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NEÜ YAYINEVİ

The Effect of Waiting Time for Surgery after Hip Fractures and the Covid-19 Pandemic on Mortality

Kalça Kırıkları Sonrası Cerrahi Zamanlamanın ve Covid-19 Pandemisinin Mortaliteye Etkisi

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Öz

Amaç: Bu çalışmanın amacı, kalça kırığı tanısı almış yaşlı hastalarımızda pandemi öncesi ve sonrasında ameliyata alınma süresinin değişip değişmediğini ve bu durumun mortalitede artışa neden olup olmadığını incelemektir.
Hastalar ve Yöntem: Mart 2019-Mart 2020 tarihleri arasında kalça kırığı tanısı ile opere edilen hastalar pandemi öncesi dönem, Nisan 2020-Nisan 2021 tarihleri arasında kalça kırığı tanısı ile opere edilen hastalar ise pandemi dönemi olarak kabul edildi. Her iki grup; yaş, cinsiyet, cerrahiye kadar geçen süre, hastanede kalış süresi ve bir yıllık mortalite açısından karşılaştırıldı.
Bulgular: Mortaliteyi etkileyen tüm faktörler incelendiğinde, ameliyata kadar geçen sürenin mortaliteyi anlamlı olarak artırdığını gösterdi. Ameliyat için ortalama bekleme süresi tüm hastalarda 27,6±19,4 saat iken Grup 1'de 25,7±19,1 saat ve Grup 2'de 29,6±19,6 saat olup iki grup arasında anlamlı fark vardı. (p=0.043). Mortaliteye neden olan cerrahi bekleme süresinin cut-off değeri "23.35" saat olarak hesaplandı. Grup 1'de mortalitede anlamlı artış saptanmazken (p=0.340), Grup 2'de cerrahi gecikmenin artması mortaliteyi anlamlı olarak etkiledi (p=0.027).
Sonuç: Bu çalışmada, yaşlı popülasyonda kalça kırığı sonrası 23.35 saatin üzerinde cerrahi başvuru gecikmesindeki artışın bir yıllık mortalite ile doğrudan ilişkili olduğu gösterilmiştir, ayrıca pandemi koşullarında ameliyat için bekleme süresindeki artışın direkt olarak mortaliteyi olumsuz etkileyen faktörlerden biri olduğu düşünülmektedir.

Anahtar Kelimeler: Kalça kırığı, mortalite, cerrahi zamanlama, covid-19 pandemisi

Abstract

Aim: The aim of this study is to examine whether the timing of surgery in our elderly patients with a diagnosis of hip fracture changed before and after the pandemic, and whether this situation caused an increase in mortality.
Patients and Methods: The patients who were operated with the diagnosis of hip fracture between March 2019 and March 2020 in our hospital database were accepted as in the pre-pandemic period, and the patients who were operated with the diagnosis of hip fracture between April 2020 and April 2021 were considered as in pandemic period. Both groups were statistically compared in terms of age, gender, waiting time for surgery, length of hospital stay and one year mortality.
Results: When the factors affecting mortality were examined, the time elapsed until surgery significantly increased mortality. While the mean waiting time for surgery was 27.6±19.4 hours in all patients, it was 25.7±19.1 hours in Group 1 and 29.6±19.6 hours in Group 2 and there was a significant difference between the two groups (p=0.043). The cut-off value of the waiting time for surgery, which caused mortality, was determined as "23.35" hours. While no significant increase in mortality was found in Group 1 (p=0.340), the increased delay for surgery in Group 2 affected mortality significantly (p=0.027).
Conclusion: In this study, it was found that the increase in the delay of admission for surgery over 23.35 hours in the elderly population after hip fractures was directly associated with one year of mortality and also we think that the waiting time for surgery in the pandemic conditions is one of the factors that negatively affect mortality in these patients.

Key words: Hip fracture, mortality, surgery timing, covid-19 pandemic

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INTRODUCTION

Hip fractures are serious health problem that incidence is constantly increasing with the increase in the elderly population. Studies show that 86% of patients who suffer hip fractures are in the 65 years and older group. Generally, low-energy traumas such as simple indoor falls are the most important etiological factor in hip fractures in the elderly population. One-year mortality in patients with hip fractures after 65 years of age ranges from 15% to 36% (1,2).

Health systems in many countries were adversely affected by the 2019 Coronavirus Disease Pandemic (Covid-19) (3). Many elective surgical procedures have also been postponed in our country to prevent the spread of the virus and to provide necessary care to infected patients. Even emergent surgical procedures were hampered by a lack of human resources and operating rooms. However, despite the mandatory quarantine measures during the Covid-19 Pandemic, the incidence of hip fracture did not change (4,5). In a few cohort studies with a limited number of patients, it was reported that there was no significant difference between the pandemic and pre-pandemic period in terms of surgical delay, treatment methods, complications, and 30-day mortality in hip fracture. (6,7). In a study by Cha et al., (8) it was shown that three-quarters of the delays in the timing of surgery are caused by factors related to the hospital, not the patient.

According to our clinical experience, since our intensive care beds were full due to virus infected patients during the Covid-19 pandemic, we often had problems in the timing of surgery due to the lack of reserved intensive care beds in the orthogeriatric high-risk patient group. Although there are conflicting results in the literature regarding the timing of hip fractures for surgery and their relationship with mortality, meta-analyses of these studies have shown that mortality increases as a result of various complications in patients who wait longer than 48 hours (9-11).

The aim of this study is to examine whether the timing of surgery in our elderly patients with a diagnosis of hip fracture changed with pandemic, and whether this situation caused an increase in mortality.

PATİENTS AND METHOD

The study was planned as a single-centered observational, descriptive, retrospective design. Ethics Committee Approval was obtained from Necmettin Erbakan University Ethics Committee (2022/3605). The patients who were operated with the diagnosis of hip fracture between March 2019 and March 2020 in Necmettin Erbakan University, Meram Faculty of Medicine hospital database were accepted as in the pre-pandemic period, and the patients who were operated with the diagnosis of hip fracture between April 2020 and April 2021 were considered as in pandemic period. As the inclusion criteria for the study; Patients over 60 years of age with intracapsular, extracapsular and intertrochanteric proximal femur fractures with an ASA score of 3 were determined. Patients with ASA 2 and ASA 4 scores were not included in the study to determine a more homogeneous sample, since clinical status is directly related to mortality. In addition, only patients who underwent regional anesthesia were included in the study in order to eliminate the effect of anesthesia techniques on mortality. The period before the World Health Organization (WHO) officially recognized Covid-19 as an international emergency on 11 March 2020 was considered pre-pandemic (12). Patients who were operated in the pre-pandemic period were determined as Group 1, and those operated in the pandemic period were determined as Group 2. Patients with multiple trauma, open fractures, pathological fractures, periprosthetic fractures, and pandemic patients who could be operated on quite late due to Covid19 positivity were not included in the study. Since Covid 19 infection is a serious cause of mortality especially in the elderly population, at follow up, patients who died due to the coronavirus infection during the pandemic period were not included in the study.

Demographic data of the patients, waiting time to surgery, ASA scores, surgical procedures, length of hospital stay were obtained from the hospital database records, while their one year mortality and causes of death were obtained from the records of the Department of Population and Citizenship. The primary outcome of the study was to determine whether the time to surgery affects mortality and whether there is a significant difference in terms of time to surgery and mortality in this patient group in the pre-pandemic and pandemic period.

In both patient groups, many variables were detected that could affect the delay in admission to surgery and their mortality. While these variables may be demographic variables such as age and gender, there may be additional diseases detected in the preoperative evaluation and preoperative clinical status (ASA score). In addition, there may be

institution-related factors, including the avaliability of surgical team and the operating theater, and especially the disruptions experienced in the provision of reserved intensive care for patients who will likely need intensive care during the pandemic period.

Data were analyzed by the International Business Machines Statistical Package for the Social Sciences (IBM SPSS) software package version 22.0 (IBM; Armonk, New York, USA). Qualitative data were defined using numbers and percentages. The Shapiro Wilk test was used to confirm the normality of the distribution. Quantitative data were defined using range (minimum and maximum), mean, standard deviation, median, and interquartile range (IQR). Mann-Whitney U-test and Pearson Chi Square test were used for statistical analysis between groups that did not fit normal distribution. The ROC curve was used to evaluate whether the time to surgery could be used as a predictor of mortality. Logistic regression analysis was made to evaluate causes of mortality. P-value of ≤ 0.05 was considered statistically significant.

RESULTS

The demographic data of the patients are summarized in Table 1. While the mean age of all patients included in the study was 81.9±6.9 (66-98), it was calculated as 82.7±7.1 in Group 1 and 81.2±6.7 in Group 2. Both groups are homogeneous in terms of age. While the time to surgery was 27.6±19.4 (1.1-114.1) hours in all patients, it was 25.7±19.14 hours (1.1-98.7) in Group 1 and 29.6±19.6 hours (10.8-114.1) in Group 2, and there was statistical difference between the two groups (p=0.043).

There was no significant difference between the two groups in terms of total hospital stay (p=0.405). Another parameter with significant difference between Group 1 and Group 2 is gender. While the male/female ratio was 1.17 in the pre-pandemic period, it was calculated as 0.63 during the pandemic period. The density of female patients in Group 2 was significantly higher than the patients in Group 1 (p=0.023). In terms of gender, both groups are not homogeneous. In terms of one year mortality, there is a statistically insignificant increase in the pandemic group (p=0.255).

All the patients included in the study in both groups are evaluated together in order to determine the main cause of mortality with logistic regresssion anlysis, the waiting time to surgery was found to be only significant cause of deaths (Table 2). When regression analysis was performed to find out the

Table 1. Characteristics of patient groups and demographic variables

Variables	Total n=217	Group 1 (Pre-pandemic) n=111	Group 2 (Pandemic) n=106	p
Age, mean ± SD (range)	81.9±6.9 (66-98)	82.7 ± 7.1 (66-98)	81.2 ± 6.7 (67-97)	0.139
Male, n, (%)	101 (%46.5)	60 (54%)	41 (35%)	0,023**
Female, n, (%)	116 (53.5%)	51 (46%)	65 (65%)	
Time to surgery, hour, mean ± SD (range)	27.6±19.4 (1.1-114.1)	25.7±19.1 (1.1-98.7)	29,6±19.6 (10,8-114,1)	0,043*
Length of stay, days, mean ± SD (range)	4.9±4,3 (0-57)	5.2±5.5 (0-57)	4.7±2.6 (2-19)	0,405
Mortality, n (%)	54 (%33)	24 (%28)	30 (%39)	0,255

Mann-Whitney U Test*, Pearson Chi square**

Table 2. Logistic regression analysis of factors affecting mortality in all patients

	Living (n=163)	Dead (n=54)	AOR	95% CI	p
Age, mean ± SD	81.6±6.9	83.1±6.9	1.037	0.989-1.087	0.137
Gender, n, M/F	77/86	24/30	0.823	0.432-1.568	0.554
Time to surgery, hour, mean ± SD	25.3±17.6	34.7±22.7	1.023	1.007-1.039	0.004*
Length of stay, days, mean ± SD	4.8±4.6	5.5±3.0	1.005	0.937-1.078	0.889
Pre-pandemic / Pandemic, n	87/24	76/30	1.407	0.733-2.701	0.304

Table 3. Logistic regression analysis of factors affecting mortality in the pre-pandemic and pandemic period

	Pre-pandemic Period (Group-1)					Pandemic Period (Group-2)				
	Living (n=87)	Dead (n=24)	AOR	95% CI	p	Living (n=76)	Dead (n=30)	AOR	95% CI	p
Age, mean±SD	82.4±7.3	83.9±6.3	1.036	0.969-1.107	0.306	82.4±7.3	83.9±6.3	1.047	0.976-1.123	0.201
Gender, M/F	47/40	12/12	0.787	0.313-1.979	0.610	30/46	12/18	1.030	0.399-2.659	0.951
Time to surgery, hour, mean±SD	24.9±19.1	28.6±19.2	1.011	0.988-1.035	0.340	25.6±15.8	39.4±24.4	1.027	1.000-1.054	0.027*
Length of stay, days, mean±SD	5.3±6.0	5.0±2.4	0.967	0.847-1.104	0.618	4.2±1.9	5.9±3.5	1.183	0.964-1.453	0.108

factors that cause mortality in Group 1 and Group 2 separately, no significant risk factor associated with mortality was detected in the prepandemic period, while increased delay of surgery during the pandemic period significantly increased mortality (p=0.027). (Table 3)

The cut-off value of the waiting time to surgery, which predicted mortality, was determined as “23.35” hours with a Sensitivity of 61.1% and a Specificity of 60.7% (Area Under the Curve = 0.644) when all patients were evaluated together. The mean waiting time to surgery in the pre-pandemic period was close to this cut-off (25.7±19.1 hours), it is remarkable that delay for surgery was increased by approximately 4 hours in the pandemic period and 6 hours away from the calculated cut-off value (29.6±19.6 hours) (Figure 1).

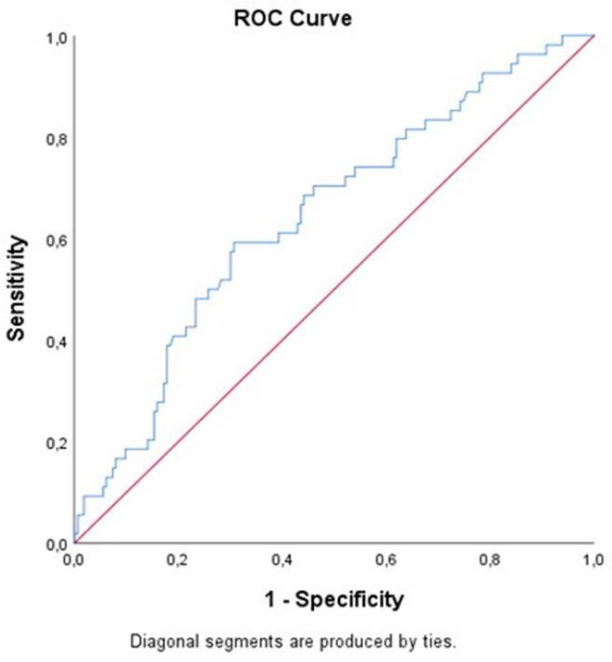

Figure 1. Roc analysis of the relationship between mortality and waiting time for surgery.

DISCUSSION

This study was conducted to examine whether the Covid-19 pandemic affects the waiting time for surgery in hip fractures associated with high morbidity and mortality in the elderly patient group, and the effects of this situation on mortality. Since hip fractures usually occur with low-energy traumas such as indoor simple falls in the elderly population, they were not affected by the measures and social isolation during the pandemic period, and the incidence of these fractures increased (13,14). The most important result of our study is that the mortality increased statistically with the increase in the waiting time for surgery and the Covid-19 Pandemic caused surgical delays in this patient group.

Although there are conflicting results in the literature regarding the time of hip fractures for surgery and their relationship with mortality, meta-analyses of these studies have shown that mortality increases as a result of various complications in patients who wait longer than 48 hours (9-11,15).

Some studies have revealed that the main reason for increasing mortality is the comorbidities and preoperative conditions of the patients rather than the waiting period (16). These delays in surgical timing have been explained by many reasons, including preoperative medical evaluations, optimization of patients' preoperative cardiovascular and pulmonary problems, access to the operating room room, and lack of reserved intensive care beds. In many countries with highly developed health systems, it has been reported that elderly patients with hip fractures are operated at least 24 hours after their admission to the emergency department (17). In a study conducted in France in 2010, the proportion of patients who were operated after 48 hours was around 47% - 60%, which is close to that observed in the United Kingdom (49%) (18). Even in protocols that accept hip fracture in the elderly as an indication for emergency surgery,

the rate of patients who underwent surgery after 48 hours exceeds 13% (19). In addition, delay in surgical timing does not only cause mortality; It has been shown in various studies that it also increases morbidities such as pressure ulcers, urinary system infections, deep vein thrombosis/embolism and the risk of cerebrovascular events (20,21). In a study by Cha et al., (8) it was shown that three-quarters of the delays in the timing for surgery are caused by factors related to the hospital resources, not the patient.

From the point of view of the Covid-19 Pandemic, we experienced some periods of semi-closure and some periods of full-closure in our country. During these periods, many hospitals throughout the country, including our hospital, were declared Pandemic hospitals and elective outpatient clinic applications and surgeries were suspended. Since elective surgery was not performed for a long time in our hospital, it can be said that more time can be allocated to emergent trauma cases and the delays are not due to access to the operating theater in this sense. However, patients infected with the Covid-19 virus filled the intensive care capacities of the hospital, and we experienced surgical delays in elderly hip fracture patients especially who may needed intensive care. In the literature, there are also studies in some cohort studies reporting that there is no significant difference in surgical delay, treatment methods, complications and 30-day mortality in hip fracture between the pandemic and pre-pandemic period (3,4), however, in our study 4 hours delay in waiting time for surgery during the pandemic period was detected (p=0.043). This delay in admission to surgery did not seem to increase mortality when the two groups were compared with each other (p=0.255). Although both groups are homogeneous in terms of age and ASA scores, they are not homogeneous in terms of gender (p=0.023). While the male/female ratio was 1.17 in the pre-pandemic period, it was calculated as 0.63 during the pandemic period. Long-term survival analyzes reveal that mortality is strongly higher for men than for women, even when factors such as age and comorbidities are controlled (22). Considering the mortality-increasing effect of male gender, the fact that we did not detect an increase in mortality during the pandemic period compared to the pre-pandemic period may be due to the heterogenity of our groups in this sense. When both groups are evaluated separately in terms of surgical timing and mortality, although surgical delays in the pre-pandemic period did not increase mortality, in the post-pandemic period mortality may have increased significantly since the cut-off value we obtained was exceeded by approximately 6 hours (p=0.027). There are studies in the literature showing that long-term (12-month) mortality increases statistically significantly when the cut-off value is calculated in 24 hours, similar to our study (20,23,24). In this sense, our results support the literature.

When Polimerase Chain reaction (PCR) tests for Covid-19 and variants became standardized in the pandemic period, PCR test samples were routinely taken from patients who admitted to Emergeny Department. If the result was positive, we transferred these patients to Infectious Disease Ward for their treatment. At the end of the treatment, after the PCR results were negative, we performed the surgeries in accordance with the Covid-19 protection rules against virus transmission. In an international study published in The Lancet Journal, higher mortality rates were reported in patients operated on with co-existing Covid-19 infection (25), so preoperative waiting times of approximately 15 days have to be occurred in these patients. Since we have a few patients who were treated in this way, and in terms of the mortality of the virus infection rather than the long waiting times of these patients, we excluded these patients in order not to deviate from the focus of the study. The mortality of these group of patients can be an another subject of a study.

As another outcome of our study, the length of hospital stay was not found to be associated with mortality when both groups were evaluated together. The increase in the length of hopital stay was affected by the time spent preoperatively for optimization of patient for surgery, hospitalizations in the intensive care unit and the orthopaedic ward postoperatively. In the pre-pandemic period, we could not find a positive relationship with surgical delay in mortality, and no relationship was found between length of hospital stay and mortality. However, it has been shown that our patients who were mortal during the Pandemic were hospitalized for a longer time but results were not statistically significant (p=0.108). There are conflicting views on this issue in the literature. Nikkel et al. (26) conducted a study in the American population and lower early mortality was found in elderly hip fractures who stayed in the hospital for less than 5 days compared to those who stayed in the hospital for 10-15 days, on the contrary, in a study conducted in the Swedish population fewer hospitalization time caused an increased mortality in patients who were

stay in hospital less than 10 days (27). It is thought that discharge protocols in different country health systems and some other comorbidities are more associated with mortality.

The most important limitation of the study is that it was designed retrospectively. In addition, although the groups are homogeneous in terms of factors such as chronic diseases (ASA scores) and age, which may affect mortality, both groups are not homogeneous in terms of gender. Since our sample size would not allow for meaningful statistical analysis, subgroup analyzes were not performed in terms of factors such as age, gender, physical condition, comorbid diseases, surgical technique, surgical duration, and amount of bleeding etc. In addition, patients with a very small number of Covid positive diagnoses in the pandemic and who had serious surgical delays (over 10 days) due to Covid-19 treatment were not included in the study because it would cause a serious deviation in the means and this disease is a cause of high mortality in this age group. Although these deaths due to Covid-19 infection were not included in the study, they may have an indirect effect of this disease on the increase in mortality rates, since Covid-19 has serious morbidity and PCR negative deaths are not recorded as Covid deaths in the records of the Department of Population and Citizenship. When calculating the delays in the time of admission for surgery, the extra time spent by patients admitted from other centers was ignored. Data analysis was not conducted on whether the number of referred patients during the pandemic period differed from the pre-pandemic period.

As a conclusion, despite all it's limitations, in this study, it was found that the increase in the delay of admission for surgery over 23.35 hours in the elderly population after hip fractures was directly associated with one yaer mortality and also we think that the delay in time for surgery in the pandemic conditions is one of the factors that negatively affect mortality in these patients.

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REFERENCES

1. Civinini R, Paoli T, Cianferotti L, et al. Functional outcomes and mortality in geriatric and fragility hip fractures-results of an integrated, multidisciplinary model experienced by the "Florence hip fracture unit". Int Orthop 2019;43(1):187-92.
2. Mariconda M, Costa GG, Cerbasi S, et al. The determinants of mortality and morbidity during the year following fracture of the hip: A prospective study. Bone Joint J 2015;97-B(3):383-90.
3. WHO. Coronavirus disease (COVID-19) pandemic. 2020. Available from: http://www.who.int/covid-19
4. Das De S, Puhaindran ME, Sechachalam S, et al. Sustaining a national surgical training programme during the COVID-19 pandemic. Bone Jt Open 2020;1(5):98-102.
5. Mathai NJ, Venkatesan AS, et al. COVID-19 and orthopaedic surgery: Evolving strategies and early experience. Bone Jt Open 2020;1(5):160-6.
6. Chui K, Thakrar A, Shankar S. Evaluating the efficacy of a two-site ('COVID-19' and 'COVID-19-free') trauma and orthopaedic service for the management of hip fractures during the COVID-19 pandemic in the UK. Bone Jt Open 2020;1(6):190-7.
7. Segarra B, Ballesteros Heras N, Viadel Ortiz M, et al. Are hospitals safe? A prospective study on SARS-CoV-2 Prevalence and outcome on surgical fracture patients: A closer look at hip fracture patients. J Orthop Trauma 2020;34(10):e371-6.
8. Cha YH, Ha YC, Yoo JI, et al. Effect of causes of surgical delay on early and late mortality in patients with proximal hip fracture. Arch Orthop Trauma Surg 2017;137(5):625-30.
9. Shiga T, Wajima Z, Ohe Y. Is operative delay associated with increased mortality of hip fracture patients? Systematic review, meta-analysis, and meta-regression. Can J Anaesth 2008;55(3):146-54.
10. Moja L, Piatti A, Pecoraro V, et al. Timing matters in hip fracture surgery: Patients operated within 48 hours have better outcomes. A meta-analysis and meta-regression of over 190,000 patients. PLoS One 2012;7(10):e46175.
11. Klestil T, Röder C, Stotter C, et al. Impact of timing of surgery in elderly hip fracture patients: A systematic review and meta-analysis. Sci Rep 2018;8(1):13933.
12. World Health Organization. Coronavirus disease 2019 (COVID-19) situation report. Updated 12 January 2021 Accessed March 21, 2021.7
13. Oguzkaya S, Misir A, Ozcamdalli M, et al. Impact of the COVID-19 pandemic on orthopedic fracture characteristics in three hospitals in Turkey: A multi-center epidemiological study. Jt Dis Relat Surg 2021;32(2):323-32.
14. Kamacı S, Göker B, Çağlar Ö, et al. The effect of the COVID-19 pandemic on orthopedic surgeries in a tertiary referral center. Jt Dis Relat Surg 2021;32(2):333-9.
15. Simunovic N, Devereaux PJ, Sprague S, et al. Effect of early surgery after hip fracture on mortality and complications: Systematic review and meta-analysis. CMAJ 2010;182(15):1609-16.
16. Greve K, Modig K, Talbäck M, et al. No association between waiting time to surgery and mortality for healthier patients with hip fracture: A nationwide Swedish cohort of 59,675 patients. Acta Orthop 2020;91(4):396-400.
17. Hip fracture accelerated surgical treatment and care track (HIP ATTACK) investigators. Accelerated care versus

standard care among patients with hip fracture: The HIP ATTACK pilot trial. CMAJ 2014;186(1):E52-60.
18. White SM, Griffiths R, Holloway J, et al. Anaesthesia for proximal femoral fracture in the UK: First report from the NHS hip fracture anaesthesia network. Anaesthesia 2010;65(3):243-248.
19. Boddaert J, Cohen Bittan J, Khiami F, et al. Postoperative admission to a dedicated geriatric unit decreases mortality in elderly patients with hip fracture. PLoS One 2014;9(1):e83795.
20. Al Ani AN, Samuelsson B, Tidermark J, et al. Early operation on patients with a hip fracture improved the ability to return to independent living. A prospective study of 850 patients. J Bone Joint Surg Am 2008;90(7):1436-42.
21. Mariconda M, Costa GG, Cerbasi S, et al. The determinants of mortality and morbidity during the year following fracture of the hip: A prospective study. Bone Joint J 2015;97-B(3):383-90.
22. Kannegaard PN, van der Mark S, Eiken P, et al. Excess mortality in men compared with women following a hip fracture. National analysis of comedications, comorbidity and survival. Age Ageing 2010;39(2):203-9.
23. Orosz GM, Magaziner J, Hannan EL, et al. Association of timing of surgery for hip fracture and patient outcomes. JAMA 2004;291(14):1738-43.
24. Maggi S, Siviero P, Wetle T, et al. A multicenter survey on profile of care for hip fracture: Predictors of mortality and disability. Osteoporos Int 2010;21(2):223-31.
25. COVID surg collaborative. Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: An international cohort study [published correction appears in Lancet 2020 Jun 9;:]. Lancet 2020;396(10243):27-38.
26. Nikkel LE, Kates SL, Schreck M, et al. Length of hospital stay after hip fracture and risk of early mortality after discharge in New York state: Retrospective cohort study. BMJ 2015;351:h6246.
27. Nordström P, Gustafson Y, Michaëlsson K, et al. Length of hospital stay after hip fracture and short term risk of death after discharge: A total cohort study in Sweden. BMJ 2015;350:h696.