Infectious complications after thoracic major trauma: peculiar aspects at Multidetector-CT's follow-up.

Poster No.:	C-0589
Congress:	ECR 2013
Type:	Scientific Exhibit
Authors:	V. Miele[1], V. Di Giacomo[1], I. Di Giampietro[1], S. Ianniello[1], G. Menichini[2], B. sessa[2], M. Trinci[3]; [1]Rome/IT, [2]Roma/IT, [3]Roma, ITALY/IT
Keywords:	Trauma, Infection, Computer Applications-Detection, diagnosis, CT, Thorax, Emergency
DOI:	10.1594/ecr2013/C-0589

Purpose

Severe chest trauma remains a leading cause of trauma death after head injury (1).

The accurate assessment of thoracic trauma is difficult because of the variety of injuries associated with skeletal trauma and other complications risk factors.

The presence of a pulmonary contusion suggest major injury to the chest, with primary etiological causes including falls and motor vehicle accidents (2).

In our specific population, the impairment of pulmonary function is frequent and multifactorial (3).

The implication of chest trauma in mortality is related to the persistent respiratory insufficiency, the development of septic complications such as pneumonia, and multisystemic organ failure.

The occurrence of pneumonia has been show to proceed and promote post-traumatic multisystemic organ failure and late mortality (4,5).

Although the management of pulmonary trauma is mostly supportive, this plays a key role in the second phase of the management of the polytrauma patient.

Multidetector- CT (MDCT) exams, following the first one, are essential to follow the evolution of pulmonary parenchymal lesions previously reported, because they can help us understand how

them will develop during hospitalization.

Some specific parenchymal pattern may represent the "tell-tale sign" of an infectious complication, which can be managed and resolved early, without waiting for the complete appearance.

The identification of patter "risk" for development of infectious complications can help in making precise directions in the choice of medical or pharmacological preventive measures .

Aim of this work is to evaluate, with MDCT, the incidence of infectious complications in major thoracic trauma, their main CT patterns, their timing of onset compared to first exam, and outcomes.Our retrospective study would like to identify, if possible, early CT signs of infectious thoracic disease, to rapidly attend therapy and reduce long-term complications, morbidity and mortality.

Methods and Materials

We revisioned 302 major trauma's patients (M 216, F 86, Mean Age 35+/- 10) that arrived in our Emergency Department from January 2012 to December 2012, evaluating first exam and all following thoracic exams of all Intensive Care's patients; all MDCT studies were performed with same protocols and same CT unit (Ultra16Lightspeed, GE).

In all patients were separately reported for each lung, if present, which kind of prevalent pattern (ground-glass, reticular, micronodular, lobar consolidation, disomogeneous consolidations), if mechanically-ventilated patient, if drainage pleuric was done, if others related-lesions (pneumatocele, hematocele, abscess, empiema) were present; if known, which patogens were present.

The data were anonymized and evaluated randomly by an experienced radiologist, who has studied the evolution of early lung lesions reviewing all the MDCT studies and has classified them according to a particular pattern of belonging. He has also indicated the time of appearance of the pattern, considering as time 0 the day on which had occurred major trauma.

In a second step, an Intensive Care Unit (ICU) anesthesiologist, has associated to each patient the clinical diagnosis of pulmonary infection, if present during the hospitalization.

All patients with an Injury Severity Score (ISS) >15 were enrolled in the study.

Images for this section:

Fig. 1: T.F. car-crash, first MDCT at the arrival in Emergency Department: limitated "ground-glass" contusive opacity of superior right lung, associated to hypertensive pneumothorax.

Fig. 2: T.F, Follow-up MDCT (4 days later): little, disomogeneous consolidations, in the same areas of contusion, with some centrolobular nodules. Pleuric tube is present on right side. (Klebsiella).

Results

In our study, 45/302 (15%) major trauma patients have depeloved infectious thoracic patterns, clinically confirmed.

All 45 patients affected by lung infections were intubated and receiving mechanical ventilation during hospitalization.

18/45 (40%)Patients showed ground- glass pattern, 1/45 (2,2%) reticular pattern, 6/45 (13,3%) micronodular pattern, 8/45 (17,8%) lobar consolidation, 12/45 (26,7%) disomogenous consolidation.

The time median value of pattern appearance, respect to time 0, was of 3 days for ground glass pattern, 5 days for reticular pattern, 7days for the lobar consolidation and 9 days for the disomogeneous consolidations.

After the chest trauma 160/302 Patients required chest drainage and 31/45 Patients with pulmonary infections.

Pneumatocele and hematocele was found in 30/45 (66,7%) patients, abscess in 3/45 (6,7%) , empiema in 4/45 (8,9%).

Haemophilus influenza is the bacteria most frequently identified in Early Onset Pneumonia (EOP).

Images for this section:

Fig. 3: M.A., precipitation. First MDCT of major thoracic trauma, which shows significative contusions of superior pulmonary regions.

Fig. 4: M.A., First MDCT, Coronal view.

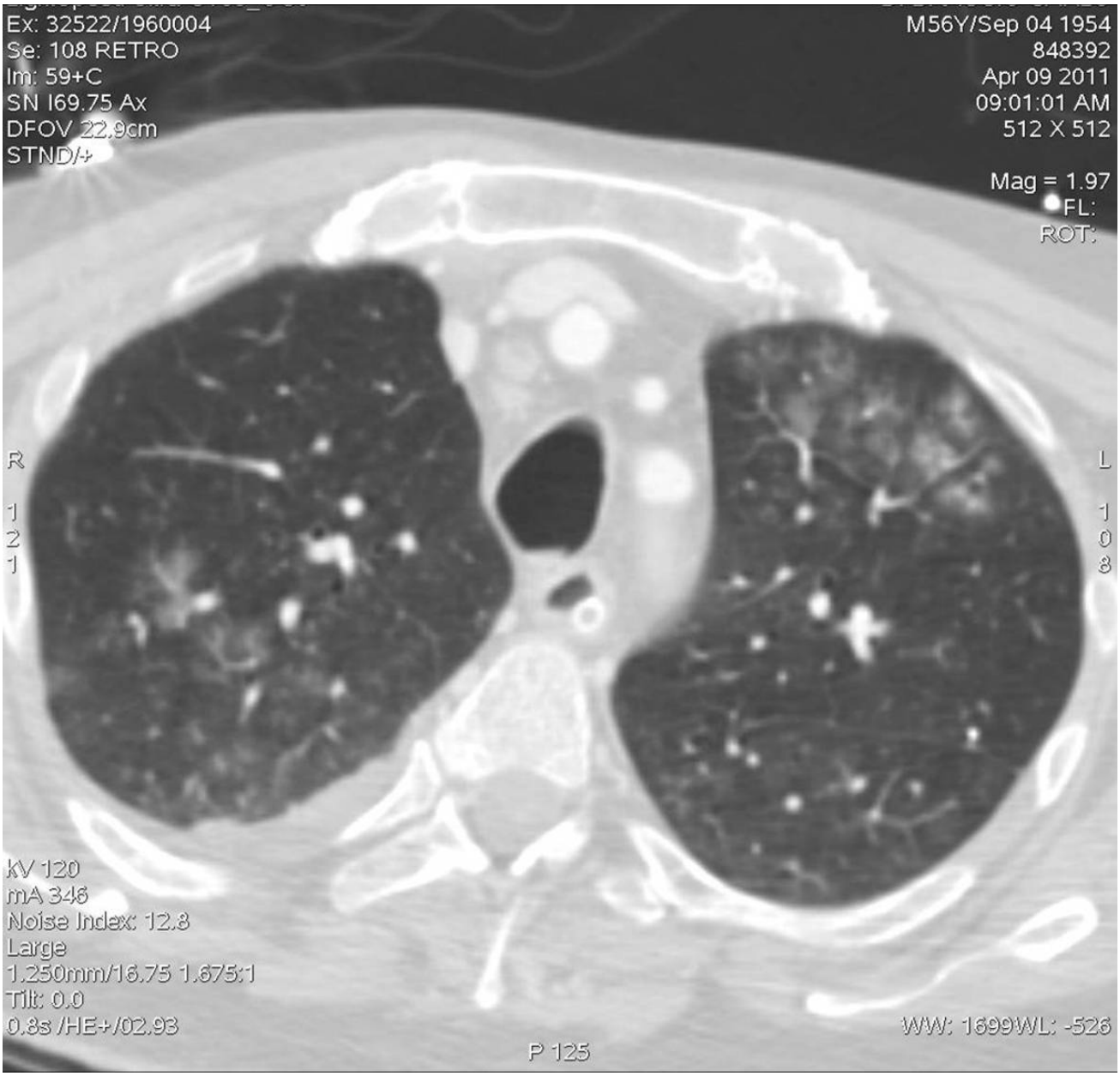

Fig. 5: M.A. Follow-up MDCT: after 5 days, development of confluent, disomogeneous opacity in the apical left lung (Staphilococcus A.).

Conclusion

Ground glass and micronodular may be considered early development pattern evolving towards lobar parenchymal consolidation or disomogeneous consolidation, which together account for approximately 44% of pulmonary complications in patients with polytrauma.

The EOP develops in about 7 days after the event of major trauma, but the "ground glass" and "centrolobular nodules" patterns can be considered the precursors of this important involvement.

On the basis of these results the pattern of early appearance can be considered as the new "risk factor" for the development of a bronchus pneumonic process.

The ICU anesthesiologist can and should use these data to decide early medical therapy feasible at least 3-4 days before the full-blown pneumonia appear.

This leads into an important reduction of the risk of multi-organ failure and late mortality and in a lesser time of hospitalization of the polytraumatized patient for lung causes.

Particular attention should be paid to patients with chest drainage, which can be considered a predisposing factor but is not essential for the occurrence of an infectious complication.

All 45 patients with infectious pulmonary complications were intubated during hospitalization.

Several authors consider intubation and mechanical ventilation in the first hour an important risk factor for the development of the EOP (2,6).

Our future perspective is to deepen this study applying this further distinction.

Images for this section:

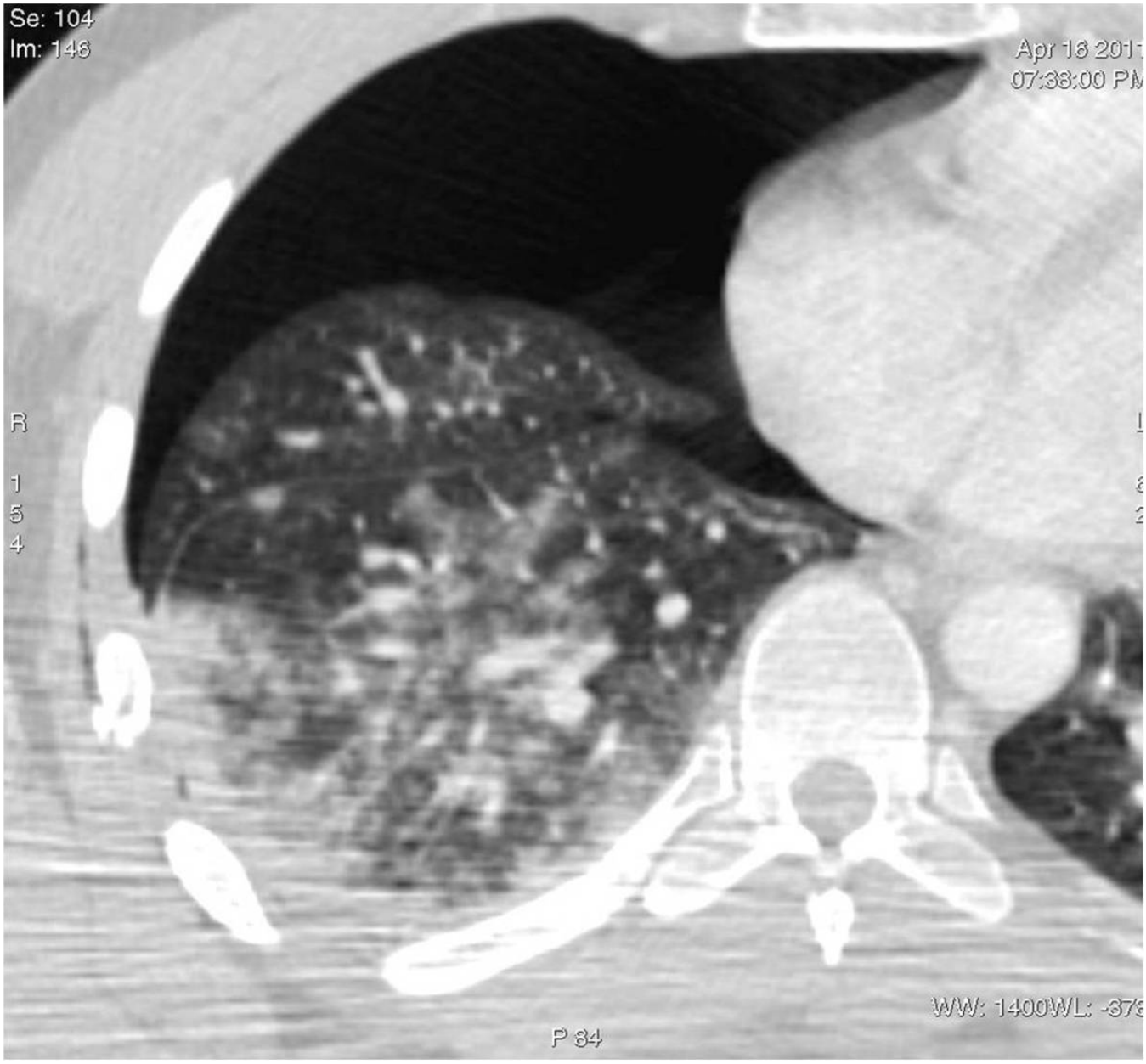

Fig. 6: F.S., moto-car crash. First MDCT: Massive right pneumothorax, associated to extensive contusive-lesions and hemothorax.

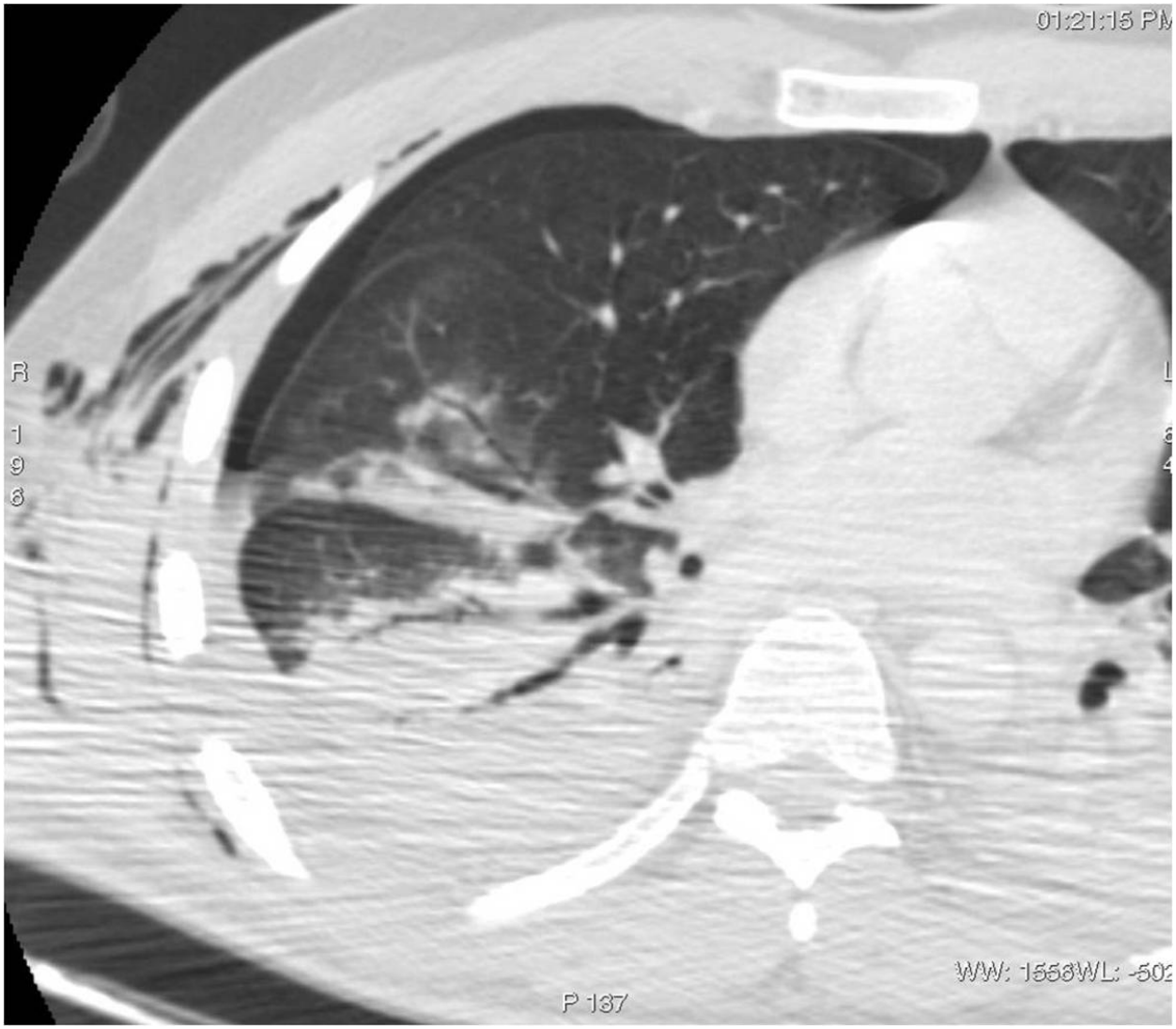

Fig. 7: F.S., moto-car crash. Follow-up MDCT: Lobar consolidation, with air bronchogram (Haemophilus I.).

References

1. LoCicero J III, Mattox KL. Epidemiology of chest trauma. Surg Clin North Am. 1989;69:15-19
2. Janus T J, Vaughan-Sarrazin MS, Baker LJ et al. Predictors of Pneumonua in Trauma Patients with pulmonary contusion. J trauma Nurs 2012;19:139-47
3. Michelet P, Couret D, Brégeon F et al. Early Onset Pneumonia in Severe Chest Trauma: a risk factor analysis. J Trauma. 2010; 68:395-400
4. Ciesla DJ, Moore EE, Johonson JL et al. The role of the lung in postinjury multiple organ failure. Surgery 2005; 138:749-758
5. Sauaia A, Moore FA, Moore EE, et al. Epidemiology of trauma deaths:a reassessment. J Trauma 1995;38:185-193
6. Stephan F, Mabrouk N, Decailliot F et al. Ventilator-associated pneumonia leading to acute lung injury after trauma. Anesthesiology 2006: 104:235-41