

Comparison of Daytime and After-Hours Surgical Treatment of Femoral Neck Fractures

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ABSTRACT

Background: The timing of surgery for femoral neck fractures in young adults remains controversial. Nonetheless, the debate continues about whether orthopedic trauma cases should be operated daytime or after hours. **Aim:** This study compared the clinical and radiological outcomes of surgery on femoral neck fractures during daytime versus after-hours. **Patients and Methods:** A total of 124 patients aged 18–60 years who were operated for femoral neck fractures between 2015 and 2020 were included in the study. The patients were separated into two groups. Seventy-two patients operated between 08:00 and 17:00 hours were defined as the daytime group and 52 patients operated between 17:01 and 07:59 hours were defined as the after-hours group. Demographic data, reduction quality, duration of operation, intraoperative estimated blood loss (EBL), postoperative complications, revision rates, and postoperative Harris hip score results of the two groups were recorded for analysis. **Results:** There was no significant difference between the groups in terms of age, gender, body mass index, smoking, fracture type and follow-up time, reduction quality, postoperative complication rates, revision rates, and Harris hip score results. Waiting times until surgery, operation duration, and intraoperative EBL amounts were, in the daytime group, significantly higher than in the after-hours group. **Conclusion:** In this study comparing femoral neck fractures operated on daytime and after-hours in adults, the waiting time until surgery was found to be higher in the daytime group. Operation duration and EBL were higher in the after-hours group.

KEYWORDS: *After-hours, daytime, femur neck fracture, hip surgery, time of surgery*

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INTRODUCTION

Femoral neck fractures are orthopedic injuries that mainly affect the elderly population and have high mortality and morbidity.^[1] It is less common in adults and is usually seen due to high-energy trauma. In the elderly, it may frequently occur after low-energy injuries such as fall at home. High complication rates can be encountered due to the characteristics of the fracture and delay in definitive treatment. Studies have found 10–30% avascular necrosis (AVN) and 15–60% nonunion after osteosynthesis.^[1,2]

The development of AVN after surgical treatment of femoral neck fracture in adults is an important complication. One of the most important factors in the

development of AVN is the degree of displacement of the fracture. It has been determined that the risk of developing AVN increases as the fracture displacement increases. In addition, many studies have found a relationship between delayed treatment and the development of AVN.^[2,3] These studies argue that early surgical treatment improves blood flow to the femoral head and reduces the risk of AVN. However, on the contrary, there are studies in which there is no

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significant relationship between the duration of surgery and AVN.^[4,5]

The timing of surgical treatment in orthopedic trauma cases depends on various factors.^[6] Emergency treatment is provided for cases with emergency surgery indications, regardless of working hours. In addition, discussions about the results of surgical interventions during after-hours continue. In some studies in the literature, a high rate of complications was found in surgeries performed after-hours.^[7,8] The most important reason for this is thought to be the surgeon's fatigue and the limited number of medical personnel support.^[9] In some studies, no difference was found in surgeries performed during daytime and after-hours.^[10-12]

However, in the literature review we have conducted, no study has been found that compares the results of surgical intervention for femoral neck fractures in adults, for which early surgical intervention is essential, daytime or after-hours. This study aims to determine the effect of the period of surgical intervention on clinical and radiological results in adults operated for femoral neck fracture.

MATERIALS AND METHODS

In this retrospective comparative study, which the institutional ethics committee approved (No: 2022/1-22 and date: 18/01/2022), 177 patients aged 18–60 years who were operated for femoral neck fractures between January 2015 and December 2020 were examined. Patients with an operation waiting time longer than 24 hours, incomplete records, less than one year of postoperative follow-up, ipsilateral extremity fractures, used any fixation material other than triple cannulated screw fixation, applied open reduction internal fixation, and who were treated with hemiarthroplasty or total hip arthroplasty were excluded from the study. After excluding patients with exclusion criteria, the remaining 124 patients were included in the study. The patients were divided into two groups according to their operation time. Seventy-two patients operated between 08:00 and 17:00 hours were grouped as daytime group, and 52 patients operated between 17:01 and 07:59 were grouped as after-hours group. Demographic variables such as age, gender, body mass index (BMI), presence of other diseases, and smoking were collected from the digital files of the patients. Trauma type, additional trauma history, type of fracture according to the Garden femoral neck fracture classification, waiting time until surgery, American Society of Anesthesiologists' (ASA) classification and follow-up period were recorded.^[13,14] Waiting time until the surgery was accepted as the time

from the admission of the patients to the hospital until the start of the surgery.

The operations were performed by surgeons, who are orthopedics and traumatology consultants and experienced in hip surgery. All patients underwent surgical intervention with closed reduction and internal fixation under fluoroscopic guidance. Fixation was performed with three cannulated screws (7.3 mm) during the operation. One of the cannulated screws was placed close to the calcar region of the femoral neck, and the other two screws were placed in the upper part parallel to each other in an inverted triangle configuration. [Figure 1] On the first postoperative day, the patients were ambulated with double crutches without weight bearing on the operated side. In the postoperative follow-ups, ambulation was achieved with double crutches without weight-bearing until radiological union was detected. The patients were called for X-ray imaging controls every two weeks for the first three months and then every three months in the postoperative thereafter period. Union was evaluated with hip joint radiographs in the controls. Controls were made by orthopedics and traumatology consultants who performed the surgery. Radiologically, the presence of tricortical bridging at the fracture line on pelvic X-rays was defined as a union.^[15]

To evaluate the intraoperative and postoperative period, the patient's follow-up period, intraoperative reduction method, reduction quality, revision rate, duration of operation, intraoperative estimated blood loss (EBL) amount and postoperative complications (avascular necrosis (AVN), implant failure, infection) were recorded. Intraoperative EBL was calculated by measuring the amount of fluid in the collection containers together with the net swab weight and subtracting the amount of fluid used for lavage. Femoral head AVN was evaluated by Ficat criteria.^[16] The Garden's alignment index was used to evaluate the postoperative reduction quality.^[17] Harris hip score was applied to all patients in the third month postoperatively for clinical functional evaluation.^[18] The obtained data were compared statistically between the two groups.

Statistical analysis

IBM SPSS 23.0 software (IBM Corp., Armonk, NY, USA) was used for statistical analysis. The Mann-Whitney *U* test was used to compare the daytime and after-hours groups, as the variables did not conform to the normal distribution. Chi-squared test was used in the analysis of categorical data. The statistical significance level was taken as 0.05.

RESULTS

The data obtained as a result of the comparison of the demographic characteristics of the patients between the two groups are summarized in Table 1. Accordingly, no statistically significant difference was found between the groups in the analyses performed regarding age, BMI, gender, comorbidity, smoking, ASA value, and Garden fracture classification.

In the analysis made in terms of trauma type, it was observed that the rate of falling was higher in the after-hours group, and the rate of traffic accidents was higher in the daytime group ($P = 0.009$). In the analyses examining the relationship between age and falling in both groups, no significant relationship was found between age and falling in both groups. The number of patients with additional trauma was statistically higher in daytime group ($P = 0.028$). Additional trauma was detected in 20 (27.8%) patients (5 phalanx fractures, 4 distal radius fractures, 4 costa fractures, 3 head trauma, 3 vertebral fractures, 1 spleen injury) in the daytime

group and 6 (11%) patients (3 phalanx fractures, 1 costa fracture, 1 clavícula fracture, 1 vertebral fracture) in the after-hours group.



Figure 1: Radiographic illustration of screws placed in the inverted triangle configuration

Table 1: Comparison of demographic variables

	After-hours group (n: 52)	Daytime group (n: 72)	Total (n: 124)	P
Age (year) range	40.2±14.7 (18-57)	43±14.6 (18-61)	41.8±14.7 (18-61)	0.201 ^a
BMI	24.5±1.7 (20.2-27.6)	25.6±1.42 (22.4-28.1)	25.1±1.6 (20.2-28.1)	0.358 ^a
Gender n (%)				
Male	34 (65.4%)	50 (69.4%)	84 (67.7%)	0.633 ^b
Female	18 (34.6%)	22 (30.6%)	40 (32.3%)	
Type of trauma n (%)				
Fall	46 (88.5%)	46 (63.9%)	92 (74.2%)	0.009 ^b
Sports injury	2 (3.8%)	8 (11.1%)	10 (8.1%)	
Traffic accident	4 (7.7%)	18 (25%)	22 (17.7%)	
Comorbidities n (%)				
Yes	10 (19.2%)	14 (19.4%)	24 (19.4%)	0.976 ^b
No	42 (80.8%)	58 (80.6%)	100 (80.6%)	
Smoking n (%)				
Yes	16 (30.8%)	24 (33.3%)	40 (32.3%)	0.763 ^b
No	36 (69.2%)	48 (66.7%)	84 (67.7%)	
ASA n (%)				
1	20 (38.5%)	14 (19.4%)	34 (27.4%)	0.053 ^b
2	30 (57.7%)	52 (72.2%)	82 (66.1%)	
3	2 (3.8%)	6 (8.3%)	8 (6.5%)	
4	0	0	0	
Preoperative Garden classification n (%)				
1	0	0	0	0.49 ^b
2	9 (17.3%)	19 (26.4%)	28 (22.5%)	
3	31 (59.6%)	38 (52.7%)	69 (55.6%)	
4	12 (23.1%)	15 (20.9%)	27 (21.9%)	
Additional trauma n (%)				
Yes	6 (11.5%)	20 (27.8%)	26 (21%)	0.028 ^b
No	46 (88.5%)	52 (72.2%)	98 (79%)	

^aMann-Whitney U test, ^bChi-squared test, ASA: American Society of Anesthesiologists' classification, BMI: Body Mass Index

Table 2: Comparison of intraoperative and postoperative variables between groups

	After-hours group (n: 52)	Daytime group (n: 72)	Total (n: 124)	P
Waiting time until surgery (hours)	4.77±1.46 (4-10)	12.2±4.87 (4-24)	2.09±5.3 (4-24)	<0.001 ^b
Duration of follow-up (months)	46.46±23.58 (16-96)	46.89±19.54 (19-76)	46.7±21.2 (16-96)	0.584 ^b
Operation duration (minutes)	49.33±18.01 (35-95)	42.99±13.91 (25-80)	45.6±16 (25-90)	0.025 ^b
Estimated blood loss (ml)	103.87±55.58 (70-200)	90.82±38.34 (50-180)	92.5±46.1 (50-200)	<0.001 ^b
Reduction quality				
AP malreduction	4 (7.7%)	14 (19.4%)	18 (14.5%)	0.06 ^c
AP + Lateral malreduction	8 (15.4%)	6 (8.3%)	14 (11.3%)	0.22 ^c
Lateral malreduction	0	3 (4.2%)	3 (2.4%)	0.26 ^d
Good reduction	40 (76.9%)	49 (68.1%)	89 (71.8%)	0.27 ^c
Postoperative complication				
AVN	12 (23.1%)	16 (22.2%)	28 (22.6%)	0.916 ^a
Implant Failure	4 (7.7%)	14 (19.4%)	18 (14.5%)	0.06 ^a
Deep Infection	0	0	0	
Revision				0.357 ^a
Yes	12 (23.1%)	22 (30.6%)	34 (27.4%)	
No	40 (76.9%)	50 (69.4%)	90 (72.6%)	
Harris Hip Score	81.4±19.9 (39-100)	75.1±21.9 (33-100)	77.8±21.2 (33-100)	0.051 ^b

^aChi-Square test, ^bMann-Whitney U test. P: Anteroposterior, AVN: Avascular necrosis

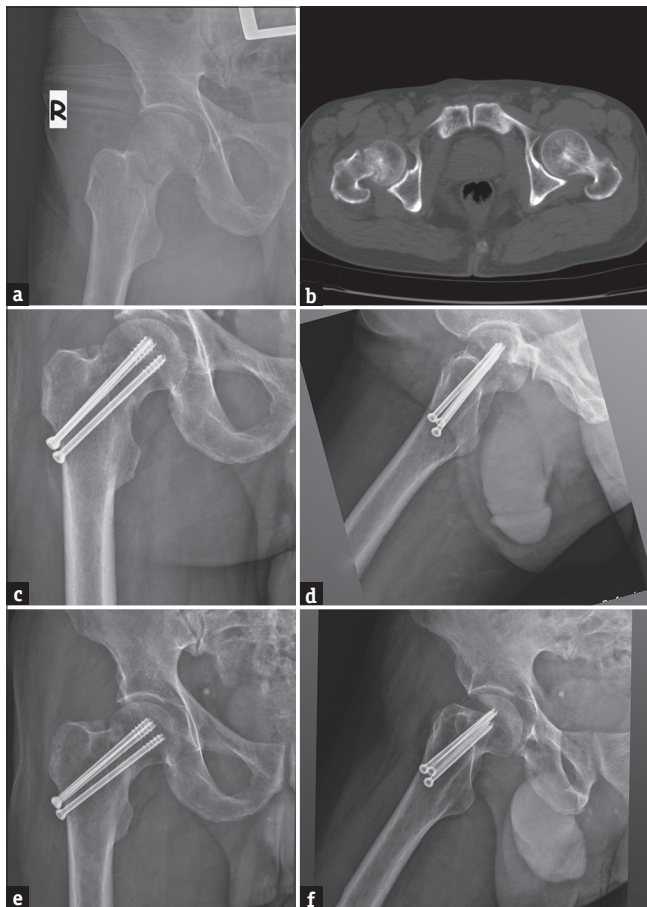


Figure 2: (a) A 36-year-old man sustained femoral neck fracture after a sports injury. (b) axial view on preoperative computed tomography. (c) and (d) early postoperative X-ray after closed reduction and internal fixation. (e and f) sixth months postoperative X-ray

In comparisons between the groups regarding intraoperative and postoperative variables, it was observed that the wait time until surgery was statistically shorter in the after-hours group ($P < 0.001$). [Table 2] In comparing the groups, significant differences were found in the analyses made in terms of operation duration and intraoperative EBL. Longer operation time and higher intraoperative EBL amounts were detected in the after-hours group ($P = 0.025$, $P < 0.001$, respectively). [Table 2] Apart from this, no statistically significant difference was found in the follow-up times, reduction quality, postoperative complications and revision rates. [Table 2] [Figure 2]

In the Harris hip scoring performed for both groups to evaluate the clinical functional results in the postoperative period, although no significant difference was observed between the groups, the average score of the after-hours group was higher than daytime group. [Table 2]

DISCUSSION

In this study, surgical treatment of femoral neck fractures in adults was compared during the daytime or after-hours. The most important result is that there is no significant difference between the postoperative reduction quality, complication rate, number of cases undergoing revision, and postoperative functional results in operations performed during the daytime or after-hours. In addition, another significant result is

that longer operation times and more intraoperative EBL were detected in cases performed outside of after-hours.

Femoral neck fractures in adults are of serious importance among orthopedic injuries due to their high complication rate and high need for revision surgery. There are different surgical treatment methods for these fractures. Multiple cannulated screws, dynamic hip screws, hemiarthroplasty, and total hip arthroplasty are the suitable surgical methods.^[3,19,20] Although significant results have been obtained for osteosynthesis in recent years, it is still a controversial issue.^[19,20] Today, despite the advances in surgical implants and techniques, it is possible to encounter high complication rates in literature reviews. One of the most important of these complications is AVN.^[3] In the literature, the incidence of AVN in femoral neck fractures treated with internal fixation is between 10 and 30%.^[1,2] Multiple factors are blamed for these high complication rates. Chief among these is the timing of surgery.^[3] Although there are quite different opinions, it has been found that the risk of AVN decreases with early surgical intervention in most of the studies.^[2] However, on the contrary, it is possible to come across studies that do not detect a difference between early or late surgical intervention and that the most important factor in reducing the risk of AVN is the anatomical reduction of the fracture.^[4,5] In our study, AVN was detected in 28 (22%) of 124 patients. It was observed that there was no significant difference between the groups in the comparison made between daytime and after-hours. Delay in surgery and quality of fracture reduction are important factors associated with AVN. In this study, the delay factor was eliminated by applying definitive operative treatment to the patients within 24 hours. In addition, according to the current results, we think that the time of surgery does not have a serious effect on the development of AVN.

The safety and results of surgeries performed outside of after-hours continue to be one of the controversial issues in the literature. There may be difficulties in providing the ideal operating room conditions outside of working hours. In addition, the surgeon's fatigue can lead to a lack of attention and therefore negative results in the surgery. It is possible to find many studies on this controversial issue in the literature.^[6-8,21-23] According to Rothschild *et al.*^[23] complications are more common in surgeries performed by doctors who do not rest adequately. In a meta-analysis, which is one of the most recent studies that examined approximately three million patients from different surgical departments, the risk of mortality increases in after-hours and nighttime surgeries

compared to those performed during the daytime.^[22] According to the study of Dorotka *et al.*^[24] one of the studies in which the opposite results were obtained, hip fracture surgery does not significantly affect postoperative mortality and morbidity if there is sufficient equipment and if the surgical team is experienced. Our study found no significant difference between the groups in the reduction quality, postoperative complications, revision rate, and postoperative Harris hip score averages in cases performed daytime and after-hours. However, more patients with poor reduction quality were found in daytime group. We think that the reason for this is the density of cases in the operating rooms during working hours. The density on the operating tables during the daytime and the excessive number of cases scheduled for surgery can put physicians under stress. Due to this situation, fracture reductions cannot be performed at the desired level, and most of the time, the surgery can be finished when the reduction quality is at an acceptable level in order not to prolong the operation time. We think this problem can be solved by increasing the number of operating rooms or creating specially designed operating rooms for trauma cases. Another important result in our study was found in revision rates. Although there is no statistically significant difference between the groups, there is a higher revision rate in the cases performed in daytime group. We think that this situation is due to two reasons. First of all, the average waiting time until the surgery was longer in the patients who were operated during the daytime. Second, there are more patients with poor reduction quality in this group of cases. Considering the data in the literature, we believe that both the length of wait time until surgery and the poor quality of fracture reduction increase the revision rates. We believe that revision rates can be reduced in such cases by reducing the waiting time until surgery and paying more attention to the intraoperative reduction quality.

Other important parameters emphasized in studies comparing the results of daytime and after-hours surgeries are the operation time and the amount of intraoperative bleeding.^[21,25,26] There are different results in the literature regarding these parameters examined. Chacko *et al.*^[21] found increased intraoperative blood loss and prolonged operation time in after-hours surgeries. Likewise, Wixted *et al.*^[25] found longer operating room times and more intraoperative bleeding in patients operated on after-hours. In addition to these, some studies found that after-hours surgeries are noticeably shorter.^[27,28] In the meta-analysis of Guan *et al.*^[26] which included approximately 580,000 patients, no significant difference was found between daytime and after-hours

groups in both the operating time and the amount of intraoperative bleeding.^[26] In our study, the duration of surgery and the amount of intraoperative EBL between the groups were compared, and a longer operation time and higher amount of intraoperative EBL were found in after-hours surgeries. In our study, the duration of surgery and the amount of intraoperative EBL between the groups were compared, and longer operative time and higher intraoperative EBL were found in postoperative surgeries. We guess that the sleeplessness and fatigue of the surgeon are effective in the emergence of these results. By providing adequate rest for the surgeon and the operating team, shortening the operation time and reducing the amount of bleeding can be achieved.

Some limitations of this study are that it was designed retrospectively and different surgeons performed the surgeries. In addition, another limitation is the lack of data on why surgeries are performed daytime or after-hours.

CONCLUSION

In this study comparing femoral neck fractures operated during daytime and after-hours in adults, the waiting time until surgery was found to be higher in the daytime group. Operation duration and EBL were higher in the after-hours group. It was determined that additional trauma was seen more in the daytime group.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Liporace F, Gaines R, Collinge C, Haidukewych GJ. Results of internal fixation of Pauwels type-3 vertical femoral neck fractures. *J Bone Joint Surg Am* 2008;90:1654-9.
- Lin JC, Wu CC, Lo C, Liang WM, Cheng CF, Wang CB, et al. Mortality and complications of hip fracture in young adults: A nationwide population-based cohort study. *BMC Musculoskeletal Disord* 2014;15:362.
- Souza AD, Nair A, Balemane S. A comparative study of rate of fracture union in femur neck fractures- operated within 24 hours and after 24 hours and within 7 days, effect of tamponade on rate of union in cases fixed with cannulated cancellous screws. *Int J Orthop Sci* 2019;5:295-9.
- Haidukewych GJ, Rothwell WS, Jacofsky DJ, Torchia ME, Berry DJ. Operative treatment of femoral neck fractures in patients between the ages of fifteen and fifty years. *J Bone Joint Surg Am* 2004;86:1711-6.
- Upadhyay A, Jain P, Mishra P, Maini L, Gautum VK, Dhaon BK. Delayed internal fixation of fractures of the neck of the femur in young adults. A prospective, randomised study comparing closed and open reduction. *J Bone Joint Surg Br* 2004;86:1035-40.
- Ricci WM, Gallagher B, Brandt A, Schwappach J, Tucker M, Leighton R. Is after-hours orthopaedic surgery associated with adverse outcomes? A prospective comparative study. *J Bone Joint Surg Am* 2009;91:2067-72.
- George TJ, Arnaoutakis GJ, Merlo CA, Kemp CD, Baumgartner WA, Conte JV, et al. Association of operative time of day with outcomes after thoracic organ transplant *JAMA* 2011;305:2193-9.
- Desai V, Gonda D, Ryan SL, Briceño V, Lam SK, Luerssen TG, et al. The effect of weekend and after-hours surgery on morbidity and mortality rates in pediatric neurosurgery patients. *J Neurosurg Pediatr* 2015;16:726-31.
- Banfi T, Coletto E, d'Ascanio P, Dario P, Menciasci A, Faraguna U, et al. Effects of sleep deprivation on surgeons dexterity. *Front Neurol* 2019;10:595.
- Rashid RH, Zubairi AJ, Slotte MU, Noordn S. Hip fracture surgery: Does time of the day matter? A case-controlled study. *Int J Surg* 2013;11:923-5.
- Switzer JA, Bennett RE, Wright DM, Vang S, Anderson CP, Vlasak AJ, et al. Surgical time of day does not affect outcome following hip fracture fixation. *Geriatr Orthop Surg Rehabil* 2013;4:109-16.
- Chan YM, Tang N, Chow SK. Surgical outcome of daytime and out-of-hours surgery for elderly patients with hip fracture. *Hong Kong Med J* 2018;24:32-7.
- Daabiss M. American Society of Anaesthesiologists physical status classification. *Indian J Anaesth* 2011;55:111-5.
- Kazley JM, Banerjee S, Abousayed MM, Rosenbaum AJ. Classifications in brief: Garden classification of femoral neck fractures. *Clin Orthop Relat Res* 2018;476:441-5.
- Benz D, Tarrant SM, Balogh ZJ. Proximal femur fracture nonunion with or without implant failure: A revision technique with clinical outcomes. *Injury* 2020;51:1925-30.
- Ficat RP. Idiopathic bone necrosis of the femoral head: Early diagnosis and treatment. *J Bone Joint Surg Br* 1985;67:3-9.
- Ekström W, Karlsson-Thur C, Larsson S, Ragnarsson B, Alberts KA. Functional outcome in treatment of unstable trochanteric and Subtrochanteric fractures with the Proximal femoral nail and Medoff sliding plate. *J Orthop Trauma* 2007;21:18-25.
- Josipović P, Moharič M, Salamon D. Translation, cross-cultural adaptation and validation of the Slovenian version of Harris Hip Score. *Health Qual Life Outcomes* 2020;18:335-40.
- Slobogean GP, Sprague SA, Scott T, McKee M, Bhandari M. Management of young femoral neck fractures: Is there a consensus? *Injury* 2015;46:435-40.
- He C, Lu Y, Wang Q, Ren C, Li M, Yang M, et al. Comparison of the clinical efficacy of a femoral neck system versus cannulated screws in the treatment of femoral neck fracture in young adults. *BMC Musculoskeletal Disord* 2021;22:994-1001.
- Chacko AT, Ramirez MA, Ramappa AJ, Richardson LC, Appleton PT, Rodriguez EK. Does late night hip surgery affect outcome? *J Trauma* 2011;71:447-53.
- Cortegiani A, Ippolito M, Misseri G, Helviz Y, Ingoglia G, Bonanno G, et al. Association between night/after-hours surgery and mortality: A systematic review and meta-analysis. *Br J Anaesth* 2020;124:623-37.
- Rothschild JM, Keohane CA, Rogers S, Gardner R, Lipsitz SR, Salzberg CA, et al. Risks of complications by attending physicians after performing nighttime procedures. *JAMA* 2009;302:1565-72.
- Dorotka R, Schoechnner H, Buchinger W. Influence of nocturnal surgery on mortality and complications in patients with hip fractures. *Unfallchirurg* 2003;106:287-93.

25. Wixted JJ, Reed M, Eskander MS, Millar B, Anderson RC, Bagchi K, *et al.* The effect of an orthopedic trauma room on after-hours surgery at a level one trauma center. *J Orthop Trauma* 2008;22:234-6.
26. Guan G, Cheng Z, Yin J, Hu Q, Zhang W, Liu X, *et al.* Daytime versus after-hours surgery outcomes in hip fracture patients: A systematic review and meta-analysis. *Aging Clin Exp Res* 2020;32:2427-38.
27. Bosma E, de Jongh MA, Verhofstad MH. Operative treatment of patients with pertrochanteric femoral fractures outside working hours is not associated with a higher incidence of complications or higher mortality. *J Bone Jt Surg Br* 2010;92:110-5.
28. Cohn MR, Cong GT, Nwachukwu BU, Patt ML, Desai P, Zambrana L, *et al.* Factors associated with early functional outcome after hip fracture surgery. *Geriatr Orthop Surg Rehabil* 2016;7:3-8.