CASE REPORT

A case of *Legionella pneumophila* evaluated with CT and ultrasound

Alessio D'Angelo¹ · Chiara De Simone¹ · Marco Pagnottella¹ · Stefano Rossi¹ · Raffaele Pepe¹ · Giacomo Ruggieri¹ · Giulio Cocco¹ · Cosima Schiavone¹

Received: 24 May 2016 / Accepted: 13 October 2016 / Published online: 24 February 2017
© Società Italiana di Ultrasonologia in Medicina e Biologia (SIUMB) 2017

Abstract A 36-year-old man was admitted to the emergency department of “SS Annunziata” hospital in Chieti complaining of a sharp chest pain arisen some hours before admission. On examination, the patient looked sweaty; his vital signs showed tachycardia and augmented breath rate; sinus tachycardia and normal ventricular repolarization were observed on ECG, and no abnormalities were observed in the echoscan of the hearth. According to the clinical and electrocardiographic findings, and to previous episode of DVT in anamnesis, a thorax CT scan was performed in order to rule out pulmonary embolism. It showed an “area of parenchymal consolidation involving almost all the left lower lobe with patent bronchial structures”; given the patient’s CURB 65 score, he was then admitted to the pneumology ward where empiric treatment with levofloxacin (750 mg PO once daily) was initiated. Thoracic ultrasound was performed using a multifrequency convex transducer, and the posterior left area was examined through intercostal approach, placing the patient in a sitting position. A subpleural patchy hypoechoic lesion with irregular boundaries was detected; the maximum diameter was 11 cm, and the multiple hyperechoic spots inside it (elsewhere defined as “air bronchogram”) showed no Doppler signal. Given the positive result of the *Legionella* urinary antigen test, antibiotic treatment was switched to Levofloxacin 1000 mg PO once daily and Claritromicin 500 mg PO twice daily. After 3 days, his clinical conditions improved dramatically. Ultrasound performed after 5 days from the diagnosis showed decreased dimensions of

the lesion previously identified (maximum diameter 8.25 cm) and a marked reduction of the hyperechoic spots in it. The patient was discharged in good clinical conditions, and both thorax CT scan obtained after 1 and 4 months from the diagnosis showed radiological resolution of the parenchymal consolidation. The key to ultrasound visualization of pneumonia is its contact with the pleural surface (86–98% in cases of CAP) and the relative loss of aeration of the portion involved by the infection and a concomitant increase in the fluid content. A paradigmatic US image for parenchymal inflammatory infiltrate has not been established yet; anyway, some typical findings, when combined with the clinical features, can confirm the diagnostic hypothesis.

Keywords *Legionella* · Pneumonia · Air bronchogram

Sommario Paziente di 36 anni giunge in PS per dolore toracico di tipo trafittivo, ben localizzato, esacerbato dalla digitopressione e dai cambiamenti posturali da circa una settimana. Negli ultimi due giorni riferisce lieve rialzo termico (T max 37.4 °C). Alla visita presenta aumento della frequenza respiratoria e cardiaca con stabilità del profilo pressorio. Riscontro di lieve leucocitosi neutrofila all’emocromo, negatività degli enzimi di miocardiocitocrosi. Viene eseguito un ecocardiogramma negativo per versamento ed un ECG con riscontro di tachicardia sinusale. Nel sospetto clinico di embolia polmonare viene eseguita una angio Tc del torace che risulta negativa per interessamento arterioso ma mostrante una opacità in sede lobare inferiore sinistra. Veniva introdotta terapia empirica con levofloxacina 750 mg/die ed eseguiti esami per la ricerca dell’agente eziologico responsabile della polmonite (*Esame culturale espettorato; Ab anti Chlamydia; Ab anti Mycoplasma; Ag urinario Legionella*) Tra gli esami di

✉ Alessio D'Angelo
alessio.dangelo@libero.it

¹ UOSD Ecografia Internistica, Università degli studi G. d'Annunzio Chieti-Pescara, Chieti, Italy

laboratorio si segnalano inoltre: VES 66 mm/h; PCR 11 mg/dL; Procalcitonina 5 ng/mL). Un esame condotto con sonda convex multifrequenza, con paziente in posizione seduta, attraverso scansione intercostale in regione posteriore sinistra evidenzia formazione ipoecogena disomogenea a margini irregolari in sede subpleurica, del diametro massimo di cm 11 circa, con presenza di multipli spot iperecogeni interni (altrove definiti «broncogramma aereo») non caratterizzabile mediante studio doppler. Sulla base della positività dell'Ag urinario della Legionella, inizia ciclo di antibiotico terapia tramite infusione ev di Levofloxacin (1000 mg/die) Claritromicina (500 mg $\times$ 2/die). Dopo 5 giorni di terapia, il paziente mostra defervescenza, riduzione degli atti respiratori/minuto e miglioramento dei parametri laboratoristici (VES, PCR, procalcitonina, formula leucocitaria) Un successivo controllo ecografico dimostra a carico della formazione precedentemente descritta riduzione sia delle dimensioni (diametro max. 8.25 cm), sia della componente iperecogena interna. Un consolidamento polmonare si rende evidente allo studio US qualora si determini un contatto con la pleura (86–98% per le CAP), con riduzione locale della componente aerea a carico del parenchima polmonare ed incremento della componente fluida. Un pattern ecografico tipico di infiltrato polmonare flogistico al momento non è stato ancora definito ma la combinazione di segni ecografici e clinici può permettere di confermare la diagnosi.

A 36-year-old man was admitted to the emergency department of “SS Annunziata” hospital in Chieti complaining of a sharp chest pain arisen some hours before admission, located on the left side, exacerbated by finger (manual) pressure on the area of discomfort and body movements, after a 7-day history of hacking cough, weakness and recent onset of fever (maximum temperature 37.4 °C).

He had taken NSAIDs for pain relief, without consulting his general practitioner.

The patient had a history of postoperative (traumatic fractures of femur and tibia) popliteal deep venous thrombosis (DVT), successfully treated by oral anticoagulants and an ongoing 10-year history of smoking (50 pack/year).

On examination, the patient looked sweaty; his vital signs were as follows: temperature, 36 °C; blood pressure, 130/80 mm Hg; pulse rate, 106 beats per minute; respiratory rate, 24 breaths per minute and 92% oxygen saturation on ambient air.

Blood tests revealed neutrophilic leukocytosis (WBC 12,000/ul), while no rise of cardiac biomarkers was observed in serial determinations.

Arterial blood gas analysis on room air showed hypoxia and a mild hypocapnia.

Sinus tachycardia and normal ventricular repolarization were observed on ECG, and neither pericardial effusion nor kinetic abnormalities of the ventricles were identified on a subsequent cardiac ultrasound examination [1]. In the end, according to the clinical and electrocardiographic findings, and to the previous episode of DVT, a thorax CT scan (Fig. 1) was performed in order to rule out pulmonary embolism [2].

It showed an “area of parenchymal consolidation involving almost all the left lower lobe with patent bronchial structures”;

Given the patient's CURB 65 score, he was then admitted to the pneumology ward where empiric treatment with levofloxacin (750 mg PO once daily) was initiated.

The following blood tests were performed:

1. Sputum culture
2. Serum anti-chlamydia antibodies
3. Serum anti-mycoplasma pneumonia antibodies
4. Legionella urinary antigen

In addition, inflammatory markers were altered (ESR 66 mm/h, CRP 11 mg/dl, procalcitonin 5 ng/ml).

Thoracic ultrasound (Fig. 2) was performed using a multifrequency convex transducer, and the posterior left area was examined through intercostal approach, placing the patient in a sitting position. A subpleural patchy hypoechoic lesion with irregular boundaries was detected; the maximum diameter was 11 cm, and the multiple hyperechoic spots inside it (elsewhere defined as “air bronchogram”) showed no Doppler signal [3–7].

Given the positive result of the Legionella urinary antigen test, antibiotic treatment was switched to Levofloxacin 1000 mg PO once daily and Claritromicin 500 mg PO twice daily. After 3 days, his clinical conditions improved dramatically (defervescence and normalization

Fig. 1 Thorax CT scan

Fig. 2 Thoracic ultrasound

Fig. 3 Thoracic ultrasound after five days of therapy

of ESR, CRP, leukocyte formula and procalcitonin occurred).

Ultrasound performed after 5 days (Fig. 3) from the diagnosis showed decreased dimensions of the lesion previously identified (maximum diameter 8.25 cm) and a marked reduction of the hyperechoic spots in it.

The patient was discharged in good clinical conditions, and both thorax CT scan obtained after 1 and 4 months from the diagnosis showed radiological resolution of the parenchymal consolidation.

Discussion

The key to ultrasound visualization of pneumonia is its contact with the pleural surface (86–98% in cases of CAP) and the relative loss of aeration of the portion involved by the infection and a concomitant increase in the fluid content.

A paradigmatic US image for parenchymal inflammatory infiltrate has not been established yet; anyway, the

following typical findings, when combined with the clinical features, can confirm the diagnostic hypothesis:

Parenchymal findings [4, 5]:

- Hypoechoic areas
- Heterogeneous echotexture
- Irregular or not well-defined margins
- Oval or polygonal shape
- Air bronchogram (70–97%)
- Fluid bronchogram (76%)

Extra-parenchymal findings [4, 5]:

- Irregular pleural margins
- Unilateral pleural effusion in the base of the lung (34–61%)
- Local pleural effusion

Doppler flow pattern:

- Branching pattern

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical standard The study was performed in accordance with the principles of the declaration of Helsinki as declared revised in 2008.

Human and animals rights This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent For this type of study informed consent is not request.

References

1. Reissig A, Gramegna A, Aliberti S (2012) The role of lung ultrasound in the diagnosis and follow-up of community-acquired pneumonia. *Eur J Internal Med* 23(5):391–397
2. Bourcier JE et al (2014) Performance comparison of lung ultrasound and chest x-ray for the diagnosis of pneumonia in the ED. *Am J Emerg Med* 32(2):115–118
3. Chavez MA et al (2014) Lung ultrasound for the diagnosis of pneumonia in adults: a systematic review and meta-analysis. *Respir Res* 15(1):50
4. Nazerian P et al (2015) Accuracy of lung ultrasound for the diagnosis of consolidations when compared to chest computed tomography. *Am J Emerg Med* 33(5):620–625
5. Ye X et al (2015) Accuracy of lung ultrasonography versus chest radiography for the diagnosis of adult community-acquired pneumonia: review of the literature and meta-analysis. *PLoS One* 10(6):e0130066
6. Schiavone C, Romano M (2013) *Manuale italiano di ecografia internistica*. Ed II. Editore Delfino, Roma. ISBN: 8872874742
7. Soldati G, Copetti R (2012) *“Ecografia toracica”* seconda edizione 2012; edizioni medico scientifiche, Torino. EAN: 9788871103167