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ORIGINAL ARTICLE

Initial chest X-ray in multiple trauma patients: Still works!

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Abstract

OBJECTIVE: Blunt thoracic aortic injury is life-threatening injury. High suspicion on this clinical condition can be made by initial chest X-ray on emergency department. The aim of study was to detect which other signs, except widened mediastinum, are specific for rupture of the thoracic aorta.

METHODS: To the study were included all Triage positive patients primary headed from the scene of injury to the Trauma center Level I from January to December 2014 and which have performed chest X-ray on emergency department followed by CT of chest, abdomen and pelvis. On chest X-ray were evaluated diameter of superior mediastinum, deviation of trachea, deviation of left and right main bronchus, aortic arch, fracture of first or second rib on the left side and obliteration of aortopulmonary space.

RESULTS: Totally n=208 patients were enrolled to the study. Seven patients had blunt thoracic aortic injury on CT angiography. All these patients had widened superior mediastinum more than 80 mm (p=0.021). Six patients with blunt thoracic aortic injury had obliteration of aortic arch (p=0.0001) and obliteration of aortopulmonary space (p=0.0001).

CONCLUSION: All patients after high energy trauma with widened mediastinum together with obliteration of aortic arch and obliteration of aortopulmonary space on initial chest X-ray without initial CT, must be indicated to the CT after initial stop the bleeding procedures for the exclusion of traumatic rupture of thoracic aorta.

INTRODUCTION

Blunt thoracic aortic injury (BTAI) is life-threatening injury. The incidence of this injury was described in less than 0.5% high-energy trauma patients admitted to the hospital (Demetriades *et al.* 2004; Trlica *et al.* 2019). Diagnosis of this injury is routinely made by multislice computed tomography with nearly 100% sensitivity and negative predictive value (Mirvis *et al.* 2007; Raptis *et al.* 2015). About 5% multiple trauma patients cannot undergo initial chest-abdomen-pelvis CT (CAP scan) because instability and massive bleeding to abdomen/chest with immediate operation (Martin *et al.* 2012). However, high index of suspicion on this injury can be made during the primary survey in the emergency department by anteroposterior chest X-ray (American College of Surgeons 2012; Raptis *et al.* 2015).

The aim of this study was to evaluate accuracy of initial chest X-ray in the detection of BTAI during initial assessment of multiple trauma patients.

METHODS

A retrospective analysis of prospective trauma database of Trauma Center Level 1 was performed in University Hospital Hradec Kralove, Czech Republic. To this observational study were involved all Triage positive patients (CDC, MMWR 2012) primary headed from the scene of injury to the Trauma center in the period January 1st to December 31st in year 2014 with blunt trauma. We searched all patients with initial chest X-ray and followed CAP scan in the first 24 hours.

Following entities on the chest X-ray were assessed: diameter of superior mediastinum (1), deviation of trachea (2), deviation of left and right main bronchus (3), aortic arch (4), fracture of first or second rib on the left side (5) and obliteration aortopulmonary space (6) (Table 1). These signs were correlated with CAP scan. All chest X-ray were viewed by attending trauma surgeon and radiological consultant.

All statistical analyses were performed using the Analyse-it for Microsoft Excel (Analyseit Software Ltd., United Kingdom). The data are presented as mean ± standard deviation. The statistical difference between the groups was tested using Chi-square test (qualitative data), Kruskal-Wallis One Way Analysis of Variance on Ranks (quantitative data) and $p < 0.05$ was considered statistically significant.

RESULTS

Triage positive 563 patients were admitted from the scene of injury to the Trauma center during the screened period. The initial chest X-ray followed by CAP scan was performed in 208 patients (Fig. 1). There were 156 males and 52 females with median age 44 years. Mean chest AIS was 2.14, mean ISS was 22.7. Sixteen patients died with mean ISS 42.8, only one of them was diagnosed BTAI. (Table 2). No patient died because unrecognized BTAI.

Seven patients were diagnosed blunt thoracic aortic injury. In all patients there was high index of suspicion on initial chest X-ray. All of these patients had widened mediastinum more than 80 mm (p=0.021) Six patients with BTAI had obliteration of aortic arch (p=0.0001) and obliteration of aortopulmonary space (p=0.0001).

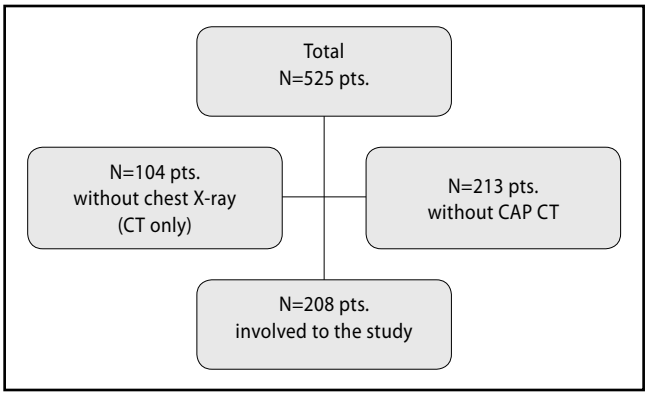

Fig . 1.

DISCUSSION

Whole body CT imaging is corner stone of care in high energy blunt trauma patients. It's impact on mortality of patients is still controversial (Huber-Wagner *et al.* 2009;

Tab. 1. Evaluated parameters on initial chest X-ray

Diameter of superior mediastinum
Deviation of trachea
Deviation of the left main bronchus
Deviation of the right main bronchus
Aortic arch
Fracture of 1st or 2nd rib on the left side
Obliteration of aortopulmonaly space

Tab. 2. Data of 208 evaluated patients

Mean age (yr)	44
Gender (n)	
Male	156
Female	52
Mean ISS	22,7
Mean chest AIS	2,14
Died (n)	16
Mean ISS	42,8

Sierink *et al.* 2016; Corbacioglu *et al.* 2018). However, chest X-ray sustains as an important adjunct in primary survey in severe trauma patients especially when CT cannot be done due to hypovolemic shock and immediate operative treatment (American College of Surgeon 2012; Martin *et al.* 2012). Chest X-ray is basic decision instrument for next CT imaging (Rodriguez *et al.* 2017).

All chest X-ray should be viewed by experienced surgeon or radiologist for signs of life-threatening injuries, especially for BTAI, because there are no specific clinical signs of this injury (Raptis *et al.* 2015). In our study all diagnosed BTAI were mentioned during primary survey on chest X-ray.

The role of initial chest X-ray in clinical settings of multiple injured patients is often discussed because low sensitivity for BTAI (Demetriades 2012; Ekeh *et al.* 2008; Raptis *et al.* 2015; Wisbach *et al.* 2007). In our opinion, considering the mechanism of injury (1), clinical status of patient (2) and initial chest X-ray (3) – the diagnosis of BTAI can be reliably predicted.

In conclusion, initial chest X-ray in high energy blunt trauma still works. In hemodynamic unstable patients with high index of suspicion of blunt thoracic aortic injury without possibility of initial CAP scan has after stop bleeding procedures hypotensive strategy still value until the CT verification of aortic injury can be proceeded.

REFERENCES

1 American College of Surgeons Committee on Trauma (2012) Advanced Trauma Life Support for Doctors. 9th ed., Chicago,IL.
2 Centers for Disease Control and Prevention (2012) Guidelines for field triage of injured patients. MMWR **61**: 1–20.
3 Corbacioglu SK, Aksel G (2018). Whole body computer tomography in multi trauma patients: Review of the current literature. Turk J Emerg Med. **18**: 142–147.
4 Demetriades D, Murray J, Martin M, Velmahos G, Salim A, Alo K et al (2004). Pedestrians injured by automobiles: relationship of age to injury type and severity. J Am Coll Surg **199**: 382–387.
5 Demetriades D (2012). Blunt thoracic aortic injuries: Crossing the Rubicon. J Am Coll Surg **214**: 247–259.
6 Ekeh P, Peterson W, Woods R, Walusimbi M, Nwuneli N, Saxe J et al (2008). Is chest X-ray an adequate screening tool for the diagnosis of blunt thoracic aortic injury? J Trauma **65**: 1088–1092.
7 Huber-Wagner S, Lefering R, Qvick LM, Korner M, Kay MV, Pfeifer KJ et al (2009). Effect of whole-body CT during trauma resuscitation on survival: a retrospective, multicenter study. Lancet **373**: 1455–1461.
8 Martin M, Izenberg S, Cole F, Bergstrom S, Long W (2012). A decade of experience with a selective policy for direct to operating room trauma resuscitation. Am J Surg **204**: 187–192.
9 Mirvis SE, Shanmuganathan K (2007). Diagnosis of traumatic aortic injury 2007: still a nemesis. Eur J Radiol. **64**: 27–40.
10 Raptis C, Hammer M, Raman K, Mellnick V, Bhalla S (2015). Acute traumatic aortic injury. Practical consideration for the diagnostic radiologist. J Trorac Imaging **30**: 202–213.
11 Rodriguez R, Hendey G, Mower W (2017). Selective chest imaging for blunt trauma patients: The national emergency X-radiography utilization studies (NEXUS-chest algorithm). Am J Emerg Med **35**: 164–170.
12 Sierink JC, Treskes K, Edwards MJ, Beuker BJ, den Hartog D et al (2016). Immediate total-body CT scanning versus conventional imaging and selective CT scanning in patients with severe trauma (REACT-2): a randomised controlled trial. Lancet **388**: 673–683.
13 Trlica J, Kucerova S, Kocova E, Koci J, Habal P, Raupach J et al (2019). Deceleration thoracic aortic ruptures in trauma center level I areas: a 6-year retrospective study. Eur J Trauma Emerg Surg In press.
14 Wisbach G, Sise M, Sack D, Swanson S, Sundquist S, Paci G et al (2007). What is the role of chest X-ray in the initial assessment of stable trauma patients? J Trauma **62**: 74–79.