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RESEARCH

COMPUTED TOMOGRAPHY FINDINGS IN GERIATRIC TRAUMA PATIENTS WHO ADMITTED TO EMERGENCY ROOM (SERVICE)

ABSTRACT

Introduction: The risk of geriatric individuals suffering trauma has increased due to the increasing elderly population and participation in more active social lives as a result of the improvement in health status. For rapid evaluation of trauma patients by emergency services, in many organ systems, multi detector computed tomography has been replaced with conventional graphics.

Materials and Methods: Computed tomography studies of geriatric patients who applied to the emergency service of a tertiary care hospital because of trauma between February 2013 and February 2014 were analyzed in terms of radiopathological findings associated with trauma. The results were examined in comparison with the literature.

Results: A total of 200 patients were enrolled, including 112 men and 88 women in the study. The mean age of the males was 75.5 and females was 75.9. Depending on the radiological findings, the number of affected anatomic regions as well as the type of trauma findings were noted. The most frequent types of trauma were falling (172 patients; 86%) and traffic accident (28 patients; 14%) respectively. The radiological findings were negative on half of (48%) the computed tomography examinations performed.

Conclusion: High rates of negative radiological findings cause cost and labor loss as well as unnecessary radiation exposure. Excessive labor in emergency services and physicians' malpractice concerns may have promoted the increased use of radiological examinations. During management of geriatric trauma patients, decisions regarding computed tomography should depend on guidelines based on further studies that stratify patient risk and consider cost effectiveness.

Key Words: Trauma; Computed Tomography; Geriatric.

ARAŞTIRMA

ACİL SERVİSE BAŞVURAN GERİATRİK TRAVMA HASTALARINDA BİLGİSAYARLI TOMOGRAFİ BULGULARI

ÖZ

Giriş: Yaşlı nüfusun artması, sağlık uygulamalarındaki iyileşme sonucu yaşlı bireylerin toplumsal yaşama daha aktif katılması gibi nedenlerle yaşlı hastalar travmaya daha fazla maruz kalmaktadır. Günümüzde acil servislerde travma hastalarının hızla değerlendirilmelerinin sağlanması amacıyla bir çok organ sisteminde konvansiyonel grafilerin yerini çok kesitli bilgisayarlı tomografi almıştır.

Gereç ve Yöntem: Şubat 2013-Aralık 2014 tarihleri arasında acil servise travma nedeniyle başvuran geriatrik olguların bilgisayarlı tomografi görüntüleri travmayla ilişkili radyopatolojik bulgular açısından analiz edildi ve sonuçlar literatür eşliğinde irdelendi.

Bulgular: Çalışmaya 88'i kadın 112'si erkek olmak üzere toplam 200 hasta dahil edildi. Yaş ortalaması erkeklerde 75.5 kadınlarda 75.9'du. Radyolojik olarak travma bulgusu saptanan anatomik bölgelerin sayısı ve etkilenme bulguları tespit edildi. En sık travma oluş şekli sırasıyla düşme (172; %86) ve trafik kazasıydı (28 hasta; %14). Bilgisayarlı tomografi incelemelerinin yarısında (%48) radyolojik bulgu yoktu.

Sonuç: Radyolojik bulgu saptanmama oranının yüksekliği maliyet ve iş gücü kaybı ile birlikte gereksiz radyasyon maruz kalımına sebep olmaktadır. Acil servislerdeki aşırı iş yükü ve hekimlerin malpraktis kaygıları radyolojik inceleme sayısındaki artışa neden olmuş olabilir. Geriatrik travma hastalarının yönetimi sırasında bilgisayarlı tomografi çekilmesine karar verme aşamasında; hastaların taşıdığı risk ve maliyet etkinlik durumunu araştıran ileri çalışmalar sonucu oluşturulacak kılavuzlara ihtiyaç vardır.

Anahtar Sözcükler: Travma; Bilgisayarlı Tomografi; Geriatri.

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Introduction

Nearly eight percent of the Turkish population is geriatric, a classification defined by the World Health Organization as those individuals who are older than 65 years of age (1). The proportion of geriatric patients is expected to increase as the living standards and healthcare improve. Geriatric individuals are at an increased risk for trauma due to the increasing elderly population and their more active social lives because of the improving health status. Trauma is the 5th leading cause of death for individuals over the age of 65 years with falls, traffic accidents, and burns being the most common types of trauma (2).

Trauma-related complications in the geriatric age group appear more frequently due to weakening of self-protection during trauma, avoiding trauma as a result of metabolic, physiological, and physical changes that occur during the aging process. To quickly evaluate geriatric trauma patients in the emergency setting, computed tomography (CT) has been replaced with conventional graphics. Developments in multi-detector computed tomography (MDCT) technology has recently provided a basis for faster scan volume, thinner collimation, and polyhedral, isotropic, and three-dimensional imaging techniques in routine use. These gains allow multiple organ systems to be evaluated simultaneously with high sensitivity, which is particularly useful for fractures and solid organ damage.

Traumatic events in the geriatric population are associated with a high risk of mortality and morbidity, and therefore, have important judicial and economic implications. Therefore, geriatric trauma cases must be managed differently from trauma cases in younger adults. In this study, MDCT images of geriatric trauma patients who presented to the emergency department of a tertiary care hospital between February 2013 and February 2014 were analyzed in terms of the radiopathological findings. The results were then compared to the literature.

Materials and Method

Two hundred patients over 65 years old who presented to our emergency department because of trauma and on whom CT examinations were performed between February 2013 and December 2014 were included in the study. Non traumatic geriatric patients were excluded from the study. The patients' demographic features and advanced acute CT findings based on trauma were retrospectively evaluated. Age, sex, and cause of trauma were recorded. Routinely, abdominal ultrasonography was performed abdominal trauma patients. Radiography was performed limb traumas. The localization and type of acute trauma-related pathology determined with CT were evaluated by a consensus of two experienced radiologists (BK, NY). Patients who presented to the emergency department with non-traumatic injuries and scans in which evaluation was suboptimal because of excessive motion artifacts were excluded. Ethical approval of the study was obtained from the Ethics Committee of our institution (2015/03 decision 04).

CT Examination Protocol

Brain, thorax, abdomen, and extremity CTs were achieved by using a 4 detector-row scanner (HiSpeed QX/i, GE Medical Systems, Milwaukee, WI, USA). Non contrast CT was performed brain, thorax and extremity scans. Contrast CT was performed only abdomen scans.

Image Evaluation and Analysis

The CT images obtained from geriatric trauma patients were evaluated in terms of the findings of acute traumatic injuries. The Abbreviated Injury Scale (AIS) (3) was used to describe the trauma region as multiple or local. According to this scale, the body was divided into four anatomic regions; head-face and neck, abdomen, thorax, and extremities. Multiple trauma was defined as trauma in at least two regions, whereas local trauma was defined as the involvement of only one region.

Depending on the radiological findings, we noted the number of affected anatomic regions as well as the type of trauma findings. Radiological signs of injury included the following: cephalohematoma, extra-axial and/or intra-axial bleeding, parenchymal injury, edema-shift, and fractures for the head and neck; pneumothorax, hemothorax, and contusion-laceration for the thoracic region; organ damage and fracture for the abdominal region; and fractures for the extremities. Only acute traumatic pathologies were included in the analysis. Radiopathological findings for previous trauma or non-traumatic findings were not considered.

Statistical Analysis

The data were analyzed using the Statistical Package for Social Science (SPSS) for Windows 15.0. Descriptive statistics were used, and the categorical variables were stated as number (n) and percentage (%). The numeric variables were expressed as average ± standard deviation (SD).

Table 1— Gender and Age Distribution of Patients

	Male	Female
Patients' gender	112(56.0%)	88 (44.0%)
Patients' age	75.56	75.96

RESULTS

Two hundred geriatric trauma patients were included in the study. The demographic characteristics were 44% female (n=88) and 56% male (n=112) (Table 1). The mean age of the males was 75.5 and females was 75.9 (range 65–94). According to the AIS classification, radiologically detected local traumatic injuries were determined in 92 (46%) patients. In 92 (46%) patients, trauma-related radiological findings were not observed. In 16 (8%) patients, multiple traumatic findings were present. The causes of traumatic injuries included traffic accident in 28 patients (14%) and falls and crashes were responsible for injuries in 172 patients (86%). CT was performed for 200 patients and included a total of 289 areas. Among these patients, 120 CT scans revealed acute traumatic injuries; the rate of the examination-based positive radiological finding was 41.5%.

The following number of areas was scanned with CT in all patient groups: a single area in 144 patients (72%), two areas in 29 patients (14.5%), three areas in 21 patients (10.5%), and four areas in six patients (3%). The most frequently examined area was the head and neck (n=119), extremities (n=71), thorax (n=60), and abdomen (n=29). There were no radiological findings in 96 patients (48%). Radiological findings related to trauma were observed mostly in the extremities (28%) and head and neck (19%). Table 2 provides a detailed account of the anatomic locatins of traumatic injuries as detected by MDCT. Although this rate was 71.8% in the extremity group (51 of 71 patients), the rate was 48% (96 of 200 patients) for the entire group.

Table 2— Posttraumatic Radiological Findings

	Number of Patients	Rate (%)
No radiological finding	96	48.0
Head and neck trauma	28	14.0
Extremity trauma	51	25.5
Thorax trauma	13	6.5
Abdomen trauma	2	1.0
Head and neck with thorax trauma	3	1.5
Head and neck with extremity trauma	3	1.5
Head and neck with thorax and extremity trauma	2	1.0
Head and neck with thorax and abdomen trauma	2	1.0

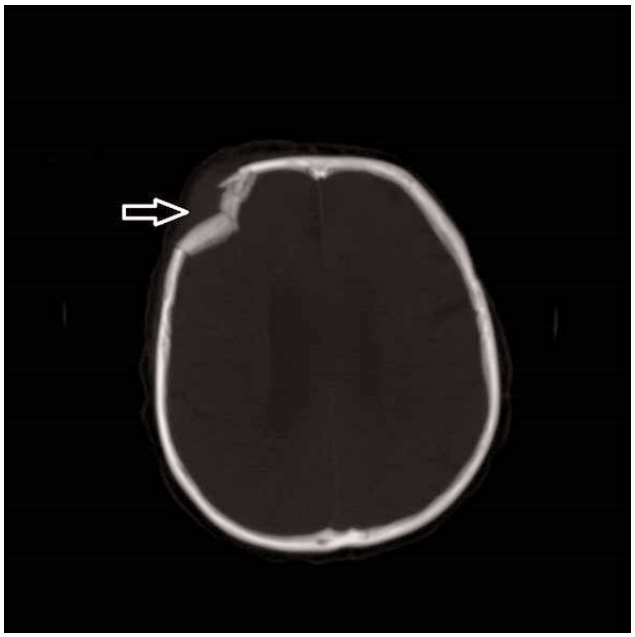

Figure 1— Compression fracture of the frontal bone.

In the head and neck trauma patient group, cephalohematoma was observed in 26 patients (13%), fracture in 22 patients (11%) (Figure 1), intra-axial bleeding and parenchymal damage in 7 patients (3.5%), extra-axial bleeding in 10 patients (5%), and brain edema and midline shift in 2 patients (1%). The regions affected by trauma and the types of pathology related to trauma are summarized in Table 3.

In the chest trauma patient group, pneumothorax was present in 7 patients (3.5%), hemothorax in 10 patients (5%) (Figure 2), parenchymal contusion/laceration in 11 patients (5.5%), and fracture in 22 patients (11%). In the abdomen trauma patient group, abdominal organ injury was present in 1 patient (0.5%) and fracture in 2 patients (1%). The extremity trauma patient group had 57 patients (28.5%) with a fracture. The extremities were the frequently affected regions by trauma because a fracture of the extremities was the most common radiological finding in all groups (Figure 3). In the traffic accident group, the rate of negative radiological fin-

Table 3— The Type of Pathology According to Trauma Site

Head and neck trauma	cephal hematomas 26 (13.0%)
	fracture 22 (11.0%)
	intraaxial bleeding-parenchymal damage 7 (3.5%)
	extraaxial bleeding 10 (5.0%)
	brain edema and midline shift 2 (1.0%)
Thorax trauma	pneumothorax 7 (3.5%)
	hemothorax 10 (5%)
	parenchymal contusion-laceration 1 1 (5.5%)
	fracture 22 (11.0%)
Abdomen trauma	abdominal organ damage 1 (0.5%)
	fracture 2 (1.0%)
Extremity trauma	fracture 57 (28.5%)

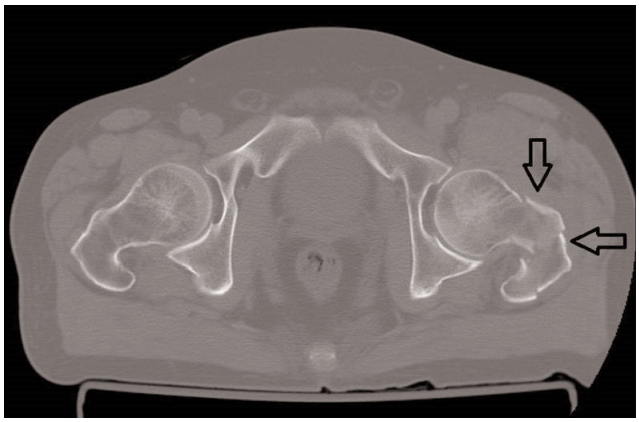

Figure 3— Femoral neck fracture on the left.

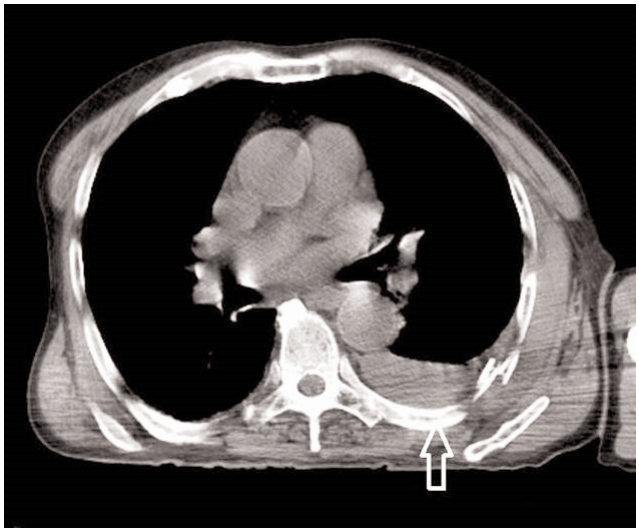

Figure 2— Left rib fractures and a hemothorax.

ding was 32.1% but 50.5% in the remaining groups. The frequently affected region was the head and neck in the traffic accident group at a rate of 46.4% (13 patients), although injury to the extremities was most frequently observed in the other patients at a rate of 28.4% (49 patients).

Discussion

Trauma is a very important part of the daily workload in emergency services. The type of trauma, mechanism of injury, and characteristics of the trauma population are the most important factors affecting the clinical course of patients. In the geriatric population, trauma constitutes 28% of all causes of death (4,5), which could be due to factors such as degenerative articular and vertebral changes, decreases in articular movements, decline in muscle support, and reduction of multiple organ reserve. In addition, a decline in the ability to deal with stress and trauma and deficiency due to disease in the organs due to aging result in higher morbidity and mortality rates in these patients after trauma than in younger age groups. We used AIS to distinguish between local and multiple trauma. Tanrıkulu et al. reported that the rate of local trauma among patients was 88.8% (6), whereas it was 46% in our study. This difference in the rates is because we evaluated only radiological findings instead of clinical findings. The type of trauma varied as per the social and cultural factors.

Present study findings represented that traffic accidents and falls are the most common causes of trauma in the Turkish geriatric population (86% falls and 14% traffic accidents). The regions most exposed to trauma in the geriatric population are the extremities [51 patients (25.5%)] and head and neck [28 patients (14%)]. Kandiş et al. (7) reported the rate of soft tissue trauma to be 49.1% and the rate of extremity trauma to be 16.1%. Similarly, Bilgin et al. (8) reported a rate of 33% for extremity trauma and 28% for soft tissue trauma. Akaoğlu et al. showed that the most injured organ was the extremity in both local and multiple trauma patients in all age groups (9). Tanrıkulu et al. reported a rate of 77% for extremity trauma, whereas the rates for head-neck trauma and multiple organ trauma were 8.6% and 11.1%, respectively. A comparison of these clinical studies shows that

although there are numerical differences, the frequently affected region is the extremity, which is consistent with our study. We suggest that the inclusion of physical examination findings to these clinical studies may have revealed this difference.

The radiological findings were negative in half of the CT examinations performed in our study. Such examinations are not only expensive but also cause labor loss as well as unnecessary radiation exposure. Excessive labor in the emergency services and physicians' malpractice concerns may have promoted the increased use of radiological examinations. Therefore, during the management of geriatric trauma patients, decisions regarding MDCT should depend on guidelines based on further studies that stratify patient risk and consider cost-effectiveness.

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