



How does the use of anticoagulants influence the outcome of elderly thoracic trauma patients?

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Abstract

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Aim: As a result of the demographic transition, an increasing number of elderly patients require therapeutic anticoagulation for a variety of comorbidities. These individuals need multidisciplinary care because they frequently use many drugs, have concomitant conditions, and have functional status that is already compromised.

Materials and Methods: A total of 103 trauma patients over the age of 65 who were admitted to the emergency department due to thoracic trauma were evaluated according to Gender, trauma etiology and characteristics, comorbidities, antithrombotic therapy use, rib and sternum fracture, hemothorax, pneumothorax, and contusion due to thoracic trauma.

Results: There were 72 male patients and 31 female patients with the average age of 73.8 +/- 8.61 years (min: 65, max: 96). The rates of hemothorax, pneumothorax, hemopneumothorax, contusion, atelectasis, and pneumonia were not significantly different between patients using and not using antithrombotics (respectively, $p = 0.666$, $p = 0.320$, $p = 0.212$, $p = 0.369$, $p = 0.633$, $p = 0.652$). Comorbid conditions or using antithrombotics had no impact on how long patients stayed in the hospital ($p = 0.503$, $p = 0.814$). The only predictor that significantly increased the length of stay was determined to be the tube thoracostomy ($p = 0.001$).

Conclusion: Antithrombotic usage had no impact on hemothorax, pneumothorax, or contusion development. However, further research and implementation initiatives are required in order to completely integrate geriatric principles into the care of older persons who have experienced trauma.



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Introduction

Geriatric patients make up 30.75% of all trauma cases [1]. There will undoubtedly be an increase in cases of geriatric thoracic trauma due to the world's aging population [2-4]. Anatomical injuries in this population are more likely to result in death than in younger patients [5]. Furthermore, even years after their trauma, geriatric patients lose the ability to perform at least one daily activity, and have a higher mortality rate within the first year after trauma [6]. Changes in cytokine expression due to age have resulted in a proinflammatory state that can worsen postoperative pain, muscle loss, and exhaustion, as well as increase the risk of postoperative complications such as venous thrombosis or stroke [7].

The elderly have a higher prevalence of baseline cardiovascular disease. Antithrombotic therapy is a mainstay of

treatment for patients with coronary artery disease. Although the benefits of pharmacotherapy for older coronary artery diseases (CAD) patients have been well documented, senior citizens are more vulnerable to the side effects of antithrombotic medications.

The increased prevalence of pulmonary comorbidities like COPD in this age group results in physiologically-impaired respiratory function in addition to the decline of functional residual capacity [8]. Due to lower lung compliance in older patients, rib fracture and lung contusion brought on by trauma have a higher impact.

Furthermore, older people are more likely to have polypharmacy and concurrent illnesses. Almost 40% of those over the age of 65 are taking five or more prescription medications [9]. Polypharmacy is associated with increased noncompliance, medication errors, postoperative delirium, and drug-drug interactions [10,11].

The current study's purpose is to look into cases of geriatric thoracic trauma and the factors that contribute to

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a longer hospital stay. Furthermore, this study also investigates the impact of antithrombotic use on clinical outcomes.

Materials and Methods

The study protocol was approved by the Gulhane Training and Research Hospital Ethics Committee (No: 2023-01/46418926). The study was conducted in accordance with the principles of the Declaration of Helsinki. This study investigated patients aged 65 and up who were admitted to the XXX Training and Research Hospital Thoracic Surgery clinic between 2018 and 2022. Gender, trauma etiology and characteristics, comorbidities, antithrombotic therapy use, rib and sternum fracture, hemothorax, pneumothorax, and contusion due to thoracic trauma were all recorded. It was determined whether the patients experienced complications such as pneumonia or atelectasis while in the hospital. The lengths of tube thoracostomy and hospitalization were investigated by determining how the patients were treated. The data was collected from the hospital's electronic database. There was no in-hospital deaths reported.

The study included patients aged 65 and up who were admitted to the emergency department due to thoracic trauma and had an indication for thoracic surgery service admission. Patients who required intensive care hospitalization at the time of administration or during hospitalization were excluded from the study. Patients who were discharged from the emergency department with superficial thoracic injuries were not included in the study.

Statistical analysis

SPSS version 22 will be used to conduct statistical analyses. Visual (histograms and probability graphs) and analytical (Kolmogorov–Smirnov/Shapiro–Wilk tests) techniques will be used to assess the variables' compliance to normal distribution. Descriptive analyses will be provided for the normally distributed age variable using the mean and standard deviation. Since the other variables are not normally distributed, the median and interquartile range will be used. The Student's t-test will be used to compare the age variable between groups. The Mann–Whitney U test will be used to compare numerical variables that do not fit the normal distribution (length of stay and number of rib fractures) in independent groups. Frequencies will be compared using the Chi-square or Fisher tests according to gender, presence of rib fracture, presence of hemothorax, presence of pneumothorax, presence of hemopneumothorax, presence of atelectasis, presence of pneumonia, presence of contusion, use of antithrombotics, and whether a tube thoracostomy has been applied or not. For variables at least one of which is not normally distributed, correlation coefficients and statistical significance will be calculated using the Spearman's rank correlation test. Cases where the P value is below 0.05 will be considered as statistically significant results.

Results

There were 72 male patients and 31 female patients. The average age was 73.8 +/- 8.61 years (min: 65, max: 96).

When the mean age by gender was examined, it was discovered that women were older, on average ($p = 0.028$). The age of patients with and without rib fractures was not different ($p = 0.576$). Similarly, there was no difference in age between patients with and without sternum fracture ($p = 0.730$). Eighty individuals (77.7%) had one or more comorbidities. Patients who had comorbid conditions were older than those who did not ($p = 0.006$).

Thirty-six patients were using antithrombotics. Acetylsalicylic acid (ASA) ($n = 17$, 16.5%) was the most frequently used antithrombotic medication. The rates of hemothorax, pneumothorax, hemopneumothorax, contusion, atelectasis, and pneumonia were not significantly different between patients using and not using antithrombotics (respectively, $p = 0.666$, $p = 0.320$, $p = 0.212$, $p = 0.369$, $p = 0.633$, $p = 0.652$). Additionally, there were no differences in the two groups' rib fracture incidence rates ($p = 1,000$). There was a difference in the number of rib fractures between the groups with and without contusions ($p = 0.005$).

Falling from one's own level was the most frequent cause of injuries, occurring in 41 cases (39.8%). In addition, 25 patients fell from a height (24.3%), four (3.9%) suffered injuries from beatings, and three patients (2.9%) were involved in motor accidents. Additionally, 20 (19.4%) patients had in-vehicle traffic accidents and 10 (9.7%) experienced out-of-vehicle accidents. When compared to other etiologies, patients who fell from their level were found to be older ($p < 0.001$).

Rib fracture was present in 95 (92.2%) of the patients and was absent in eight (7.8%). Although the incidence of rib fracture did not differ statistically ($p = 0.178$), the most common incidence of rib fracture occurred after falling from the patient's level ($n = 35$, 85.4%). There were multiple traumas (24.3%) involving at least one system outside the thorax in 25 of the patients. Six of the patients had sternum fractures (5.8%). In 16 patients (15.5%), there was bilateral trauma.

Hemothorax was found in 43 (41.7%) of the patients, pneumothorax was found in 44 (42.7%) of the patients, and hemopneumothorax was found in 18 (17.5%) of the patients. Fifty-two patients had contusions (50.5%), 73 (70.9%) patients were followed conservatively, 28 (27.2%) underwent tube thoracostomy, and two (1.9%) underwent surgery. Between the last three groups, there was a statistically significant difference in their lengths of stay ($p = 0.002$). It was discovered that patients undergoing conservative treatment spent significantly less time in the hospital ($p = 0.001$). The mean length of the patients' hospital stay was 4.49 ± 4.93 days (range 1–43 days). The mean duration of stay for a patient who underwent a tube thoracostomy was 4.37 ± 2.62 days (range 2–15 days).

Comorbid conditions or using antithrombotics had no impact on how long patients stayed in the hospital ($p = 0.503$, $p = 0.814$). The only predictor that significantly increased the length of stay was determined to be the tube thoracostomy ($p = 0.001$).

A weak correlation was discovered between the number of rib fractures and the length of stay ($r = 0.301$, $p = 0.002$). Two patients (1.9%) acquired pneumonia during

their hospital stay, while 23 individuals experienced atelectasis (22.3%). It was found that there was a weak correlation between the number of rib fractures and the length of stay ($r = 0.301$, $p = 0.002$).

Discussion

Over time, the global geriatric population defined as those 65 and over [1] has grown [2,3]. The growing geriatric population is straining the healthcare system. It is critical to identify risky patients and implement preventive measures, as well as to effectively triage these patients in the emergency department in order to predict possible negative outcomes. It is intended to quickly restore functional capacity to the pre-traumatic level in cases of elderly trauma. In our study, we tried to identify both the factors that can affect a rapid recovery and the features that can predict poor outcomes.

In the literature review, 80% of elderly trauma patients had at least one chronic condition, such as diabetes, hypertension, arthritis, cancer, heart disease, pulmonary disease, or a history of stroke [12]. This rate was 77.7% in our patient sample, which is consistent with the literature. Additionally, more than 75% of blunt thoracic traumas are known to result in pulmonary contusion [13]. In our study, all injuries were blunt and approximately half ($n = 52$, 50.5%) had a pulmonary contusion.

Additionally, we deduced that individuals with contusions had a higher rate of rib fractures.

Falling is the most frequent cause of injuries in the elderly population [1]. In our study, falling from one's own level was the most common cause of this type of damage. We think that the at-risk group and the caregivers of this group should be educated regarding this injury as it can be prevented using very simple precautions.

Many studies have found that patients who receive anticoagulants have a higher mortality rate when subjected to any major trauma [14]. For example, pre-injury warfarin was found to double the mortality rate after head trauma [15].

In our study, the most commonly used antithrombotic agent was ASA ($n = 17$, 16.5%). Although studies involving elderly patients have demonstrated a clear excess of adverse events with aspirin even at a lower dosage [12,13], very few trials have specifically addressed the aspirin benefit-risk ratio in this population. It is unclear how much aspirin for primary prevention will benefit certain populations, such as the elderly, and how much it will

harm them. We consider the need for randomized studies of aspirin usage for primary prevention in subgroups of patients at high risk of bleeding and thrombotic complications, such as the elderly.

Direct acting oral anticoagulants (DOACs) are a new class of anticoagulants that inhibit factor Xa. Dabigatran directly inhibits thrombin. However, in a study comparing the groups that received DOACs and warfarin prior to injury, no significant difference in blood transfusion, hospital length of stay (LOS), or mortality in people over the age of 60 was found [16]. However, some people argue that DOACs, which are regarded as being safer, should be favored because of their simplicity of use, lack of monitoring requirements, and potential for reduced bleeding in seniors with greater fall and related mortality [16-18]. There is not one particular antithrombotic that has been shown to worsen thoracic trauma fatality rates [16-18]. In our investigation, we came to the conclusion that antithrombotic usage had no impact on hemothorax, pneumothorax, or contusion development. However, further research and implementation initiatives are required in order to completely integrate geriatric principles into the care of older persons who have experienced trauma.

Clopidogrel is currently recommended as an option for aspirin-intolerant patients to use for secondary prevention of recurrent ischemic episodes [16]. Clopidogrel does not require a dose change based on age. Three patients in our study used this medication. All had received conservative care.

More than 55% of patients over the age of 60 who died in a car accident had no injuries worse than a rib fracture, according to Kent. Rib fracture was found in 95 (92.2%) of the 103 traumas studied [19]. As a result, we believe that thoracic surgeons and emergency physicians should work closely together, and that the hospitalization criteria should be tailored particularly for the senior population.

Pneumonia has been reported as the most common complication in geriatric patients admitted to the hospital following a trauma [20]. According to reports, the rate of pneumonia development, which significantly increases mortality after rib fracture in the elderly, is more than 34%. Only two patients in our study developed pneumonia. All patients in this study were admitted to the thoracic surgery clinic, and the rate of pneumonia was expected to be higher in patients admitted to intensive care.

Ozdemir et al. discovered a significantly increased mortality rate in their 6-month study of 400 thoracic trauma cases in patients over 65 years of age [21]. Additionally, it was found that hemopneumothorax increased mortality, particularly during the incident. There were no deaths in our study. In senior patients, the traditional outcome measure-a 30-day mortality rate- is a poor statistic. Geriatric trauma survivors still have a significant risk of death within 2 months of discharge despite the fact that the quality of hospital care is an effective indicator of survival until discharge [22].

Geriatric trauma care has a substantial monetary impact. The growing number of geriatric trauma patients will have major financial consequences, not just for future trauma care but also for the overall healthcare system [22].

Table 1. Minimum discharge requirements and recommendation for safe disposition.

Absence or minimal pain with adequate analgesics
Ability to take in food orally
Absence of abdominal discomfort, nausea, or vomiting
Ability to void, dress, and ambulate
Absence of fever or tachycardia
No radiological finding of additional pathology
Requirement of additional blood transfusion or gross increase in contusion
No sign for delirium

Geriatric trauma patients should be discharged according to a safe strategy. The ability of these patients to act independently, the ability to manage numerous drug uses, the effectiveness of physical therapy, and the ability of their cognitive skills to manage appropriate drug usage should all be carefully assessed. Table 1 lists our discharge suggestions in this regard. Adequate analgesia and respiratory physical therapy are crucial for preventing trauma sequelae [23].

This study's limitations include the sample size and the relatively small number of patients undergoing antithrombotic therapy. In addition, there were no patients who were severely injured, and thus, extrapolation of these data should be made with caution. Third, antithrombotic groups were heterogeneous (consisting of ASA, heparin, low molecular weight heparin, kvit antagonist, and DOACs). Also, we were unable to control for confounding variables and conduct our study at a single institution.

Conclusion

We believe that in the future, particularly strict drug monitoring of the geriatric population will increase knowledge on how anticoagulants affect clinical outcome after geriatric thoracic trauma, contributing to cost-effective policies, improving quality of life, and positively influencing societal conscience.

Ethical approval

The study protocol was approved by the Gulhane Training and Research Hospital Ethics Committee (No: 2023-01/46418926).

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