The data were analyzed by SPSS 18 and also Chi-square, *t*-test, and analysis of variance (ANOVA) tests, as well as descriptive statistics such as frequency distribution, mean, and standard deviation were used.

## RESULTS

In this study, 42 patients with femoral neck fracture were treated with open and closed reduction in addition to osteosynthesis. Open reduction was used for 31 patients (73.8%) and closed reduction

for 11 patients (26.2%). The patients' mean age was  $47.3 \pm 9.8$  years, which was  $46.9 \pm 8.6$  years in closed reduction treated patients and  $48.1 \pm 11.2$  years in open reduction group; 29 patients (69%) were males and 13 patients (31%) were females.

Mean of the pain scores was assessed according to VAS immediately after surgery, and 3 and 6 months later, and it was  $7.7 \pm 1.5$ ,  $4.6 \pm 1.8$ ,  $3.4 \pm 2.1$ , respectively, which was  $8.6 \pm 1.3$ ,  $5.3 \pm 2.7$ , and  $3.7 \pm 1.4$  in the open reduction group and  $7.4 \pm 2.2$ ,  $4.2 \pm 1.6$ , and  $3.2 \pm 1.8$  in the closed reduction group, which are shown in Table 1.

Evaluation of range of motion (ROM) 3 months after surgery revealed that 12 patients (28.6%) had bad ROM, 16 patients (38%) had an intermediate ROM, and 14 patients (33.4%) had good ROM. [Table 2]

The results of ROM measurements 6 months after surgery were: 12 patients (28.6%) with bad ROM, 10 patients (23.6%) with intermediate ROM, and 20 (47.6%) with good ROM. [Table 3]

**Table 1: Mean of pain scores immediately, and 3 and 6 months after surgery**

Pain score group	Immediately after surgery	3 months after surgery	6 months after surgery
Open reduction	8.6±1.3	5.3±2.7	3.7±1.4
Closed reduction	7.4±2.2	4.2±1.6	3.2±1.8
Total	7.7±1.5	4.6±1.8	3.4±2.1

**Table 2: Range of motion (ROM) 3 months after surgery**

ROM group	Bad		Intermediate		Good		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Open reduction	10	32.2	10	32.2	11	35.6	31	100
Closed reduction	2	18.2	6	54.6	3	27.2	11	100
Total	12	28.6	16	38	14	33.4	42	100

**Table 3: Range of motion (ROM) 6 months after surgery**

ROM group	Bad		Intermediate		Good		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Open reduction	10	32.2	5	16.1	16	51.7	31	100
Closed reduction	2	18.2	5	45.4	4	36.4	11	100
Total	12	28.6	10	23.8	20	47.6	42	100

**Table 4: Frequency distribution of avascular necrosis (AVN)**

Frequency distribution Group	AVN				Total	
	Yes		No		Frequency	Percent
	Frequency	Percent	Frequency	Percent		
Open reduction	5	16.1	26	83.9	31	100
Closed reduction	2	18.2	9	81.8	11	100
Total	7	16.7	35	83.3	42	100

Non-union was seen in 15 patients (35.7%) after 6 months. This study showed that there were 11 (35.5%) non-union cases in the open reduction group and 4 cases (36.4%) in the closed group. One-year follow-up showed 12 (27.6%) non-union cases, of which 10 (32.3%) were in the open reduction group and 2 cases (18.2%) were in the closed group.

There were 6 patients (14.3%) with malunion after 6 months, of whom 5 (16.1%) were in the open reduction group and 1 (9.9%) was in the closed one. There were 8 patients (19.5%) with malunion during 1 year after surgery: 6 cases (19.4%) in the open group and 2 (18.2%) in the closed group.

As shown in Table 4, AVN was seen in seven patients (16.7%): 5 cases(16.1%) in the open group and 2 cases (18.2) in the closed group.

Infection happened in one patient (2.3%) after open reduction surgery, but none in the closed reduction group was infected.

## DISCUSSION

Femoral neck fracture is one of the common orthopedic fractures involving high cost and results in disability to do work. So, studies of this kind can help the patients with this fracture to have a better life at a low cost.

The study results show that the patients' mean age was 47.3 years with 70% males, the demographic features

of which are similar to those of other studies.<sup>[8-10]</sup>

In our study, the pain score was evaluated in three phases: Immediately after surgery, and 3 and 6 months later, on the basis of VAS criteria which showed pain reduction with time. Back *et al.* and Magu *et al.* have reported the same results in their studies.<sup>[11,12]</sup>

The other results of this study were about joint movement range on the basis of Harris criteria evaluated in three scores: Bad, intermediate, and good. Regarding these results, almost half of the patients (47.6%) had a good movement range after 6 months, which shows similarity with the other studies.<sup>[11-14]</sup>

Assessing the rate of non-union and malunion during 6 months and 1 year after surgery achieved results were similar to those of the other studies on malunion, which may be due to poor postoperative care.<sup>[15,16]</sup>

Considering the high rate of non-union and AVN as the common complications of femoral neck fractures all over the world, Haidukewych reported its incidence as 23% and Lu-yao *et al.* reported it as 11–19% in a meta-analysis study.<sup>[15,16]</sup>

The best diagnosis method of AVN, especially in the first 6 months, is magnetic resonance imaging (MRI); but we had to use radiography due to interactions between MRI magnet and the applied metal and steel screws for fixation.<sup>[17]</sup>

On the other hand, AVN was followed only after a few years after fracture, so achieving a real rate of this complication needs longer duration studies. Only a 50-years-old woman, who had not have regularly followed-up, had infection after open reduction.

Investigation of movement range and comparing the results of two reduction methods in this study showed that the patients treated with closed reduction had better movement range than those of the open group.

## CONCLUSION

From the results of this study we can conclude that femoral neck fracture is associated with several

complications, especially if open reduction was necessary. So, this surgical method needs extreme care and many types of equipment such as radiolucent table, C-ARM machine, and implant cannulated screw set.

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