



## COMPARISON OF THE RESULTS OF SURGICAL TREATMENT OF HUMEROUS FRACTURES BY INTRAMEDULLARY NAILING AND PALATE

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**ABSTRACT** **Background:** Humerus shaft fracture is one of the most common orthopedic problems, accounting for approximately 5% of all fractures. This study aimed to compare the surgical treatment results of humerus shaft fractures by intramedullary

nailing and palate.

**Methods:** This study was performed as a retrospective cohort. Eighty patients were referred to the Madani hospital with humerus shaft fracture, of which 40 patients were treated with either IMN or palate methods. All patients were followed up in outpatient clinics at six weeks and 3 and 6 months. Evaluation of the results was evaluated based on performance improvement, ability to return to previous jobs after six months, time of union formation, rate of union formation, and incidence of complications. Data were analyzed using the SPSS program.

**Results:** The mean amount of blood lost during the operation and the duration of surgery in the IMN group were significantly lower than the DCP group ( $P < 0.05$ ), but there was no significant difference between the two groups in terms of length of hospital stay ( $P > 0.05$ ). On the other hand, the mean of Constant and ASES criteria and the frequency of unions in the two groups were not significantly different ( $P > 0.05$ ).

**Conclusion:** The present study results showed that the rate of intraoperative bleeding and duration of surgery in the IMN group was significantly lower than the DCP group. Still, there was no significant difference between the two groups in terms of length of hospital stay and functional criteria.

**KEYWORDS :** Fracture, Humerus shaft, Intramedullary Nailing, Palate

### INTRODUCTION:

Humerus shaft fracture is one of the most common orthopedic problems that accounts for approximately 5% of fractures (1). Therapies for this type of injury use both surgical and non-surgical methods (2). Some primary or secondary indications for surgery include polytrauma with significant damage to the chest or head, similar fractures in both bones of the forearm (floating elbow), extensive injury with joint involvement, brachial plexus, muscle, or tendon. Unsuccessful reduction of humerus shaft fractures by closed methods and pathological humerus shaft fractures (3). Encouraging results have been reported regarding internal fixation techniques and related tools, which has led to widespread indications for surgical treatment of this type of fracture, palate fixation being the preferred method (4). Problems with this procedure include wound complications such as infection, likely delay in healing (especially when palate fixation principles are not accurately followed), non-union, and failed fixation (5). Intramedullary nailing is another convenient surgical procedure that can be performed with either anterograde or retrograde. There are different results in the literature on unreamed humeral nailing (UHN), and some trials have presented different reports of non-union (6). We believe that due to the wide range of motion of the UHN shoulder joint with the anterograde approach without distal locking, it will have no significant side effects except a slight increase in non-union risk but may reduce operation time and radial nerve damage. Since the demographic characteristics of different societies are significantly different from each other, and a comprehensive study that can examine the relationship between factors affecting the results of patients' surgery with their structural and functional results has not been performed in Iran, in the present study We examined the method of anterograde in patients with humeral shaft fracture in Alborz Madani Hospital.

### MATERIALS AND METHODS:

This retrospective cohort study was performed in 2019 in the orthopedic surgery department of Alborz University of Medical Sciences, Shahid Madani Educational and Medical Center. During this time, 40 patients with humerus shaft fractures who needed surgical fixation underwent surgery using DCP or IMN fixation (orthopedic surgeons who have had a history of performing both procedures). The fractures were located 2 cm distal to the humerus surgical neck or 3 cm proximal to the olecranon fossa. Inclusion criteria were patients with displaced diaphyseal humerus fracture who were candidates for surgery. The following patients were excluded from the study, patients with an open fracture, pathological fractures, osteoporotic fractures, and humerus refractures.

After random selection, patients underwent surgery by DCP or IMN. DCP was implanted through an anterolateral or posterior approach (the length of the palates used depending on the type of fracture), Russell Taylor's IMN was used, and because surgeons were more familiar with the anterograde method, this method was used to implant the IMN. Proximal and distal locking and reshaping were performed in all cases. It should be noted that this surgery was performed under general anesthesia in all patients. In all patients, the antibiotics were administered for 48 hours. Patients were discharged after 48 hours. Sutures were removed in 10 days in all patients. From the first day, isometric exercises of the upper and lower arm muscles were performed. All patients were followed up in outpatient clinics at six weeks and at 3 and 6 months. Clinical and radiological evaluations were performed at each visit. Six months was chosen as the minimum time because, at this time, fracture healing normally occurs, and performance improvement begins to return to its previous level. Implants will usually be removed after 12 months after fixation of the fracture. Results were evaluated based on the performance improvement, ability to return to previous jobs after six months, time of union formation, rate of union formation, and incidence of complications (union evaluation in two clinical methods. Three of the four cortices were performed on orthogonal radiography (AP and Lat).

### RESULTS:

There were 25 patients in each group. The mean age of patients in the two groups was compared with each other, which was not significantly different in the Independent T-test ( $P > 0.05$ ) (Table 1). The sexual frequency of patients in the two groups was compared with each other (Table 2), which did not differ significantly in the Chi-square test ( $P > 0.05$ ). The frequency of patients was compared according to the classification of fractures in the two groups (Table 3), which were not significantly different in the Chi-square test ( $P > 0.05$ ). The frequency of patients was compared in terms of the mechanism of injury in the two groups (Table 4), which were not significantly different in the Chi-square test ( $P > 0.05$ ). Mean blood loss during surgery (ml), duration of surgery (minutes), length of hospital stay (days) were compared in two groups (Table 5) so that the average amount of blood lost during surgery and length The duration of surgery in the IMN group was significantly shorter in the Mann-Whitney test than in the DCP group ( $P < 0.05$ ) but there was no significant difference between the two groups in terms of length of hospital stay ( $P > 0.05$ ). The mean of Constant and ASES criteria were compared in the two groups (Table 6), which were not significantly different in the Mann-Whitney test ( $P > 0.05$ ). The frequency of unions was compared in the two groups (Table 7), which were not significantly different in the Chi-square test ( $P > 0.05$ ).

**DISCUSSION:**

This study aimed to compare the surgical treatment results of humerus shaft fractures by INTRAMEDULLARY NAILING and PALATE methods. In the present study, the mean amount of blood lost during surgery and surgery duration in the IMN group was significantly lower than the DCP group. Still, there was no significant difference between the two groups in terms of length of hospital stay. On the other hand, the mean of Constant and ASES criteria and the frequency of unions in the two groups were not significantly different from each other. In the same study, Fan et al., Who compared the use of Interlocking Nail and Locking Compression Plate in the treatment of humerus shaft fracture, lost blood during surgery, operation time, and length of hospital stay in the group (Interlocking Nail), was significantly less than the group (Locking Compression Plate). Still, the mean ASES score between the groups was not statistically significant, consistent with the present study results. In the present study, the length of hospital stay in the IMN group was shorter than the DCP group. Lack of significant difference can be due to limitations in the sample size of the present study.

On the other hand, in this study, the incidence of complications such as radial nerve palsy with the Locking Compression Plate was higher compared to Interlocking Nail (7). Therefore, one of the most critical limitations of the present study is the lack of long-term follow-up of patients and registration of complications. In another study conducted by Changulan et al. To compare intramedullary nail and dynamic compression plate in the treatment of humerus shaft fracture, no significant difference was observed between the ASES score between the two groups, and the Union rate was similar in both groups, which confirms the results of the present study (8). Therefore, using the IMN method to treat humeral shaft fracture is a better treatment option than the DCP method due to similar functional results but problems during surgery (bleeding and duration of surgery) but due to the limitations of the present study. Also, more complications due to the IMN method than the DCP method in previous studies (9). Long-term studies with a higher sample size and long-term follow-up are recommended.

**CONCLUSION:**

The present study results showed that the rate of intraoperative bleeding and duration of surgery in the IMN group was significantly lower than the DCP group. Still, there was no significant difference between the two groups in terms of length of hospital stay and functional criteria.

**Table 1- Comparison Of The Mean Age Of Patients In The Two Groups**

| Group    | DCP       | IMN       | P value |
|----------|-----------|-----------|---------|
| Mean age | (7.3)38.2 | (9.4)36.3 | 0.42    |

**Table 2 - Comparison Of Sexual Frequency Of Patients In The Two Groups.**

| Group / Gender | Number (percent) |           | P value |
|----------------|------------------|-----------|---------|
|                | DCP              | IMN       |         |
| Male           | (64%) 16         | (60%) 15  |         |
| Female         | (36%) 9          | (40%) 10  | 1.00    |
| Total          | (100%) 25        | (100%) 25 |         |

**Table 3- Comparison Of Patients' Frequency According To Fracture Classification In Two Groups.**

| Group/Type | Number (percent) |            | P value |
|------------|------------------|------------|---------|
|            | DCP              | IMN        |         |
| A          | (48%) 12         | (44.7%) 11 |         |
| B          | (52%) 13         | (56%) 14   | 1.00    |
| Total      | (100%) 25        | (100%) 25  |         |

**Table 4- Comparison Of The Frequency Of Patients According To The Mechanism Of Injury In The Two Groups.**

| Group/ Mechanism | Number (percent) |           | P value |
|------------------|------------------|-----------|---------|
|                  | DCP              | IMN       |         |
| Accident         | (92%) 23         | (84%) 21  |         |
| Falling          | (8%) 2           | (16%) 4   | 0.66    |
| Total            | (100%) 25        | (100%) 25 |         |

**Table 5 - Comparison Of The Average Amount Of Blood Lost During Surgery (ml), Surgery Duration (minutes), Hospitalization (days) In The Two Groups.**

| Group      | (SD) Mean |       | P value |
|------------|-----------|-------|---------|
|            | DCP       | IMN   |         |
| Blood lost | (12)108   | (8)55 | 0.0001  |

|                  |           |          |       |
|------------------|-----------|----------|-------|
| Surgery duration | (4.2)85.7 | (6)55.2  | 0.001 |
| Hospitalization  | (2.1)4.4  | (2.3)3.5 | 0.15  |

**Table 6- Comparison Of The Mean Of Constant And ASES Criteria In The Two Groups.**

| GROUP    | (SD) Mean |           | P value |
|----------|-----------|-----------|---------|
|          | DCP       | IMN       |         |
| Constant | (1.1)86.2 | (1.4)85.7 | 0.16    |
| ASES     | (1.1)89.4 | (1.2)89.2 | 0.54    |

**Table 7- Comparison Of Union Frequencies In Two Groups**

| Group | Number (percent) |         | P value |
|-------|------------------|---------|---------|
|       | DCP              | IMN     |         |
| Union | (88%)22          | (80%)20 | 0.7     |

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