PLEURO-PULMONARY NEEDLE BIOPSY IN DIFFERENTIAL DIAGNOSIS OF PULMONARY CONTUSION

Voicu Voiculescu¹, Eustatiu Memu¹, Octavian Cretu², Romanita Glaja³,
Carmen Muntean³, Ovidiu Burlacu¹, Calin Tunea¹, Gabriel Cozma¹,
Iris Miron¹, Gabriela Nicodin⁴, Alexandru Nicodin¹

INTRODUCTION

Pulmonary contusion in severe polytrauma patients often rises difficult problems in differential diagnosis.

This paper tries to establish the role of pleuro-pulmonary fine needle aspiration (FNA) and cytological examination from specimen obtained in differential diagnosis of pulmonary contusion when the clinical course and radiological aspect indicates an open chest surgery.

We intend to outline that we have not found any reference regarding the cytological diagnosis by FNA in thoracic trauma.

MATERIAL AND METHODS

We have analyzed seven cases of polytrauma patients with major thoracic trauma, in whom we have performed pleuro-pulmonary FNA to make a differential diagnosis between pulmonary contusion and intrapleural clot on the one hand, and between pulmonary contusion and loculated pleural effusions on the other hand, all patients having chest tubes in the moment of FNA.

All cases have been selected based on necessity to have an immediate decision weather to proceed with thoracotomy in situation of a chest drained patient, the latter securing the patient against possible complication of pulmonary FNA – pleural collections.

A major criterion of selection has been the...
impossibility to reach an accurate diagnosis through chest X-ray or computed tomography, the severe clinical course of these polytrauma patients claiming a therapeutic decision.

All patients were informed about the procedure and risks and a written consent was obtained.

Pulmonary FNA has been performed with needle for spinal anesthesia 75 to 90 mm long and 20 G large, and the aspiration was performed with a 20 ml syringe. The overall cost of these instruments is much cheaper than standard Cook needle. For all FNA the APT Dragan coloration has been used, with a 400-fold magnification.

In one case we have performed an open chest biopsy from a pulmonary contusion, and we could make a comparison between the postoperative hystopathological and post-FNA cytological aspects of pulmonary contusion.

In three cases the diagnosis of pulmonary contusion was established only through FNA and clinical and radiological course of the patients are discussed. All these three cases had in common the presence of inflammatory and alveolar cells.

Patient C.N., 47 yrs, after 16 days of thoracic drainage for posttraumatic hemothorax, had a chest CT showing bilateral diffuse pulmonary opacities with a left basal pulmonary condensation of inhomogeneous over-fluid density. (Fig.1) Because of the suspicion of intrapleural clot, we performed a FNA and established the cytological diagnosis of pulmonary contusion. The subsequent course of the patient confirmed the pulmonary contusion with rapid involution of symptoms and slow radiological improvement.

We wish to outline that the radiological aspect of pulmonary contusion was present at three weeks after the trauma and this is different from data in the literature, stating that radiological image of pulmonary contusion is vanishing after 7 to 10 days from the trauma. (Fig. 2) In this patient, pulmonary contusion was not been complicated with pneumonia or ARDS.

In two patients the diagnosis of intrapleural clot was established using CT and FNA, and this was confirmed intraoperatively, when thoracotomy and clot evacuation were performed. Both cases had a cytological aspect of mesothelial and red blood cells on a background of non-specific inflammation.

Patient D.I., 58 yrs, with drained right post-traumatic hemopneumothorax, presented 18 days after the accident with a diffuse right thoracic opacity, with different densities on the thoracic CT. (Fig. 3) FNA establish the cytological diagnosis of intrapleural clot, with intraoperative confirmation, evacuation and subsequent favorable course of the patient.
in one case and through thoracentesis, clinical and radiological evolution in the other case. The cytological aspect of both patients included mesothelial cells on a non-specific inflammatory background.

Patient G.C., 28 yrs, with drained left post-traumatic hemopneumothorax, presented fever after 18 days from the accident, with minimal pleural drainage and diffuse left basal opacity on chest X-ray. (Fig. 4) Cytology after FNA showed chronic nonspecific inflammatory aspect and mesothelial cells. Left thoracotomy demonstrated a loculated pleural effusion with pleural thickening. Subsequently, decortication was performed, with uneventful postoperative course.

**Figure 4.** Radiological aspect of left basal opacity.

**RESULTS**

All patients included in this study had suffered polytrauma with a severe involvement of the thorax. The associated lesions were:

- Craniocerebral trauma: 5 cases;
- Craniofacial trauma: 2 cases;
- Lower limb fractures: 1 case;
- Upper limb fractures: 2 cases;
- Abdominal contusion: 1 case;
- Lumbar contusion: 1 case.

From the surgical point of view, all patients underwent drainage from the beginning. Three thoracotomies and the following surgical procedures were performed:

- Repeated chest tube drainage: 2 cases;
- Clot evacuation: 2 cases;
- Decortication: 2 cases;
- Pleural biopsy: 1 case.

In the patients included in this study we found the following complications:

- Postoperative atelectasis: 1 case;
- Failure of lung reexpansion at the apex after drainage: 2 cases;
- Intrapleural clot: 2 cases;
- Neurological complications: 1 case;
- Loculated pleural effusion: 2 cases;
- Surgical infection of the incision: 2 cases;
- Prolonged fever: 4 cases.

The most serious complication diagnosed by FNA was the intrapleural clot. (Fig. 5)

**Figure 5.** Operative aspect of an intrapleural clot.

Total hospital stay was quite long, more than three weeks in three cases: between 11 and 14 days in two cases, 22 days in one case, and between 29 and 34 days in four cases.

There was no mortality. Patients status at hospital discharge was: cured in five cases and just stabilized in two cases.

**DISCUSSION**

To illustrate the concordance of cytological aspects after FNA and histopathological aspects after intraoperative pulmonary biopsy in pulmonary contusion, we quote here the histopathological bulletin of a piece of lung with contusion and laceration, which necessitated a wedge resection in a patient with thoracic trauma where a surgical intrapleural clot evacuation had been performed: fragments of lung parenchyma covered by pleura, with massive deposits of fibrin and leukocytes in serosa, subpleural layer and pulmonary interstitium, extensive hemorrhagic infiltrates, discreet atelectasis, deposits of antracotic pigment within bronchiolar walls, areas of pulmonary edema.

From a histopathological point of view, lesions that appear during pulmonary contusion can be classified as primary lesions and secondary lesions.

Primary lesions consist of disruptions of the alveolocapillary membrane situated at the point of impact but also in the surrounding areas, with blood filling these alveoli; less frequent there are small
intrapulmonary hematomas (cavities of 1-3 cm filled with blood).

Secondary lesions are edema, alveolar fibrin and hyaline deposits, hyaline membranes and capillary and precapillary thrombi. These lesions are characteristic for shock lung, precursor of ARDS, and they appear both in the contused lung and the opposite lung.

Some authors report microlacerations with liquid, air or liquid-air content, surrounded by alveolar hemorrhage and with little interstitial involvement.

Successive stages of pulmonary contusion are hemorrhage, inflammation, organization and scarring.

Cytological aspects of the specimens get at FNA in contused lung vary with place and stage of the contusion. From the edge of the lesion, we can get alveolocytes with reactive atypia mimicking an adenocarcinoma. Reactive atypia includes a wide lesional aspect, ranging from obvious benign changes to pseudomalignant changes, with only few and isolated marked atypical cells.

In old pulmonary contusion there are multiple macrophages with hemosiderinic pigment, while in recent contusion numerous red blood cell. Acute or chronic inflammatory response inside the damaged tissue is represented by the numerous neutrophils or lymphocytes with histiocytes respectively.

FNA from a recent clot get fresh red blood cell. Mesothelial cells have an atypical reactive aspect, but with benign characteristics: paracentrally positioned nucleus, small, rounded nucleolus, and fine granulated cytoplasm with endo-ectoplasmic differentiation.

The cells found in pulmonary contusion are represented by alveolocytes and inflammatory cells. In intrapleural clot, there were no alveolocytes but mesothelial cells, hematic material and granulocytes. In loculated pleural effusions there were no alveolocytes but only chronic inflammatory cells and mesothelial cells. An image of a hystiocyte and a macrophage with hemosiderinic pigment obtained by FNA from a contused lung is shown in Figure 6.

Another cytological image obtained through FNA from a pulmonary contusion reveals two histiocytes and two normal alveolocytes. (Fig.7)

In loculated pleural effusions we have found a cytological aspect of hemosiderinic pigment within atypical reactive mesothelial cells. (Fig. 9)

The green color of hemosiderinic pigment means a recent hemorrhage, while changing the color towards brown means an old hematic material. This is an
important aspect for forensic medicine because allows evaluation of the period of time elapsed from the trauma just through a pleuropulmonary FNA.

The principal element of differentiation was the presence or absence of alveolocytes on the one hand and the predominance of hematic material, inflammatory cells and mesothelial cells on the other hand.

The study group consisted of severe polytrauma patients, who often presented important complications and had to be operated many times, with complexes surgical intervention and subsequent prolonged hospital stay.

Although hemoptysis and pneumothorax are reported in the literature as rare complications after pulmonary FNA, there was no complication due to this procedure. This is explained by the fact that cases were carefully selected, one of the most important criterion being the presence of chest drainage. Due to this criterion, the number of patients included was small.

FNA has established the proper diagnosis in all cases. This diagnosis has been confirmed by surgery in three cases and clinical course of disease in four cases.

The correct diagnosis and surgical treatment had allowed us to save these severely traumatized patients.

**CONCLUSIONS**

The analyzed cases demonstrate that pleuropulmonary FNA allows a correct cytological diagnosis in differential diagnosis of pulmonary contusion.

We hypothesize that it is possible to evaluate the time passed from the pleuropulmonary trauma based on the color of the fagocitated hemosideric pigment and on the acute or chronic aspect of the inflammation process, with implications in forensic medicine.

Another observation of our study is that pulmonary image on chest X-ray in simple pulmonary contusion may persist longer than previously reported in the literature.

**REFERENCE**