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Dr. Sandeep Kumar Reddy and
Assistant Professor, Department of Orthopedics, Fathima Institute of Medical Sciences, Kadapa, Andhra Pradesh, India

Dr. Vasim Hasan Raja S
Assistant Professor, Department of General Surgery, Santhiram Medical College, Nandyal, Andhra Pradesh, India

Corresponding Author:
Dr. Vasim Hasan Raja S
Assistant Professor, Department of General Surgery, Santhiram Medical College, Nandyal, Andhra Pradesh, India

Surgical treatment of displaced femoral neck fractures in young adults: A prospective study

Sandeep Kumar Reddy and Vasim Hasan Raja S

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Abstract
Background and Objective: Complications including avascular necrosis (AVN) and non-union pose serious problems to the management of displaced femoral neck fractures in young people, which are rare but frequently caused by high-energy trauma. This study set intended to determine the frequency of postoperative problems and the functional and radiological results of surgical therapy for displaced femoral neck fractures in people ranging in age from 18 to 50 years.
Material and Methods: This prospective analysis encompassed 40 patients with displaced femoral neck fractures who had surgical intervention at a tertiary care facility. This study was undertaken by the Department of General Surgery at Santhiram Medical College, Nandyal, Andhra Pradesh, India, from January 2020 to December 2020. All patients received either open or closed reduction, subsequently followed by internal fixation utilizing cannulated screws or dynamic hip screw (DHS) fixation. Patients were monitored for 12 months following surgery, with assessments conducted at 6 weeks, 3 months, 6 months, and 12 months. Functional results were evaluated using the Harris Hip Score (HHS), and radiographic healing, union duration, and complications including avascular necrosis, non-union, and infection were recorded.
Results: On average, it took 14.2±2.5 weeks for 35 patients (87.5%) out of 40 (mean age: 34.5±6.7 years) to have their fractures healed. Three patients (7.5%) experienced AVN, while two patients (5.0%) did not achieve union. At the 12-month mark, the average Harris Hip Score was 86.4±9.2, and 28 patients, or 70%, demonstrated good to exceptional results. Functional outcomes were better when surgery was performed quickly (within 12 hours). There were no reports of implant failure or deep infections.
Conclusion: When done quickly, surgical repair of displaced femoral neck fractures in young people results in functionally satisfactory fractures with a reasonably low complication rate. Reducing the risk of AVN and non-union requires early intervention and adequate fixation procedures. Detection and therapy of delayed problems require long-term follow-up.

Keywords: Femoral neck fracture, young adults, internal fixation, avascular necrosis, Harris Hip Score, fracture union, orthopedic surgery, and prospective study

Introduction
Despite a lower prevalence compared to older groups, displaced femoral neck fractures in young adults provide a significant orthopedic issue. While osteoporotic fractures mostly affect the elderly, younger people can sustain these types of injuries from high-energy trauma like car accidents or falls from great heights. Complications, such as avascular necrosis (AVN) of the femoral head and non-union, can result in long-term impairment if not well treated, and displaced fractures are particularly vulnerable due to the vascular and anatomical features of the femoral neck [1, 3].
Because of their high levels of physical activity and relatively extended life expectancy, young individuals often do not have joint replacement, making the preservation of their native hip joint a top priority. Anatomic reduction and stable fixation are the treatment goals in order to facilitate fracture healing and reduce the likelihood of femoral head ischemia. Different types of fractures, displacements, and surgeon preferences dictate the optimal surgical fixation strategy, which can range from multiple cancellous cannulated screws to dynamic hip screws (DHS) [4, 6].

An important factor in the success rate of surgical procedures is how quickly they are performed. Research has demonstrated that femoral head vascular compromise can be minimized by surgical fixation within 6 to 12 hours of damage, therefore reducing the incidence of AVN. Furthermore, the effectiveness of surgical treatment greatly affects functional recovery, return to work, and quality of life in this youthful group [7, 9].

This prospective study intends to assess the surgical results, functional recovery, and complication rates in patients treated with internal fixation procedures for displaced femoral neck fractures in younger adults. These fractures are clinically significant and have long-term ramifications. The results may shed insight on the significance of early intervention and personalized surgical planning while also helping to improve treatment methods.

Material and Methods

This prospective study was performed in a tertiary orthopedic care facility. This study was undertaken by the Department of General Surgery at Santhiram Medical College, Nandyal, Andhra Pradesh, India, from January 2020 to December 2020. Forty young adult patients, aged 18 to 50 years, diagnosed with displaced femoral neck fractures were enrolled. All patients had surgical treatment utilizing internal fixation techniques after providing informed permission. Ethical approval was secured from the Institutional Ethics Committee before the commencement of the project. Patients underwent clinical and radiological evaluation upon admission. Fractures were categorized according to the Garden classification system, and displacement was verified using anteroposterior (AP) and lateral radiographs.

Inclusion Criteria

- Patients aged between 18 and 50 years.
- Radiologically confirmed displaced femoral neck fractures (Garden type III and IV).
- Patients treated with internal fixation (cannulated screws or DHS).
- Injury-to-surgery time less than 72 hours.
- Willingness to participate and provide informed consent.

Exclusion Criteria

- Pathological fractures due to malignancy or metabolic bone disease.
- Open femoral neck fractures.
- Polytrauma patients with life-threatening injuries.
- Previous surgery or pre-existing condition involving the ipsilateral hip.
- Inability to comply with follow-up schedule (e.g., psychiatric illness, substance abuse).

Results

Forty patients who had femoral neck fractures that had displaced were included in the study and monitored for a year. There were 28 males (70%) and 12 females (30%), with an average age of 34.5±6.7 years. Although 40% of the fractures were of Garden type IV, 60% were of Garden type III. Fifteen patients (37.5%) underwent dynamic hip screws (DHS) while twenty-five (62.5%) underwent cannulated screw fixation.

Table 1: Demographic and Clinical Characteristics of Patients

Characteristic	Number of Patients (%)
Age (Mean ± SD)	34.5±6.7 years
Gender	
Male	28 (70%)
Female	12 (30%)
Mechanism of Injury	
Road Traffic Accident	26 (65%)
Fall from Height	14 (35%)
Garden Classification	
Type III	24 (60%)
Type IV	16 (40%)

Table 1 provides a concise overview of the study population's demographic information, gender distribution, injury etiology, and fracture classification.

Table 2: Surgical Fixation Methods Used

Fixation Method	Number of Patients (%)
Cannulated Screws	25 (62.5%)
Dynamic Hip Screw (DHS)	15 (37.5%)

In order to treat displaced femoral neck fractures, the distribution of internal fixation methods is described in Table 2.

Table 3: Time to Surgery and Functional Outcome

Time from Injury to Surgery	Number of Patients (%)	Mean Harris Hip Score±SD
≤12 hours	18 (45%)	91.2±6.5
>12 hours	22 (55%)	82.3±9.0

The effects of surgical intervention timing on functional results are displayed in Table 3. There was a strong association between having surgery within 12 hours and considerably superior Harris Hip Scores (p<0.05).

Table 4: Fracture Healing and Complications

Outcome	Number of Patients (%)
Radiological Union Achieved	35 (87.5%)
Non-union	2 (5%)
Avascular Necrosis (AVN)	3 (7.5%)
Deep Infection	0 (0%)
Implant Failure	0 (0%)

Results from the follow-up period, including the rate of union and complications, are summarized in Table 4.

Table 5: Functional Outcome Based on Harris Hip Score

Harris Hip Score Category	Number of Patients (%)
Excellent (>90)	15 (37.5%)
Good (80-89)	13 (32.5%)
Fair (70-79)	8 (20%)
Poor (<70)	4 (10%)

Patients are grouped in Table 5 according to their functional results at the 12-month follow-up, as measured by the Harris Hip Score.

Discussion

The purpose of this prospective study was to examine the frequency of complications, functional recovery, and union rates following surgical treatment for displaced femoral neck fractures in young adults. The results highlight the importance of correct fixation techniques and prompt surgical intervention in improving patient outcomes. Our cohort's average age of 34.5 years is in line with earlier research that pinpoints young people as a separate population that needs the native hip joint preserved to keep functioning and quality of life intact reported by the Swiontkowski, 1990; Parker and Gurusamy, 2006 [10, 11]. Seventy percent of our patients were male, which is in line with epidemiological statistics showing that men are more likely to sustain fractures as a result of exposure to high-energy trauma, as seen in studies like the one by Bhandari *et al*., 2005 [12].

In comparable cohorts treated with internal fixation, our overall union rate of 87.5% is comparable to rates reported by Haidukewych (2009) and Patwa *et al*. (2019) [13, 14]. Based on the results of the studies conducted by Upadhyay *et al*. (2017) and Swiontkowski *et al*. (1984) [15, 16], it can be concluded that surgical management within 12 hours of injury leads to better functional outcomes. This supports the hypothesis that minimizing ischemic time through prompt reduction and fixation reduces the risk of complications like avascular necrosis (AVN). Upadhyay *et al*. (2017) and Swiontkowski *et al*. (1984) both highlighted the significance of early intervention in preserving the viability of the femoral head, and this finding echoes their work [17, 18].

Our study's 7.5% AVN and 5% non-union rates are in the lower range of what has been reported in the literature; according to Houdek *et al*. (2016) and Sanders and Swiontkowski (2011), AVN rates can range from 10% to 30% depending on factors such as fracture displacement, surgical delay, and patient characteristics [19, 20]. Complication rates were higher among patients with Garden type IV fractures (40 percent of our patients), which is in line with earlier findings that a worse prognosis is related with more severe displacement reported by the Garden, 1961 [21].

Results from our series corroborate those from studies by Kauffman *et al*. (2005) and Zlowodzki *et al*. (2008), which found that both dynamic hip screws (DHS) and cannulated screw fixation yield similar results when used cautiously in accordance with fracture morphology and surgeon competence. 22 and 23 While DHS offers more durable fixation in vertically oriented fractures reported by Swiontkowski *et al*., 1984 [24], some data indicate that cannulated screws may better retain bone stock and allow for less invasive surgery.

The Harris Hip Score (HHS) was used to evaluate functional recovery, and it was shown that 70% of patients who had excellent or good outcomes had adequate results. In light of the difficulty associated with displaced femoral neck fractures in adults, this is promising. Parker and Gurusamy (2004) found that early mobilization and rehabilitation helped lower morbidity, which likely contributed to these results.

The effectiveness of sterile surgical approach and proper postoperative care was highlighted by the absence of deep infections and implant failures in our investigation. According to Mousa *et al*., 2019 [26], late problems like post-traumatic osteoarthritis can affect hip function in the long run, therefore it's important to keep an eye on patients for a longer period of time.

The results may not be applicable to a broader population due to the study's limitations, which include a limited sample size and a single-center methodology. Implant longevity and late problems should be better studied with longer follow-up periods. In conclusion, there is a reasonable risk of complications and good union rates and functional results from surgically fixing displaced femoral neck fractures in young people as soon as possible. Essential components of successful management in this group of patients are timely intervention, selection of suitable fixation, and careful postoperative care.

Conclusion

Rapid anatomical reduction and stable internal fixation result in positive clinical and radiographic outcomes, according to this prospective study of surgical treatment of displaced femoral neck fractures in young adults. Concerns like non-union and avascular necrosis are greatly diminished when surgical intervention occurs within 24 hours, the implants are appropriately chosen, and post-operative therapy is conducted. Patient compliance and thorough follow-up are also highlighted in the report. When it comes to this age group, internal fixation is still the go-to method since it preserves the natural femoral head and allows for functional rehabilitation. Optimizing treatment procedures and improving prognostic accuracy in this difficult patient population requires ongoing research with bigger cohorts and longer follow-up.

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Conflict of Interest
None

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