

Clinical and radiological results of using proximal femoral locking compression plate and proximal femoral nail antirotation for subtrochanteric fractures

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Abstract

The aim of this study was to evaluate the results of treatment of subtrochanteric femoral fracture in the use of proximal femoral locking compression plate (PFLCP) and proximal femoral nail antirotation (PFNA). This retrospective study was performed on patients who referred to Firoozgar Hospital in 2017 with subtrochanteric fracture. During follow-up, control radiographs were obtained from patients and the Harris Hip Score questionnaire was completed. Finally, the data were entered into Spss version 22 and then analyzed. A total of 56 patients were included in the study. Patients were divided into two treatment groups of 28: including groups with locking plate and nailing treatment. The results showed that the treatment was not significantly different in patients with subtrochanteric fractures who were treated with either intramedullary nailing or plate placement. There is no difference between the two groups in any of the parameters. The two groups were similar in terms of fracture classification, and finally no significant difference was found in terms of union findings. This study showed that clinical and imaging findings are not significantly different between the two groups of patients with subtrochanteric fracture who are treated with nailing or plate placement.

Key Words: Subtrochanteric fractures; surgical treatment, clinical findings.

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Proximal femoral fractures due to trauma and simple falls are very common and costly in the elderly.¹ Patients with these fractures occupy about 20% of orthopedic beds in the UK.¹ It is estimated that the number of these fractures in the world is 1.2 million per year and is expected to reach 2.6 million in 2025 and 4.5 million in 2050.² Regardless of the type of fracture, the mortality rate is very high in these patients. Overall, the mortality rate in the first year after fracture has been estimated to be 20%.³ The incidence of proximal femoral fractures is two to three times higher in women than in men. Some articles have reported the sex distribution of hip fractures in 30% of men and 70% of women.⁴ In fact, intertrochanteric fracture, such as fractures of the distal radius and vertebral body, are considered as osteoprotic fractures.⁵ Femoral neck fractures are a common problem in the elderly and are

often associated with debilitating complications. Treatment of these fractures is also very complicated, because some reports have recommended internal fixation of these fractures and preservation of the head, and others have recommended the replacement of the head with a prosthesis.⁶ Proximal femoral fractures are divided according to anatomical location into femoral neck fractures, intertrochanteric and subtrochanteric fractures, each with its own unique characteristics and different surgical treatments and different prognosis.⁷ Proximal fractures of the femur, especially fractures of the femoral neck and intertrochanteric region, are very important fractures in orthopedic surgery.⁸ On the other hand, *subtrochanteric* fractures, which anatomically refer to the proximal part of the femur and are located up to 5 cm below the lower edge of the small trochanter, are of special importance due to the very serious

complications caused by Lack of proper management and poor clinical outcomes after treatment.⁹ Important factors influencing the incidence of these fractures include age, sex, smoking, dementia and psychological diseases, underlying disease and osteoporosis.¹⁰ Therefore, the aim of this study was to evaluate the results of treatment of subtrochanteric femoral fracture in the use of proximal femoral locking compression plate and proximal femoral nail antirotation.

Materials and Methods

Ethical considerations

The study received ethical approval from the Iran University of Medical Sciences. Informed written consent to participate was obtained from all participants upon enrolment. All methods were performed in accordance with the guidelines and regulations in the Declaration of Helsinki to promote ethical standards and respect for the participants that ensured their safety and protected their health and rights.

This retrospective study was performed on patients with subtrochanteric fractures referred to Firoozgar Hospital in Tehran, Iran in 2017.

Study design

This retrospective study was performed on patients with subtrochanteric fractures referred to Firoozgar Hospital in Tehran, Iran in 2017.

Inclusion criteria

Dialect in Persian, completing the informed consent form, the ability to refer for an examination at specified times, the ability to follow up treatment and treatment recommendations.

Exclusion criteria

pathological fracture, trauma associated with knee injury, bilateral hip fracture, severe underlying diseases that prevent surgery, and death of the patient.

Sample size

Initially, 28 patients were included in the proximal femoral locking compression plate (PFLCP) group and 41 patients in the proximal femoral nail anti-rotation (PFNA) group. Based on age, sex, and fracture type, 13 patients were excluded from the 41 patients in the nail group. Finally, 28 patients were divided into two groups (each group n=28, and total is n=56). In both groups, patients were followed up at 2 weeks, 6 weeks, 3 months, 6 months and 1 year in the absence of

complications according to the routine procedure of this type of fracture and surgery.

Procedure

Initially, demographic information such as age, gender, smoking, and underlying disease (e.g., osteoporosis) were recorded after the patients were referred. The radiographs were evaluated 12 months after surgery for Union evaluation by the project manager. The Harris Hip Score questionnaire was completed by the facilitator for each individual and its final score was recorded. Plate implant surgery was performed by a surgeon in the lateral position with a type of plate from Synthesis Company. Nail was implanted on an orthopedic bed and performed by various surgeons. By default, there was a Harris questionnaire in the medical records of patients with subtrochanteric fractures according to the clinic routine, which was explained to the patient by the responsible resident and he/she was asked to fill the questionnaire. All patients were sent to the radiology department of the hospital for AP and lateral radiography to control the healing process.

Statistical analysis

Data were recorded in SPSS statistical software version 22. Quantitative and qualitative data were analyzed using independent t-test and Chi-square, respectively, and the results were announced by comparing the two groups. P-value <0.05 was considered to be statistically significant.

Results

A total of 56 patients were included in the study. The mean age of patients was 41.50 ±13.87, and ranged from 16 to 85 years. Of these, 45 patients (80.4%) were male and 11 patients (19.6%) were female (Table 1). According to the fracture mechanism, 46 patients (82.1%) suffered fractures due to Motor Vehicle Accident, including 24 (85.7%) in the locking plate group and 22 (78.6%) in the nailing group. Furthermore, 10 patients (17.9%) had this fracture due to falling, 4 in the locking Plate (14.3%) and 6 (21.4%) in in the nailing group. The mechanism of fracture did not differ significantly between the two groups according to the type of treatment (p = 0.729). Based on the fracture classification, 10 patients (17.9 %) were oblique, of which 6 (21.4%) were in the locking plate group and 4 in the nailing group. Moreover, 22 patients (39.8%)

Table 1. Demography of patients.

Group	Sex		Age	Total
	Male	Female		
Locking Plate	26 (92.8%)	2 (7.2%)	16.62 ± 42.10	28
Nailing	19 (67.8%)	9 (32.2%)	10.54 ± 45.07	28
Total	45 (80.4%)	11 (19.6%)	13.87 ± 41.50	56

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Table 2. Harris Hip Score parameters by study groups.

		PFLCP	PFNA	Total	p - Value
Pain	Medium	3 (10.7%)	4 (14.2%)	7 (12.5%)	0.120
	Mild	1 (3.5%)	2 (7.1%)	3 (5.4%)	
	Sometimes	10 (35.7%)	9 (32.1%)	19 (33.9%)	
	Painless	14 (50%)	13 (46.4%)	27 (48.2%)	
Limping	Medium	4 (14.2%)	4 (14.3%)	8 (12.3%)	0.241
	Summary	7 (25%)	9 (32.1%)	16 (28.6%)	
	Without lameness	17 (60.8%)	15 (53.6%)	32 (57.1%)	
Support	A cane	1 (3.6%)	0 (%)	1 (1.8%)	0.352
	Most of the times	2 (7.1%)	5 (17.8%)	7 (12.5%)	
	During long walks	1 (3.6%)	8 (28.6%)	9 (%)	
	No need for a cane	24 (85.7%)	15 (53.6%)	39 (69.6%)	
Distance	Two or three blocks	2 (7.1%)	6 (21.4%)	8 (14.3%)	0.063
	Six blocks	2 (7.1%)	7 (25%)	9 (16.1%)	
	Unlimited	24 (85.7%)	15 (53.6%)	39 (69.6%)	
Sitting	Ordinary chair 30 minutes	3 (10.7%)	9 (32.1%)	12 (21.4%)	0.102
	One hour high chair	25 (89.3%)	19 (67.9%)	44 (78.6%)	
Public Transportation	No used	1 (3.6%)	3 (10.7%)	4 (7.1%)	0.214
	Used	27 (96.4%)	25 (89.3%)	52 (92.9%)	
Stairs	In any way	1 (3.6%)	4 (14.3%)	5 (8.9%)	0.621
	Using the fence	3(10.7%)	4(14.3%)	7(12.5%)	
	No fences	24(85.7%)	20(71.4%)	44(78.6%)	
Shoes and socks	Hardly	5(17.9%)	6(21.4%)	11(19.6%)	0.762
	Easily	23(82.1%)	22(78.6%)	45(80.4%)	
Total		28	56	28	28

were Transverse, of which 11 (39.3%) were in the locking plate and nailing groups. Furthermore, 24 patients were classified in Multifragmentary (42.9%) of which 11 were in the locking plate group and 13 (46.4%) were in the nailing group. Fracture patterns

did not differ significantly between the two groups according to the type of treatment (p = 0.753). Harris Hip Score (HHS) parameters were examined separately in the study groups (Table 2) and the results showed no statistically significant difference

Table 3. The amount of pelvic joint movements by study groups.

Total	PFNA	PFLCP	
106.78 ±14.02 (90-140)	105.71 ±10.69 (90-130)	107.85 ±16.85 (90-140)	Flexion Degree
30.08 ±11.46 (10-60)	34.10 ±11.30 (15-60)	26.07 ±10.30 (10-40)	Abduction Degree
26.07 ±8.82 (10-40)	27.50 ±7.51 (20-40)	25.35 ±9.99 (10-40)	Adduction Degree
26.07 ±11.54 (10-40)	28.21 ±8.62 (20-50)	23.92 ±13.70 (0-40)	External Rotation Degree
27.67 ±12.05 (0-50)	31.07 ±9.16 (20-50)	24.28 ±13.72 (0-40)	Internal Rotation Degree
4.23 ±0.83 (3-5)	4.18 ±0.86 (3-5)	4.29 ±0.81 (3-5)	Rom

Table 4. Union rate by study groups

Group	Union	Nonunion	Malunion varus	Malunion valgus	Total
Locking Plate	20 (71.4%)	3 (10.7%)	4 (12.3%)	1 (3.6%)	28
Nailing	21 (75%)	4 (12.3%)	2 (7.1%)	1 (3.6%)	28
total	41 (73.2%)	7 (12.5%)	6 (10.7%)	2 (3.6%)	56

between the two groups ($p > 0.05$).

The HHS qualitative classification was examined by groups. 15 people were classified as (53.6%) Excellent in the group Locking Plate, followed by Good (6; 24%), Fair (1; 3.6%), and Poor (6; 21.4%). In the Nailing group, 21 patients (75%) were categorized as Excellent, followed by Good (2; 7.1%), Fair (4; 14.3%) and Poor (1; 3.6%). No statistically significant difference was found between the two groups ($p = 0.072$). In the deformity study, there were four general categories including less than 30° *fixed flexion contractures*, less than 10° *fixed abduction contracture*, less than 10° *fixed internal rotation in extension*, and a significant difference in length of more than 2 cm between the two limbs was observed. Considering the above cases, it was found that 24 patients in the locking plate group (85.7%) had all of the abovementioned conditions and there was not at least one item in the remaining 4 patients (14.3%). In the Nailing group, 20 patients (71.4%) had all abovementioned conditions and 8 patients (28.6%) didn't show at least one item. Deformity of the studied groups demonstrated no statistically significant difference between the two groups ($p = 0.675$). In Table 3, the amount of pelvic joint movements in the two groups of Nailing and Locking Plate was examined. In Figure 1 and Table 4, fusion in patients was examined. The results showed union in 41 patients (73.2%), followed by nonunion (7 patients; 12.5%), varus malunion (6 patients; 10.7%) and Valgus Malunion (2 patients; 3.6%). There was no statistically significant difference between the two groups ($p = 0.548$).

Discussion

Proximal femoral fracture covers a wide range and is associated with many morbidities and mortality.¹¹ This fracture is one of the most common lower limb fractures and can occur in young and old people.¹² Therefore, the aim of this study was evaluation of clinical and radiological findings of proximal femoral locking compression plate and proximal femoral nail antirotation for the treatment of subtrochanteric fractures in patients.

This study showed no significant difference in the treatment results in patients with *subtrochanteric* fractures who are treated with either intramedullary or plate placement as well as the HHS questionnaire was used to compare the treatment results and finally no

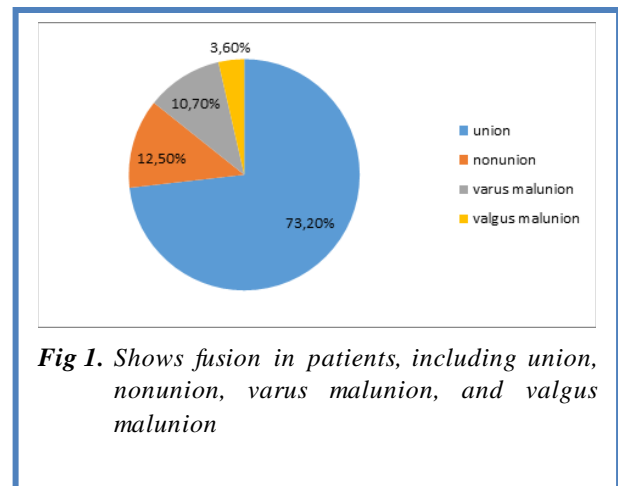


Fig 1. Shows fusion in patients, including union, nonunion, varus malunion, and valgus malunion

significant difference was found between the two groups in any of the parameters. Furthermore, we also showed that the two groups, which were similar in terms of fracture classification, did not differ significantly in terms of union results. Parker's study of 3,500 cases of proximal femoral fractures showed that the use of extra and intra-medullary implants did not differ significantly in terms of mortality, infection, union, bleeding, and surgical time.¹³ There was no significant difference between the two treatment groups in terms of all the parameters studied in this study. The study by Yoon BH et al. Showed that the use of RFLCP could be a simpler treatment with acceptable results and alternative to other methods, especially in cases where the fracture is in the lateral wall, because it can provide acceptable stability in the vertical axis. They stated that the implant was able to help establishment of fixation with minimal soft tissue damage, maintaining the angle of the neck and the femoral shaft, creating stability at the posterior medial level and a high chance of establishing a union.¹⁴ This study did not address complications such as infection in these two methods used in subtrochanteric fractures, but according to previous studies, complications from surgery occur in more than 20% of patients undergoing intramedullary implants. Furthermore, protrusions from the lateral area and their migration into the joint and causing pain and reduction of movement are some of the complications of this treatment. Patients undergoing intermodular fixation will need reoperation. Usually, surgeries that directly target the fracture site increase complications such as infection, re-fracture, and delayed healing due to bone exposure.^{15,16} In the initial study of

patients, the mean age of patients was about 41 years. All in all, the age of patients seems to play a role in determining the type of fracture because most subtrochanteric fractures occur as a result of high-energy trauma. This result is in line with the result reported in similar articles. Lindvall et al. showed that there is a significant relationship between intertrochanteric fractures and age, and its incidence increases significantly in those over 80 years of age. Also, in a study in South Korea, Ion et al. found a high association between femoral and intertrochanteric fractures and age. They also observed no *subtrochanteric* fractures over the age of 80 years. The age variable has been reported as one of the risk factors for femoral and intertrochanteric neck fractures, where *subtrochanteric* and femoral neck fractures, which are often caused by high-energy and accidents, have been more common in people aged 20 to 65 years. According to these findings, age seems to play an important role in determining the type of proximal femoral fracture.^{14,17,18} Also, demographic examination of proximal femoral fractures showed that women were at a higher risk of femoral fractures (about 33% higher) than men.⁴ In the present study, 19.6% of patients were female. This may be due to the small number of people studied in this study, as only 11 women were studied. Therefore, it can be said that it is not possible to comment on gender distribution. In this study, 73.2% of union patients finally showed a fracture. The mean HSS in patients was 89.21%, which was almost similar in the two groups. Azboy and colleagues evaluated pelvic function after Locking Plate implantation using the Harris Hip Score questionnaire, where the mean Harris score was reported to be comparable to the results of the nailing method.¹⁹ Huang SG, et al. retrospectively examined 45 patients with *subtrochanteric* fractures. Union occurred in 95.5% of patients and the mean score of Harris in patients was 86.5 ± 9.8 . They concluded that proximal lateral femur locking plate can be used for internal fixation of trochanteric fractures as an effective and low-complication method, especially when the fracture is in the lateral femoral wall.²⁰ Srinivasan P, et al.²¹ compared the results of using PFLCP and intramedullary implants. They report that although most researchers consider the use of IM implants a standard treatment, but the use of PFLCP can achieve the same result with fewer side effects. However, they emphasized that the use of PFLCP should be based on the type of fracture and the patient's condition to lead to a satisfactory outcome,²¹ methods similar also has been applied on surgical in fractures.^{22,23} In conclusion this study showed that the rate of clinical and imaging results in the two groups of patients with *Subtrochanteric* fractures treated with proximal femoral locking compression plate and proximal femoral nail antirotation was not significantly different. Of course, it can be noted that the number of patients in the study is small, so it is recommended to use a statistical

population with more patients to achieve results with higher reliability. PFLCP surgery, on the other hand, was performed by a surgeon with one type of plaque, but PFNA surgery was performed by different surgeons with different levels of experience, and this factor must be considered a limitation.

List of acronyms

PFNA - proximal femoral nail antirotation

PFLCP - proximal femoral locking compression plate

Contributions of Authors

All five authors have approved the submitted and modified version of paper and agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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Conflict of Interest

There is no conflict of interest or any financial agreement with companies whose products may be alluded to in the paper.

Ethical Publication Statements

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines. The authors declare that all material in this manuscript is our own work and all materials discussed from other sources have been clearly referenced to the respective bibliography, in compliance with our understanding of the current definition of plagiarism. The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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References

- Nieves JW, Bilezikian JP, Lane JM, Einhorn TA, Wang Y, Steinbuch M, Cosman F. Fragility fractures of the hip and femur: incidence and patient characteristics. *Osteoporos Int.* 2010 Mar;21(3):399-408. doi: 10.1007/s00198-009-0962-6. Epub 2009 May 30.
- Mohseni M, Sadeghpour A, Mohseni S. Demographic characteristics of patients with proximal femoral fractures in an educational center in tabriz. *Iranian J Orthopaed Sur.* [online] 2015;13[4(53)]:183-187. Available: <https://www.sid.ir/en/journal/ViewPaper.aspx?id=605158>.
- Ng AC, Drake MT, Clarke BL, Sems SA, Atkinson EJ, Achenbach SJ, Melton LJ 3rd. Trends in subtrochanteric, diaphyseal, and distal femur fractures, 1984-2007. *Osteoporos Int.* 2012;23(6):1721-6. doi: 10.1007/s00198-011-1777-9.
- Maravic M, Ostertag A, Cohen-Solal M. Subtrochanteric/femoral shaft versus hip fractures: incidences and identification of risk factors. *J Bone Miner Res.* 2012 Jan;27(1):130-7. doi: 10.1002/jbmr.517.
- Raval P, Ramasamy A, Raza H, Khan K, Awan N. Comparison of Short vs Long Anti-rotation in Treating Trochanteric Fractures. *Malays Orthop J.* 2016 Mar;10(1):22-28. doi: 10.5704/MOJ.1603.005.
- Maruthi CV, Shivanna S. Proximal femoral nail in the management of intertrochanteric fractures: A prospective study. *J Evol Med Dent Sci.* 2020;4(75):13063-9. doi: 10.14260/jemds/2015/1881.
- Hong JB, Dan Y, Ouyang L, Liu Y, Xiong LM, Li S, Feng XB, Shao ZW, Yan C, Yang SH, Liu P. Biomechanical study on different lengths of PFNA fixation for unstable intertrochanteric femoral fractures. *J Musculoskelet Neuronal Interact.* 2017 Dec 1;17(4):299-302.
- Wei J, Qin DA, Guo XS. [Curative effect analysis on proximal femoral nail antirotation for the treatment of femoral intertrochanteric fracture and integrity of lateral trochanteric wall]. *Zhongguo Gu Shang.* 2015 Jun;28(6):572-5. Chinese..
- Nyholm AM, Palm H, Malchau H, Troelsen A, Gromov K. Lacking evidence for performance of implants used for proximal femoral fractures - A systematic review. *Injury.* 2016 Mar;47(3):586-94. doi: 10.1016/j.injury.2016.01.001. Epub 2016 Jan 13.
- Ponkilainen VT, Huttunen TT, Kannus P, Mattila VM. Hardware removal rates after surgical treatment of proximal femur fractures: Nationwide trends in Finland in 1997-2016. *Arch Orthop Trauma Surg.* 2020;140(8):1047-54. doi: 10.1007/s00402-020-03356-z.
- Khoori M, Moharrami A, Hoseini Zare N, Mortazavi SJ. The Importance of Length of the Cephalomedullary Nails for Fixation of the Proximal Femoral Fractures: An Educational Corner. *J Orthop Spine Trauma.* 2021;6(3):55-6. Doi :<https://doi.org/10.18502/jost.v6i3.4963>
- Kim KK, Won Y, Smith DH, Lee GS, Lee HY. Clinical Results of Complex Subtrochanteric Femoral Fractures with Long Cephalomedullary Hip Nail. *Hip Pelvis.* 2017 Jun;29(2):113-119. doi: 10.5371/hp.2017.29.2.113.
- Pervez H, Parker MJ. Results of the long Gamma nail for complex proximal femoral fractures. *Injury.* 2001 Nov;32(9):704-7. doi: 10.1016/s0020-1383(01)00022-5.
- Yoon BH, Lee YK, Kim SC, Kim SH, Ha YC, Koo KH. Epidemiology of proximal femoral fractures in South Korea. *Arch Osteoporos.* 2013;8:157. doi: 10.1007/s11657-013-0157-9. Epub 2013 Oct 23.
- Tencer AF, Johnson KD, Johnston DW, Gill K. A biomechanical comparison of various methods of stabilization of subtrochanteric fractures of the femur. *J Orthop Res.* 1984;2(3):297-305. doi: 10.1002/jor.1100020312.
- Pankovich AM, Tarabishy IE. Ender nailing of intertrochanteric and subtrochanteric fractures of the femur. *J Bone Joint Surg Am.* 1980;62(4):635-45.
- Lindvall E, Ghaffar S, Martirosian A, Husak L. Short Versus Long Intramedullary Nails in the Treatment of Pertrochanteric Hip Fractures: Incidence of Ipsilateral Fractures and Costs Associated With Each Implant. *J Orthop Trauma.* 2016 Mar;30(3):119-24. doi: 10.1097/BOT.0000000000000420.
- Won Y, Yang KH, Kim KK, Weaver MJ, Allen EM. Amputated limb by cerclage wire of femoral diaphyseal fracture: a case report. *Arch Orthop Trauma Surg.* 2016 Dec;136(12):1691-1694. doi: 10.1007/s00402-016-2580-z. Epub 2016 Oct 5.
- Azboy I, Demirtaş A, Gem M, Cakır IA, Tutak Y. A comparison of proximal femoral locking plate versus 95-degree angled blade plate in the treatment of reverse intertrochanteric fractures. *Eklemler Hastalıkları Cerrahisi.* 2014;25(1):15-20. doi: 10.5606/ehc.2014.04.
- Huang SG, Chen B, Zhang Y, Nie FF, Ju L, Li M, Zhang YH. Comparison of the Clinical Effectiveness of PFNA, PFLCP, and DHS in Treatment of Unstable Intertrochanteric Femoral

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- Fracture. Am J Ther. 2017 Nov/Dec;24(6):e659-e666. doi: 10.1097/MJT.0000000000000346.
21. Srinivasan P, Balasubramaniam S, Dhinesh NL. Management of Unstable Intertrochanteric Fractures with Proximal Femur Locking Compression Plate - A Prospective Study. IOSR J Dental Med Sci. 2020; 19 (1): 17-26. DOI: 10.9790/0853-1901181726
 22. Yeganeh A, Otoukesh B, Kaghazian P, Yeganeh N, Boddohi B, Moghtadaei M. Evaluation of the Etiologies of Implant Fracture in Patients With Fractures of the Implants of Lower Limbs' Long Bones. Med Arch. 2015 Dec;69(6):405-8. doi: 10.5455/medarh.2015.69.405-408.
 23. Moghtadaei M, Otoukesh B, Pazoki-Toroudi H, Boddouhi B, Yeganeh A. Evaluation of inflammatory response in patients undergoing surgical treatment for early and delayed femoral fractures. Arch Med Sci. 2019 Jan;15(1):141-145. doi: 10.5114/aoms.2016.63013. Epub 2016 Oct 17.

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