THE EFFECTS OF TIME-TO-SURGERY ON MORTALITY IN ELDERLY PATIENTS FOLLOWING HIP FRACTURES

Simon Trpeski, Igor Kaftandziev, Aleko Kjaev

University Traumatology Clinic, Medical Faculty, Ss. Cyril and Methodius University, Skopje, R. Macedonia

Corresponding Author: Trpeski Simon, M.D., Mr.Sci, Department for Traumatology, University Surgery Clinic, Ss. Cyril and Methodius University, Vodnjanska 17, 1000 Skopje, R. Macedonia, Tel. + 389 (0)2 070 24 02 02, E-mail: trpeskisimon@yahoo.com

Abstract

Introduction: Mortality occurring as a consequence of hip fracture in older patients is very high. Mortality is highest in the first few months after the injury, and this rate is kept at a high level within the first six months postoperatively. Current guidelines indicate that surgery should be performed within 48 hours of injury because early surgery is associated with lower rates of perioperative complications and mortality.

Aim: To analyse the effects of time-to-surgery on mortality in elderly patients with hip fracture.

Material and methods: The research was conducted at the University Traumatology Clinic in Skopje, where 120 patients with hip fracture of age 65 and above were treated. The age span was 55–95 years, with a mean age of 73.9 ± 9.8 years. The time frame for the research and the follow-up of the patients was 6 months. Inclusion criteria included patients aged above 65 and isolated proximal femur fractures. Survival time for patients after six months was determined with the Kaplan-Meier product-limit method. Statistical significance was evaluated at level of p < 0.05.

Results: The mean time from patient admission to surgical intervention was 3.07 ± 1.5 days (range 0–6 days). Hospitalization time averaged 11 ± 4.7 days. We separated our patient population into two groups, one consisting of patients operated in the first two days, the other after two days. The patient death rate in the first group of 25 patients operated in the first 48 hours was a total of 4 patients (16%) after 6 months. The second group, 95 patients operated after 48 hours, showed a significant rise in mortality – 32 patients (33.7%). The mean survival time of patients operated within 48 hours is 168.8 days, while the mean survival time of patients operated after 48 hours from their hospital admission was 143.6 days.

Conclusion: Delay in surgery is associated with significant increase in mortality. Patients should have their operation as soon as possible after admission to hospital, preferably in the first 48 hours.

Key words: elderly patients, hip fracture, mortality, time-to-surgery.
patients with a fracture of the proximal femur die within one year post-operatively. The number of sustained falls and fall-related injuries will undoubtedly increase in the near future.

One year after hip fracture, only 40% of patients regain the level of mobility they had before the injury, and only 25% regain their full mobility and function [15]. Mortality is highest in the first few months after the injury, and this rate remains at a high level for six months. Delaying the surgical procedure has an effect on mortality; patients that were postponed for surgery more than two days after hospital admission have a 17% higher mortality rate within one month after the injury [14]. Mortality is associated with hip fracture as a result of patient immobilization, deep venous thrombosis, pulmonary embolism and infection.

Complications associated with the surgical procedure includes: anaesthesia induced complications, postoperative surgical site infection, malunion, nonunion and chronic pain, among others. High-energy hip fracture is commonly associated with other bone and soft-tissue injuries, intra-abdominal and intra-pelvic injuries, massive blood loss, head and neck injuries, injuries to other extremities. Failure to return to the pre-injury level of mobility results in loss of everyday independent functioning, quality of life reduction and depression, especially in the elderly population, that can affect the rate of mortality.

The aim of this study was to research the contributing factors that lead to increased mortality within six months postoperatively.

Materials and methods

The research was conducted at the University Traumatology Clinic in Skopje, where 120 patients with hip fracture of age 65 and above were treated. The time frame for the research and patient follow-up was 6 months. Inclusion criteria included patients aged above 65 and isolated proximal femur fractures (including inter- and pertrochanteric fractures, subtrochanteric fractures), with or without additional co-morbidities, and with/without previous surgical interventions. Exclusion criteria included age below 65 years, relevant additional injuries (including poly- or multitrauma), pathological fractures and fractures of the head and neck of the femur. The research was designed to be a prospective cohort study. Patients were followed for 6 months postoperatively. Female patients, as expected and compared with various articles in the literature, were predominant with a total of 93 patients (77.5%), while male patients accounted for 27 (22.5%). The mean age was 73.9 ± 9.8 years (age span 55–95 years).

Fractures of the proximal femur were classified according to the AO17 (Arbeitsgemeinschaft für Osteosynthesefragen) classification – the majority, 63 patients (52.4%) had sustained a 31.A1 Type fracture, 27 patients (22.6%) sustained a 31.A2 Type fracture, while the remaining 30 (25%) had a 31.A3 Type fracture. Each of the 120 patients was operatively treated using a standard operative technique, including DHS (Dynamic Hip Screw), DCS (Dynamic Condylar Screw) or PFNa (Proximal Femoral Nail – antirotation), depending on the type of fracture, patient characteristics and surgeon experience. Patients with a head and/or neck fracture of the femur and patients with an endoprosthetic device were excluded from this study. Each patient had a clinical examination (arterial blood tension, ECG), standard radiographs (hip radiograph – AP and profile, chest radiograph) and laboratory analysis (blood analysis, electrolytes, urea, creatinine, haemostasis).

Every patient received an antibiotic therapy lasting for three days post-op (cephalosporin group antibiotic), deep venous thrombosis prophylaxis with a low-molecular heparin during hospitalization (and one month after release from hospital) and regular post-op wound care. In-hospital parameters were noted: the time from admission until surgical procedure, hospitalization time, the type of surgical technique, blood loss and early complications. In the 6 months postoperative period, the patients were noted for: late complications, return to pre-op work/life quality before the injury, six month death rate. Patient follow-up was conducted on the first, third and sixth month post-operatively.

For statistical data analysis, we used standard descriptive and analytical univariate, bivariate and multivariate methods (mean, median, standard deviation, Chi-square test). Survival time for patients after six months was determined with the Kaplan-Meier product-limit method. Statistical significance was evaluated at level of $p < 0.05$. 
**Results**

Hospitalization time averaged 11 ± 4.7 days, with the shortest hospital admission of 4 and the longest hospital admission of 33 days. The mean time from patient admission to surgical intervention was 3.07 ± 1.5 days (range 0–6 days). The majority of the patient population, 39 patients (32.5%), were operated within the first three days after their hospital admission (Chart 1). A total of 39 patients (32.5%) had surgical intervention on the third day after admission, 24 patients (20%) on the second and fifth day after admission.

We separated our patient population into two groups, one consisting of patients operated in the first two days, the other after two days. In the first group, 25 patients (20.8%) were operated in the first 48 hours (or less) while in the second group of 95 patients (79.2%) were operated after two days (Table 1).

Patient death rate in the first group of 25 patients operated in the first 48 hours was a total of 4 patients (16%) in the first six months after the surgical procedure. The second group, 95 patients operated after 48 hours, showed a significant rise in the number of deceased patients. A total of 32 patients (33.7%) died in the first six months after the surgical procedure (Table 2). The mean survival time of patients operated within 48 hours was 168.8 days, while the mean survival time of patients operated 48 hours after their hospital admission was 143.6 days (Table 3).

In Figure 1 we present the survival curve for patients operated in the first 2 days, and patients operated after 2 days, calculated by the Kaplan-Meier method. Our analysis shows that after 6 months 84% of patients on whom sur-

<table>
<thead>
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<th>Time to surgery</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2 days</td>
<td>25</td>
<td>20.83</td>
</tr>
<tr>
<td>&gt; 2 days</td>
<td>95</td>
<td>79.17</td>
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<tr>
<td>Total</td>
<td>120</td>
<td>100</td>
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</table>

<table>
<thead>
<tr>
<th>Admission-operation</th>
<th>Total N</th>
<th>Events (Died)</th>
<th>Censored</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>2 days and less</td>
<td>25</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>&gt; 2 days</td>
<td>95</td>
<td>32</td>
<td>63</td>
</tr>
</tbody>
</table>

**Chart 1 – Time-to-surgery – time intervals**

**Table 1**

**Patients operated within different time intervals**

**Table 2**

**Patient survival rate according to time-to-surgery**

**Table 3**

**Mean for survival time according to time-to-surgery**

<table>
<thead>
<tr>
<th>Admission-operation</th>
<th>Mean for Survival Time</th>
<th>95% Confidence Interval</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>Std. Error</td>
</tr>
<tr>
<td>2 days and less</td>
<td>168.6</td>
<td>5.8</td>
</tr>
<tr>
<td>&gt; 2 days</td>
<td>143.6</td>
<td>5.7</td>
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Surgery was performed in the first 2 days were alive, in comparison with 66% of patients on whom surgery was performed more than two days after hospital admission were alive. The difference in survival time between the two groups is statistically significant (p < 0.05). According to our results, patients with time-to-surgery more than 48 hours have a significantly shorter six months survival time than patients operated within 48 hours.

**Discussion**

The mortality in elderly patients following hip fracture is affected by many factors such as their pre-fracture state, quality of fracture fixation, additional co-morbidities and social support, among others. The treatment problem is not consistent only with an adequate surgical technique and the fewest possible postoperative complications but a solution so that patients regain their prefracture quality of life, as much as possible. Mortality after hip fracture is estimated to be highest in the first months after the injury and is maintained at a high level up to one year after the fracture. After this period the mortality rate is the same as for elderly people who had not sustained a proximal femur fracture. Hip fractures worldwide have a 20% mortality within the first year and 33% mortality within two years after the injury.

According to Klug [16], older patients and the delay in surgery are related to an increased risk for loss of function and mortality after hip fracture surgery. In their retrospective 2006 study, Klug et al. investigated the factors related to the loss of function after surgical procedure. They extensively researched older patient mortality with a hip fracture, and found that certain studies show a 37% mortality rate within 90 days postoperatively. According the authors, delay in surgery for more than 48 hours is associated with loss of function and death. The research found that the poor outcome is also related to the general condition of the patient, not only as a result of the fracture. This research study points out the fact that the surgeon must identify the factors associated with a poor outcome in this group of patients. Increased age, delay in surgery, and a higher ASA score increase patient mortality.

Previous studies suggested that early operation might reduce the risk of fracture-healing complications and mortality for hip fractures when treated by open reduction and internal fixation [16]. According to one systematic review of 52 published studies involving 291,413 patients admitted to hospital with a proximal femur fracture, surgery should be performed as soon as possible after admission to hospital [17]. In a total of 778 patients, Breddahl et al. showed that surgery within 12 hours significantly reduced mortality at 5 months to 1
The effects of time-to-surgery on mortality in elderly patients...  

year compared to surgery performed after 12 hours [32]. Zuckerman et al. prospectively studied 367 patients and found a higher mortality rate during the first year in patients who had surgery after 72 hours after hospital admission. The association was still present after controlling for age, gender, and number and severity of pre-existing health conditions [7]. A systematic review on the effect of time-to-surgery on mortality, which included 257,367 patients across 16 prospective and retrospective studies, found that a delay in surgery of more than 48 hours was associated with increased mortality rates in hip fracture patients [38].

One study included a total of 4,633 patients, older than 65; patients waited > 2 days from admission to surgery. There was a substantial variation in the median pre-operative stay among the hospitals (range 0–4 days). Patients who had surgery within 2 days had lower mortality (in-hospital, 1-month and 1-year) compared to those who waited for surgery > 4 days. The 818 non-operated patients suffered the highest 1-year mortality, 36.2% [34]. In one other prospective study, Moran et al. [18] reported a small group of patients (28 cases) who had a delay to surgery of more than 4 days. Their analysis suggested an increase in the 90 day and 1 year mortality for this group of patients. Furthermore, several other studies report that mortality was increased by delay [19–31]. Other studies report that not only mortality but complications as well as hospital stay were increased by delay in surgery [34–37].

Conclusion

Delaying surgery can affect mortality; it can increase morbidity as well, including pulmonary complications, DVT, occurrence of pressure sores and, as a result, will increase hospital stay. Patients in whom there are no particular conditions and co-morbidities that can be improved prior to surgery should have their operation as soon as possible after admission to hospital, preferably in the first 48 hours; for those patients who are acutely ill on admission, delaying surgery to stabilize the patient could be beneficial.

REFERENCES


денови (опсег 0–6 денови). Времето на хоспитализација е во просек 11 ± 4,7 денови.

До два дена по приемот оперирани се 25 пациенти, од кои кај четири (16%) настанал егзитус во период од 6 месеци по интервенцијата. Предоперативниот период траел повеќе од два дена кај 95 испитаници, од кои 32 (33,7%) починале. Просечното време на преживување за групата пациенти оперирани до два дена по хоспитализацијата изнесува 168,8 дена, додека за групата пациенти оперирани по повеќе од два дена од хоспитализирањето изнесува 143,6 дена. Повеќе од 180 дена се живи 84% пациенти кај кои интервенцијата е извршена во првите два дена од приемот, и 66% пациенти оперирани по повеќе од два дена по приемот.

Пациентите со предоперативен период подолг од два дена имаат сигнификантно пократко 6-месечно време на преживување споредено со испитаниците кај кои интервенцијата е извршена во првите два дена од приемот. Времето на прием на пациентите во болница до нивниот оперативен зафат треба да изнесува до 48 часа за да се намали морталитетот.

Ключни зборови: време до операција, фрактура на колк, морталитет, постари пациенти.