



Timing of Hip-fracture Surgery in Elderly Patients: Literature Review and Recommendations

Yoon Jae Seong, MD, Won Chul Shin, MD, PhD, Nam Hoon Moon, MD, PhD*, Kuen Tak Suh, MD, PhD

*Department of Orthopaedic Surgery, Pusan National University Yangsan Hospital,
Pusan National University School of Medicine, Yangsan, Korea,*

*Department of Orthopaedic Surgery, Pusan National University Hospital, Busan, Korea**

The incidence of hip fractures is rapidly increasing with an aging population and is now one of the most important health concerns worldwide due to a high mortality rate. The effect of delayed surgery on postoperative outcomes has been widely discussed. Although various treatment guidelines for hip fractures in the elderly exist, most institutions recommend that operations are conducted as soon as possible to help achieve the most favorable outcomes. While opinions differ on the relationship between delayed surgery and postoperative mortality, a strong association between earlier surgery and improvement in postoperative outcomes (e.g., length of hospital stay, bedsores occurrence, return to an independent lifestyle), has been reported. Taken together, performing operations for hip fractures in the elderly within 48 hours of admission appears to be best practice. Importantly, however, existing evidence is based primarily on observational studies which are susceptible to inherent bias. Here, we share the results of a literature search to summarize data that helps inform the most appropriate surgical timing for hip fractures in the elderly and the effects of delayed surgery on postoperative outcome. In addition, we expect to be able to provide a more accurate basis for these correlations through a large-scale randomized controlled trial in the future and to present data supporting recommendations for appropriate surgical timing.

Key Words: Hip fracture, Surgical timing, Mortality, Hospital stay, Complication

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Address reprint request to

Won Chul Shin, MD, PhD

[<https://orcid.org/0000-0002-6918-3015>]

Department of Orthopaedic Surgery, Research Institute for Convergence of Biomedical Science and Technology, Pusan National University Yangsan Hospital, Pusan National University School of Medicine, 20 Geumo-ro, Mulgeum-eup, Yangsan 50612, Korea

TEL: +82-55-360-2125 **FAX:** +82-55-360-2155

E-mail: dreami3e5t@pusan.ac.kr

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INTRODUCTION

Hip fractures in the elderly have emerged as a serious injury that incurs high medical costs and public resources due to long-term bed rest, limitations of independent daily living, or death¹⁻³. In South Korea, more than 28,000 hip fractures occur annually; this number is rapidly rising with the aging population⁴. The incidence of postoperative complications is relatively high even after surgical treatment, and the mortality rate within one year after surgery is 14-36%^{5,6}. Surgical treatment has become a requisite for elderly patients with hip fractures because of worsened outcomes without surgery. Age, underlying

disease, use of anticoagulants, and physical status of patients are well-known factors associated with prognosis of hip fractures in the elderly, and many efforts have been made to improve surgical outcomes of medical treatment⁷⁾.

The effect of delayed surgery for various reasons on postoperative outcomes has been the subject of a long-standing debate. Operating room availability and preoperative medical evaluation are common factors delaying surgeries worldwide⁸⁾. Studies on the association between surgical timing and clinical outcomes have conflicting findings⁹⁻¹¹⁾. The currently accepted guidelines, based on the improvement of postoperative functional outcomes after early surgery and reduction of mortality, length of hospital stay, and postoperative complications, suggest that surgery be performed within 24 hours of admission, if possible^{9,10)}. In contrast, for patients with severe underlying disease, delayed surgery is necessary for medical evaluation and stabilization. In fact, several studies have shown that delayed surgery is not associated with an increase in postoperative mortality and that postoperative complications increase when surgery is performed rapidly and prior to medical stabilization^{12,13)}. Large-scale randomized controlled trials are needed to provide a more accurate basis for understanding the postoperative effects of surgical timing.

The purpose of this report is to organize and summarize published prospective and retrospective studies addressing the association between surgical timing and mortality, length of hospital stay, and postoperative complications of hip fractures in the elderly.

SURGICAL TIMING AND MORTALITY

To date, opinions vary among orthopedic surgeons regarding the association between surgical timing and mortality in hip fractures. Many authors still report that earlier surgery is an important factor in improving survival. Pincus et al.¹⁴⁾ analyzed a cohort of 42,230 Canadians and reported the results of surgery performed within 24 hours of admission for hip fractures. The authors found that the 30-day postoperative mortality rate was significantly lower in patients who underwent surgery within 24 hours of admission and reported 24 hours after admission as a key mortality threshold. Uzoigwe et al.⁹⁾ analyzed the results of 2,056 patients who underwent surgery for hip fractures within 12, 24, and 36 hours of admission and 36 hours after admission for hip fractures. This group

reported that postoperative mortality was significantly higher for those in whom surgery was performed 36 hours after admission compared with those receiving surgery within 24 hours of admission. An early systemic review of 16 published studies revealed that postoperative 30-day and 1-year mortality increased due to delayed surgery of over 48 hours¹⁵⁾. In a more recent systemic review, 35 published studies were analyzed and 191,873 patients with hip fractures were included. Surgery within 24-48 hours of admission was rated as a major factor in reducing all-cause mortality¹⁶⁾. This is consistent with the results of previous meta-analysis studies by Simunovic et al.¹⁷⁾.

On the other hand, several studies have suggested that there is little correlation between delayed surgery and postoperative mortality. The guidelines issued by the British and Irish Orthopedic Associations, and the Association of Anesthetists of Great Britain and Ireland have specified “acceptable reasons for delay”¹⁸⁾, including anemia of <8 g/dL, electrolyte imbalance, uncontrolled diabetes, ventricular failure, arrhythmia, chest infection, and correctable coagulopathies. These guidelines recommend that it may be safer to perform surgery after stabilization in patients with these complications, if possible. In a prospective analysis of 850 patients with hip fractures, Al-Ani et al.¹⁰⁾ reported no difference in mortality among surgeries performed within 24 hours, 36 hours, and 48 hours of admission. Moran et al.¹³⁾ also prospectively analyzed 2,660 patients with hip fractures and reported that surgical delay up to four days after admission had no effect on postoperative mortality and that four days after admission was a key mortality-based threshold. In a study of 2,250 patients with hip fractures, Vidán et al.⁸⁾ reported similar findings that surgical delay of up to 120 hours after admission had no effect on postoperative mortality, after controlling for confounders, such as old age, dementia, and chronic disease. They concluded that patients with a poor initial health status experienced greater delays in surgery and that such association alone produced negative outcomes for those with delayed surgery. Orosz et al.¹⁹⁾ reported that surgery within 24 hours in 1,178 patients with hip fractures was not associated with improved mortality. A recent systemic review of 291,143 patients with hip fracture based on 52 published studies²⁰⁾ concluded that early surgery and postoperative survival rates were not closely associated, after adjusting for various associated factors.

SURGICAL TIMING AND HOSPITAL STAY

Many studies have shown that earlier surgery is associated with a shortened length of hospital stay in elderly patients with hip fractures. Siegmeth et al.²¹⁾ reported a prospective, 15-year follow-up of 3,628 patients who underwent surgery for hip fractures. They analyzed patients by dividing them into two groups, those who underwent surgery before and those who underwent surgery after 48 hours after admission and found that the length of hospital stay shortened an average of 10.9 days in patients who underwent surgery within 48 hours. Al-Ani et al.¹⁰⁾ conducted a similar study and found that the average length of hospital stay was reduced by four days in patients who underwent surgery within 24 hours after admission. Lefavre et al.²²⁾, after controlling for related factors (e.g., age, fracture type, medical complications) similarly reported an association between delayed surgery and a prolonging of hospital stays. In a prospective cohort study by Vidán et al.⁸⁾, there was a significant positive correlation between delayed surgery for more than five days and prolongation of hospital stay. In the analysis of several studies, lack of the operating room availability was identified as a common cause for delayed surgery. However, one should bear in mind that when this challenge is successfully resolved, treatment efficacy and patient outcomes will improve.

SURGICAL TIMING AND POSTOPERATIVE COMPLICATIONS

Among various postoperative complications after hip fracture surgery in the elderly, the incidence of pressure sores can be reduced significantly by earlier surgery. Pressure sores are a serious complication resulting from prolonged limitation of motion after hip fracture. Grimes et al.²³⁾ reported that the incidence of pressure sores was significantly increased when the operation was delayed by more than 96 hours. These results are similar to those of other studies, and there is little difference regarding the association between delayed surgery and pressure sores^{16,17,20)}. Pneumonia is another serious complication that may occur as immobilization is prolonged after a hip fracture. As with pressure sores, pneumonia is significantly correlated with delayed surgery^{12,17)}. Some differences among studies on the association between delayed surgery and the occurrence of venous thromboembolism remain. Shin et al.²⁴⁾ reported the prevalence of venous

thromboembolism in 23 of 208 patients (11.1%) with hip fracture whose operation was delayed for more than 24 hours. To prevent serious complications due to venous thromboembolism in cases of delayed surgery, thorough active preoperative investigations are recommended.

Al-Ani et al.¹⁰⁾ reported that earlier surgery in elderly patients with hip fractures positively affects long-term functional outcomes. After adjusting for potential confounders, they observed that surgery performed within 36 hours increased the likelihood of returning to independent daily life within four months. In a similar report, Doruk et al.²⁵⁾ evaluated for activities of daily living scores before fracture, and postoperative first, third, sixth and twelfth months. They reported that earlier postoperative weight-bearing recovery and a return to daily activities could be achieved if surgery was performed within 5 days of admission. Another study has also reported on earlier surgery resulting in a reduction of pain during hospital stay in patients with hip fractures¹⁹⁾. They reported that surgery within 24 hours was associated with fewer days of severe and very severe pain.

AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS RECOMMENDATIONS

Moderate evidence exists supporting the concept that hip fracture surgery within 48 hours of admission is associated with better outcomes. Nine moderate-strength studies evaluated patient outcomes in relation to timing of hip fracture surgery^{13,19,21,26-31)}. In many of these studies the presence of increased comorbidities was a confounding effect, and therefore delays for medical reasons were often excluded. The majority of studies favored improved outcomes in regards to mortality, pain, complications, or length of stay^{19,21,26,28-30)}. Although several studies revealed a benefit of surgery within 48 hours, one study showed no harm with a delay up to four days for patients fit for surgery who were not delayed for medical reasons¹³⁾. Patients delayed due to medical reasons had the highest mortality and it is this subset of patients that could potentially benefit the most from earlier surgery.

CONCLUSION

The incidence of hip fractures is rapidly increasing concomitantly with the number of elderly patients, however there is still controversy about the relationship between proper surgical timing and postoperative outcomes (Table 1).

Table 1. Characteristics of Included Studies

Study	Design	No. of participant	Association with delay	Optimal timing (hr)	Conclusion
Mortality					
Pincus et al. (2017) ⁽⁴⁾	Retrospective	42,230	+	24	30-day postoperative mortality rate was significantly lower in patients who underwent surgery within 24 hours of admission.
Uzoigwe et al. (2013) ⁽⁹⁾	Prospective	2,056	+	24	Postoperative mortality was significantly higher for surgery performed 36 hours after admission.
Shiga et al. (2008) ⁽⁵⁾	Systemic review	257,367	+	48	Postoperative 30-day and 1-year mortality increased due to delayed surgery of over 48 hours.
Moja et al. (2012) ⁽⁴⁾	Systemic review	191,873	+	24	Surgery within 24-48 hours of admission was rated as a major factor in reducing all-cause mortality.
Simunovic et al. (2010) ⁽⁷⁾	Systemic review	13,478	+	24	Earlier surgery within 24 hours was associated with a significant reduction in mortality.
Al-Ani et al. (2008) ⁽¹⁰⁾	Prospective	850	-	N	No difference in mortality among surgeries performed within 24, 36, and 48 hours of admission.
Moran et al. (2005) ⁽³⁾	Prospective	2,660	-	96	Delayed surgery of up to 4 days after admission had no effect on postoperative mortality.
Vidán et al. (2011) ⁽⁸⁾	Prospective	2,250	-	120	Delayed surgery of up to 120 hours after admission had no effect on postoperative mortality, after controlling confounders such as old age, dementia, and chronic disease.
Orosz et al. (2004) ⁽¹⁹⁾	Prospective	1,178	-	N	Early surgery was not associated with improved function or mortality.
Khan et al. (2009) ⁽²⁰⁾	Systemic review	291,413	-	48	Early surgery and postoperative survival rates were not closely associated, after adjusting for various associated factors.
Hospital stay					
Siegmeth et al. (2005) ⁽²¹⁾	Prospective	3,628	+	48	The length of hospital stay shortened at an average of 10.9 days in patients who underwent surgery within 48 hours.
Al-Ani et al. (2008) ⁽¹⁰⁾	Prospective	850	+	24	The average length of hospital stay was reduced by 4 days in patients who underwent surgery within 24 hours after admission.
Lefaire et al. (2009) ⁽²²⁾	Retrospective	465,000	+	48	Elderly patients with a fracture of the hip should be stabilised surgically within the first 48 hours in order to minimise the delay to discharge and hospital morbidity.
Vidán et al. (2011) ⁽⁸⁾	Prospective	2,250	+	120	Significant positive correlation between delayed surgery for more than 5 days and prolongation of hospital stay.
Postoperative complication					
Grimes et al. (2002) ⁽²³⁾	Retrospective	1,383	+	24	The incidence of pressure sores was significantly increased when the operation was delayed by more than 96 hours.
Moja et al. (2012) ⁽⁴⁾	Systemic review	191,873	+	24	Surgical delay is associated with a significant increase in the risk of pressure sores.

Continue

Table 1. Continued

Study	Design	No. of participant	Association with delay	Optimal timing (hr)	Conclusion
Simunovic et al. (2010) ¹⁷⁾	Systemic review	13,478	+	24	Earlier surgery was associated with a lower rates of postoperative pneumonia and pressure sores among elderly patients with hip fracture.
Smektala et al. (2008) ²¹⁾	Prospective	2,916	+	12	Shorter time-to-surgery may be associated with somewhat lower rates of post-operative complications, such as decubitus ulcers, urinary tract infections, thromboses, pneumonia, and cardiovascular events, and with somewhat higher rates of others, such as postoperative bleeding or implant complications.
Shin et al. (2016) ²⁴⁾	Retrospective	208	+	24	The prevalence of venous thromboembolism in 23 of 208 patients (11.1%) with hip fracture whose operation was delayed for more than 24 hours.
Al-Ani et al. (2008) ¹⁰⁾	Prospective	850	+	36	Surgery performed within 36 hours increased the likelihood of returning to independent daily life within 4 months.
Doruk et al. (2004) ²⁵⁾	Retrospective	65	+	120	Early postoperative weight-bearing recovery and a return to daily activities could be achieved if surgery was performed within 5 days of admission.

Here, it is concluded following a literature review that many studies support earlier surgery when evaluating the relationship between surgical delay and mortality. However, it is also noted that in cases of medical conditions that can be corrected, delayed surgery for stabilization is not associated with mortality. Thus, further studies on the relationship between surgical timing and mortality need to be conducted to further elucidate the correlation. In contrast, it was generally agreed that delayed surgery prolongs the length of hospital stay and is a risk factor of pressure sores. Earlier surgery can serve as a positive factor for pain relief and rapid functional recovery of patients during a hospital stay. Based on published results, it is wise to consider earlier surgery after admission for hip fractures in the elderly. Patients who do not require medical stabilization should undergo surgery within 24 hours after admission and this target should be revised to within 48 hours of admission if there is a correctable medical condition. During this period, active collaborative interactions between various departments (e.g., internal medicine, anesthesiologists) should take place, and surgery should not be delayed simply because of a test or medical conditions that cannot be corrected.

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CONFLICT OF INTEREST

The authors declare that there is no potential conflict of interest relevant to this article.

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