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**Research Article** 

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# A comparison of frequency of Avascular Necrosis and Non-Union in patients with Ipsilateral Femoral Shaft and Neck fracture and with Only Femoral Neck Fracture: A four year study in Ahvaz Referral Hospitals

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# ABSTRACT

Femoral neck fracture is an emergency orthopedic condition that needs early and efficient management. Two common complications of this fracture are occurrence of non-union and avascular necrosis (AVN). The most damaging effect in femoral neck fracture is vascular damage that causes ischemic conditions which subsequently may induce ischemia cell necrosis. This study aimed to comparatively investigate the frequency of avascular necrosis and non-union in patients with ipsilateral femoral shaft and neck and with femoral neck fracture. This was a clinical study conducted on the patients admitted to Ahvaz (Khuzestan, Iran) referral hospitals during 2010 to 2014. A total of 60 patients were divided into two groups (n=30). Group A included patients with ipsilateral femoral shaft and neck fracture. The data on the frequencies of union and ANV in the broken bone were collected and compared. The mean age of the group A and group B was 40.05 and 39.83 years old, respectively. The age range of the patients was 17-60 years old. The duration of follow-up was two years. The results showed that the rate of non-union in the group of ipsilateral femoral shaft and neck fractures (group A) was more so that the difference was statistically significant (P= 0.01). In addition, the frequency of AVN in the group B was significantly higher than the group A (P= 0.01). The findings showed higher rate of non-union in patients with femoral neck fractures and AVN in the patients with ipsilateral femoral shaft and neck fracture compared with the patients with ipsilateral femoral shaft and neck fractures and AVN in the patients with jubicateral femoral shaft and neck fractures with ipsilateral femoral shaft and neck fractures and AVN in the patients with femoral neck fractures and AVN in the patients with femoral neck fractures compared with the patients with ipsilateral femoral shaft and neck fractures compared with the patients with ipsilateral femoral shaft and neck fractures and AVN in the patients with femoral neck fracture compared with

Keywords: Femoral Neck, Fracture, Avascular Necrosis, Non-Union, Frequency, Comparison

#### **INTRODUCTION**

Femoral neck fracture is a serious and life-threatening lesion in the elderly as well as threatening functional prognosis in the young. It is a frequent pathology, with an annual incidence of about 1/1000 of the population. The basic anatomic risk of the fracture is post-traumatic osteonecrosis and has been reported at 10 to 30%. In elderly patients, this is life threatening, with a mortality rate of 20 to 30% in the year following the fracture. The conventional treatment options aim at a rapid restoration of the patient's autonomy. Femoral neck fracture causes vascular damages and its destructive effects have been reported in several studies.

Fracture with slight displacement induces ischemic conditions which in turn result in ischemic cell necrosis (1). Femoral neck fractures are considered as orthopedic emergency for adolescents (2, 3) and avascular necrosis and nonunion are the most common complications (2-4). The risk of complications of femoral neck fractures have been reported more than 60% (5-8). The previous studies have demonstrated that delayed surgery in femoral neck fracture increases the risk of avascular necrosis (5, 9, 10). A 24-hour delay in surgery in femoral neck fracture will increase the incidence of nonunion and non-infectious necrosis of the femoral head by 10-30% and 15-30%, respectively (5, 9, 10).Similarly, a 12-hour delay in surgery will increase the risk of nonunion and avascular necrosis by 4-59% and 10-86%, respectively (11). The studies on the risk of nonunion among femoral neck fractures have indicated were stated more related to biological causes and result of mechanical causes (8). During the recent years different non-medication and non-invasive techniques have been developed for enhancing the fracture healing or improving the treatment of musculoskeletal disorders. However, surgery is still one of the gold standard treatment options for fractures and the related disorders.

The frequency of nonunion after the restoration of femoral neck was reported 10 to 33%. Previous studies on the patients lower than 50 years old, have shown that the occurrence rate of avascular necrosis and nonunion increases by 23% and 8%, respectively (8). Hip femoral neck and shaft fractures caused by high energy trauma, constitute 2.5% to 9% of femoral fractures so that the prevalence among younger people and more is observed in (12-14).

This damage may be induced by car accidents, motorcycle accidents, falling from height or accidents in the industrial environment (15, 16). In addition, this damage occurs in the elderly by trauma with low pressure such as falling (17). The probable mechanism of this injury requires that the thigh be bent and tilted to the degree that the femoral head sits within the acetabulum. The force from knee starts and then extends in longitudinal direction of the femoral shaft (18-21).

Avascular necrosis is the most common and most severe consequence in proximal fractures and femoral shaft. In comparison with other common complications of femoral fractures, nonunion is less frequent than avascular necrosis (11). The frequency of union in femoral shaft fractures has been reported as 85 to 100%. Most cases of nonunion in these fractures are just hypertrophy non-septic nonunion (22).

Previous studies have shown controversial findings on the incidence and frequencies of femoral neck fractures and their complication including avascular necrosis and nonunion. In addition, these fractures are important fractures as their emergency nature. Therefore, this study was aimed to comparatively investigate the frequency of avascular necrosis and non-union in patients with ipsilateral femoral shaft and neck and with femoral neck fracture.

### MATERIALS AND METHODS

This was a clinical study conducted on the 60 patients with ipsilateral femoral shaft and neck fracture or patients with femoral neck fracture admitted to Ahvaz (Khuzestan, Iran) referral hospitals during 2010 to 2014. The patients were divided into two groups (each 30 patients). The group A included patients with ipsilateral femoral shaft and neck fracture and Group B patients with femoral neck fracture. The data on the frequencies of union and ANV in the broken bone were collected and compared.

Inclusion criteria included the femoral neck fracture and at the same time femoral shaft fracture in group A, femoral neck fracture in group B and exclusion criteria were as follows: Diabetes, immune deficiency, surgical site infection. Patients for up to 6 months after surgery, have been clinically examined on the monthly interval, and after that for up to two years underwent clinically examinations and radiologic evaluations at 3 month intervals. In addition, the time course required for tracking the AVN was at least two years and nonunion was considered of 9 month after surgery. The data collected for each patient included demographic characteristics and radiologic data such as age, sex, class femoral neck fracture, femoral shaft fractures class, status of union, avascular necrosis of the femoral head, union time to breakdown at the femoral neck and the femoral shaft, duration of delay in fixation, osteonecrosis of the femoral head. Union formation in the patients was a full weight bearing without pain in the affected limb due to radiologic consolidation in both AP and lateral view and observing the union at least in 3 determined cortexes. In the suspicious cases, the CT scan was used to further assessment of the union. The results were evaluated and compared with SPSS software.

### RESULTS

Study population in this study consisted 60 patients with ipsilateral femoral shaft and neck fracture (group A) or with femoral neck fracture (group B) (n=30 in each group). The frequency distribution of age and gender as well as other demographic data are presented in Table 1.

#### Table 1. The frequency distribution of age and gender for each group

	(%) Number of female patients	(%) Number of male patients	total mean age of patients
Group A	6 (20%)	24 (80%)	40.05
Group B	7 (23.33%)	21 (70%)	39.83

Patients in the both groups underwent the surgery. Fixation type used in type of surgery in groups of people was different. The fixation type used in surgery can significantly influence in forming the bone union or non-union processes. Therefore, the parameters related to the type of fixations were also evaluated in the patients (Table 2).

Table 2. Type of fixation for the groups A and B

Group	Type of Fixation	Frequency (%)
	Plates and Screws	19
Casua A	DHS	8
Group A	DHS and Plate	2
	PFN	1
Crown D	CRIF or ORIF with Screws	27
Стоир в	CRIF or ORIF with DHS	3

After that patients were studied in terms of union fracture site (Table 3 and Figure 1).



Table 3. Frequency of union and non-union between the two groups

Figure 1. Comparison of the frequency of occurrence of non-union between the two groups A and B

The frequency of non-union in the group A, patients with ipsilateral femoral shaft and neck fracture, was higher than the other group.

Some of the patients in the group B showed nonunion complications in the femoral neck area or femoral shaft area, while some other patients showed these complications in both areas (Table 4).

Table 4. Comparison of the frequency of non-union complications in the femoral neck and femoral shaft in the group A

Dlaga	Number (%)
Place	Non-union
Femoral Neck	4 (40%)
Femoral Shaft	5 (50%)
Both of them	1 (10%)

As can be seen in Table 4, 50% nonunion in the group B occurred in the femoral shaft area, 40% at the femoral neck, and 10% in both areas.

In addition, in these patients, the incidence of AVN was also investigated (Table 5 and Figure 2).

Table 5. Comparison of AVN incidence rate between the two groups A and B

Group	AVN	
Group	Number (%)	
Group A	5 (16.66%)	
Group B	7 (23.33%)	

The results showed that the incidence of AVN was higher among the group B (patients with femoral neck fractures). Some of these patients underwent the bipolar or total hip ultimately.



Figure 2. Comparison of the frequency of occurrence of AVN between the two groups A and B

#### CONCLUSION AND DISCUSSION

This study aimed to comparatively investigate the frequency of avascular necrosis and non-union in patients with ipsilateral femoral shaft and neck fracture and with femoral neck fracture.

The rate of nonunion in the group A (33.33%) was lower than the results of the studies of Matthew et al.(47%) and Watson et al. (75%), whereas higher than the values reported in the study of Bennett et al. (7.14%) (14, 16, 23). The rate of nonunion in the group B (20%) was higher than other similar studies with 15.79% and 4% (24, 25). The rate of AVN in the group B (23.33%) was lower than a similar study conducted by Nikolopoulos et al. (24), whereas was higher than two other similar studies reported 11 and 14.1 percent (3, 25).

Contrary to the apparent impression, because of fracture in two districts, occurrence of non-union is expected to increase in these cases. However, the union or non-union as well as AVN depend on the severity of the damage and injury. Therefore, in the ipsilateral femoral shaft and neck fracture because of the division of force, the severity of damage to the femoral neck fracture alone that the full force incurred to damage point, the appearance of these complications is lower. Our findings support this explanation. The comparison of the results between the two groups

showed higher rate of nonunion in patients with ipsilateral femoral shaft and neck fracture (33.33% in group A versus 20% in group B).

Furthermore, comparison of AVN in the two groups showed higher rates of this complication in patients with femoral neck fracture alone (23.33% in Group B versus 16.66% in Group A). Some factors such as suitable fixation and timely surgery can be attributed to this reduced complication.

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