Contrast-enhanced ultrasound does not discriminate between community acquired pneumonia and lung cancer

ABSTRACT
We investigated if contrast-enhanced ultrasound (CEUS) may differentiate community acquired pneumonia (CAP) from lung cancer (LC). Among 1374 patients admitted in a 5-year period for lung opacities, 728 (329 CAP and 399 LC) were investigated by CEUS, comparing the time of appearance, disappearance, duration and pattern of distribution of contrast enhancement (CE). The patients with CAP and LC did not differ in terms of age, time of CE appearance, disappearance and duration or CE distribution. Our data show that the timing and pattern of CE detected by chest CEUS does not distinguish between CAP and LC and overly optimistic beliefs on this matter should be abandoned.

Contrast-enhanced ultrasound (CEUS) is a real-time ultrasound technique evaluating tissue perfusion using an ultrasound (US) contrast agent. An injected suspension of gas microbubbles amplifies the backscatter signal, enhancing the echogenicity of the intravascular ‘blood pool’. After obtaining a basal image of a lesion, this is scanned dynamically during contrast enhancement (CE). Registered indications in Europe are cardiac, macrovascular, liver and breast lesions.1 2 The possible application of CEUS to pleural/lung conditions has recently been claimed as a safe (only deserving caution in heart failure), repeatable, cheap, radiation-free and complementary approach to differentiate inflammatory and cancerous pulmonary lesions.3 4 However, despite the fact that guidelines2 defined its non-hepatic application, a role for CEUS in lung diseases is far from established. We compared CEUS characteristics of community acquired pneumonia (CAP) and lung cancer (LC) lesions in a large sample of patients with chest radiograph opacities consecutively admitted to our Department of Internal Medicine.

METHODS
Between November 2010 and December 2015, for 1374 patients admitted to our department because of opacities on chest radiographs, the usual management was supplemented by an US scan of the chest performed shortly after admission. Among the 742 patients with lesions adherent to the pleura (amenable to be adequately explored by US), 728 patients (527 men and 201 women) finally diagnosed with CAP or LC underwent CEUS examination (figure 1). Their results were then compared in light of the definitive diagnosis of CAP or LC, which was not known at the time of CEUS examination. All patients gave informed consent and the study was approved by the local ethics committee.

Figure 1 Flowchart of the study. US, ultrasonography; CEUS, contrast-enhanced ultrasonography; CAP, community acquired pneumonia; LC, lung cancer; FNAB, fine needle aspiration biopsy.
researcher by another operator with 20 years of experience.

RESULTS

The definitive diagnosis (based on clinical course, imaging and laboratory and/or histology tests) was CAP in 329 and LC in 399 patients. After normality testing, the mean times of beginning, end and duration of CE of CAP and LC were compared by the Mann-Whitney U test. There was no significant difference between the investigated parameters for patients with CAP and LC. The respective medians (25–75th IQR) were: age 66 (58–75) vs 65 (59–71) years, p=0.098; time of contrast appearance 24 (19–31) vs 23 (21–30) s, p=0.726; time of CE disappearance 247 (236–257) vs 249 (239–257) s, p=0.230; duration of CE 221 (211–232) vs 223 (213–233) s, p=0.169. A homogeneous distribution of CE was found in 242/329 (73.6%) CAP lesions and in 294/399 (73.7%) LC lesions whereas a non-homogeneous distribution was observed in 87/329 (26.4%) CAP lesions and in 105/399 (26.3%) LC lesions. The distribution pattern did not differ significantly (p=0.969, χ² test). Inter-reader agreement was excellent (Spearman’s coefficient ≥0.90 for all parameters).

DISCUSSION

Our results showed that the timing and pattern of CE detected by CEUS of the chest did not significantly distinguish between CAP and LC, therefore CEUS does not discriminate between benign and malignant US-detected lesions. Although our previous work indicated that CEUS may not discriminate between benign and malignant lesions, it was not investigated whether the largest fraction of these limitations, our negative results deserve interest because they hamper overly optimistic beliefs about the performance of CEUS in the discrimination between benign and malignant pulmonary lesions.

Marco Sperandeo,¹ Gaetano Rea,² Maria Arcangela Grimaldi,³ Francesca Trovato,⁴ Lucia M C Dimiti,¹ Vincenzo Carnevale³

¹Unit of Interventional Ultrasound of Internal Medicine, “Casa Sollievo della Sofferenza” Hospital, IRCCS, San Giovanni Rotondo, Foggia, Italy
²Department of Radiology, Ultrasound Diagnostic Unit, “Monaldi” Hospital, AO dei Colli, Naples, Italy
³Department of Internal Medicine, “Casa Sollievo della Sofferenza” Hospital, IRCCS, San Giovanni Rotondo, Foggia, Italy
⁴Department of Internal Medicine, University of Catania, Catania, Italy

Correspondence to Dr Marco Sperandeo, Unit of Interventional Ultrasound of Internal Medicine, “Casa Sollievo della Sofferenza” Hospital, IRCCS, Viale dei Cappuccini snc, San Giovanni Rotondo, FG 71013, Italy, sperandeom@libero.it

Contributors MS: designed the study, collected and interpreted data, drafted, revised and approved the manuscript. GR: collected and interpreted data, revised and approved the manuscript. MAG, FT: database setup and revised and approved the manuscript. LMCD: interpreted data and revised and approved the manuscript. VC: analyzed data and drafted, revised and approved the manuscript.

Competing interests None declared.

Patient consent Obtained.

Ethics approval Ethical approval was obtained from the local ethics committee of Casa Sollievo della Sofferenza San Giovanni Rotondo.

Provenance and peer review Not commissioned; externally peer reviewed.
Data sharing statement We accept to share our data for systematic review.

To cite Sperandeo M, Rea G, Grimaldi M A, et al. Thorax Published Online First: [please include Day Month Year] doi:10.1136/thoraxjnl-2016-208913 Received 15 May 2016 Revised 18 August 2016 Accepted 20 September 2016 Thorax 2016;0:1–3. doi:10.1136/thoraxjnl-2016-208913

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