



Retrospective analysis of whole-body multislice computed tomography findings taken in trauma patients



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ABSTRACT

Objectives: Using whole-body multislice computed tomography (MSCT) excessively or with irrelevant indications can be seen in many centers. The aim of this study was to analyze retrospectively the MSCT findings in trauma patients admitted to the emergency department.

Methods: Records of the patients who have applied to the emergency department due to blunt trauma in a 12 month period and whose whole body MSCT images have been taken, were evaluated using the "Nucleus Medical Information System".

Results: The most frequent type of trauma was traffic accidents in 61.4%, falling down from the height in 22.4%, and motorcycle accidents in 11.4% of patients. Of the patients, 25.2% were discharged from the emergency, while 73.8% were hospitalized. At least one CT findings associated with trauma was present in 61.4% of our patients. Pathological findings in MSCT were most frequently detected in the head and face (35.3%) and thoracic (28.6%) regions, respectively. The most common finding in the head and face region was fractures. The most common pathological findings in the thoracic region were pulmonary contusion and rib fractures. A significant relationship was detected between trauma type and spinal MSCT result ($p < 0.001$). In a large percentage of the patients, MSCT findings were normal in the abdominal region and genitourinary system. Vertebral fractures were most frequently detected in the thoracolumbar region.

Conclusions: In our study, our rate of negative CT was found to be 38.6%, which is a higher ratio compared to other studies conducted on this topic.

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1. Introduction

Today, trauma is one of the basic health problems in every country irrespective of socioeconomic development. It is the third leading cause of death among all age groups and the most common cause of death in healthy persons aged 1–44 years worldwide.¹ Thus, management, diagnosis and treatment of trauma victims is of great importance.

There are evidences that clinical findings may be either suspicious or misleading in 20–50% of blunt multitrauma cases.^{2,3}

Therefore, rapid and reliable imaging modalities are needed. The use of computed tomography (CT) has recently gained importance in the early phase of trauma management. Advances in MSCT technology have made a significant impact in diagnosis of the patients.^{4,5} Whole body CT is regarded as an accessible, useful, and rapid tool in the management of trauma patients. In primary emergency, other traumatic injuries that can easily be overlooked should also be controlled.^{5–7}

MSCT is a useful technique for evaluation of brain, lung, liver, kidney, spleen, and retroperitoneum and has a high sensitivity, specificity, and accuracy for detection of pathologies in these organs.⁸ CT images of intra-abdominal injuries may direct clinicians to conservative management and prevent unnecessary laparotomic procedures. MSCT is of great importance in management of cases of vertebral trauma. It is possible to show fractures missed by plain

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films.^{9,10} On the other hand, MSCT has some disadvantages including high cost, requirement of considerable time for evaluation, and the risks of radiation. Moreover, there are some unclear points concerning the appropriate patient groups (lack of evidence-based information etc.) and indications (high-energy trauma victims, hemodynamic stability, and clinical indications) for MSCT. Hence, MSCT is overused or misused in many centers.^{7,11}

The aim of this study was to retrospectively examine the whole body MSCT in trauma patients presenting to emergency department. We aimed to determine the rate of ordering whole body MSCT and detection of pathologic findings; we also attempted to determine which body regions had injuries detected on MSCT.

2. Materials and method

2.1. Study design

Our study was a retrospective descriptive study that screened data of patients who presented to Mersin University (MEU) Health Research and Application Center, Emergency Department with blunt trauma and who underwent MSCT between 1 June 2012 and 31 May 2013.

The medical records of 294 patients who applied to emergency department and underwent whole body MSCT for trauma for a period of 12 months were obtained and analyzed using the “Nucleus Medical Information System”. Eighty-four patients were excluded owing to missing medical data or inadequate image quality. A total of 210 patients equal to or above the age of 18 were included in the final analysis.

Our study was approved by MEU Medical Faculty, Ethics Committee Chairmanship on 10/04/2014 with the approval No 2014/80. The first-time emergency applications were taken into consideration during a 12-month period. The reported MSCT findings, medical data (age, sex, time of emergency department application, trauma mode/mechanism (traffic accident, fall from a height, motorcycle accident etc.), the interventions applied at the emergency department (surgical or conservative), final diagnoses and the patient outcome (hospital admission, discharge etc.) were recorded. While recording MSCT findings human body was grouped into 6 regions: 1) head and face, 2) thorax (ribs, clavicle, and scapula included), 3) abdomen, 4) genitourinary system and retroperitoneum, 5) vertebrae, 6) pelvis.

2.2. Imaging protocol

All blunt trauma victims underwent a MSCT that included whole body from the uppermost tip of head to the lower edge of pelvis. The CT imaging was performed with the 64-slice CT device (Aquilion Toshiba Japan). The imaging protocol included the axial images of head, facial bones, cervical vertebrae, thorax, abdomen, and pelvis. Thoracic, abdominal, and pelvic CT imaging were performed with a contrast material whereas cerebral and cervical CT imaging were carried out without contrast use. Contrast material was injected by an automatic CT injector (Ulrich Missouri CT injection system). A non-ionic contrast material at a dose of 100 ml for an average patient weighing 80 kg was administered via a forearm vein at an infusion rate of 2.5 ml/s. Following the bolus injection of the contrast material the imaging was initiated after waiting for 45–50 s for thorax and 70–75 s for abdominopelvic region. Nonionic contrast materials, Ultravist (Iopromide) 300 mg/ml and Xenetix (Iobitridole) were used for contrast studies. Oral contrast was not administered in any patient. The images were analyzed in bone, soft tissue, and lung windows; vertebrae and other bones were evaluated in coronal and sagittal planes. A late phase imaging was performed when an abnormal finding was spotted in

genitourinary system during abdominopelvic imaging. All MSCTs were reported by radiologists. The radiology reports were retrospectively recorded on the Picture Archiving and Communication System (PACS) connected to the Nucleus Medical Information System.

2.3. Statistical analysis

In the statistical evaluation of the data to be obtained from the studies, the categorical variables were expressed in frequency and percentage. They were analyzed using the cross table statistical methods, namely the Chi-Square and Likelihood Ratio tests. When more than 2 categories were present, paired ratio comparisons were performed for the significant relationships. A *p* value less than 0.05 was considered statistically significant.

3. Results

During the study period a total of 50.707 patients applied to the emergency department (excluding repeated applications). A total of 3878 patients underwent CT for various indications (including non-traumatic indications). The blunt trauma victims totaled 639 and 294 (46%) of them underwent whole body MSCT.

The analysis of the demographic variables of the study population revealed that among 210 patients 161 were male and 49 were female. The age range was 19–79 years and the mean age was 38.4 ± 15.4 years. Of all patients, 39.5% (*n* = 83) applied to the emergency department between 18:00–23:59 and 32.4% (*n* = 68) between 12:00–17:59. Trauma mechanisms included traffic accident in 61.4% (*n* = 129), fall from a height in 22.4% (*n* = 47), and motorcycle accident in 11.4% (*n* = 24). The interventions were surgical in 41% (*n* = 86) and conservative in 59% (*n* = 124). An analysis of the short-term outcome of the patients revealed that 25.2% (*n* = 53) were discharged. Among those who were admitted to hospital, 58.1% (*n* = 122) were admitted to regular ward and 15.7% (*n* = 33) to intensive care unit. Two (1%) patients died at the emergency department (Table 1). Of 210 patients whose MSCT images were analyzed, 129 (61.4%) had at least one finding related to trauma, 81 (38.6%) had no relevant findings. Among 129 patients diagnosed to have a pathological finding on MSCT, the most common pathologies were located to head region at a rate of 35.3%

Table 1
Basic datas of trauma patients scanned with MSCT.

Datas	Number (n)	(%)
Sex		
Male	161	76.7
Female	49	23.3
Application time		
06:00–11:59	27	12.9
12:00–17:59	68	32.4
18:00–23:59	83	39.5
24:00–06:00	32	15.2
Trauma mechanism		
Traffic accident	129	61.4
Falls from height	47	22.4
Assault	5	2.4
Motorcycle accident	24	11.4
Diger	5	2.4
Type of intervention		
Surgery	86	41.0
Conservative	124	59.0
Result		
Discharge	53	25.2
Hospitalization (service)	122	58.1
Admission (ICU)	33	15.7
Death	2	1

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