CLINICAL CASE - TEST YOURSELF Chest

New pulmonary lesions in an oncologic patient

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PART A

A 44-year-old woman with a history of right elbow osteosarcoma underwent her routine follow-up chest CT scan. She had been treated with chemotherapy (cisplatin, epirubicin and ifosfamide) and her WBC count at the time of the examination was 3,500 / mcL. She was asymptomatic, erythrocyte sedimentation rate was normal and C-reactive protein was up to 2-fold increased. CT images and pathology slides are shown (**Fig. 1-5**).

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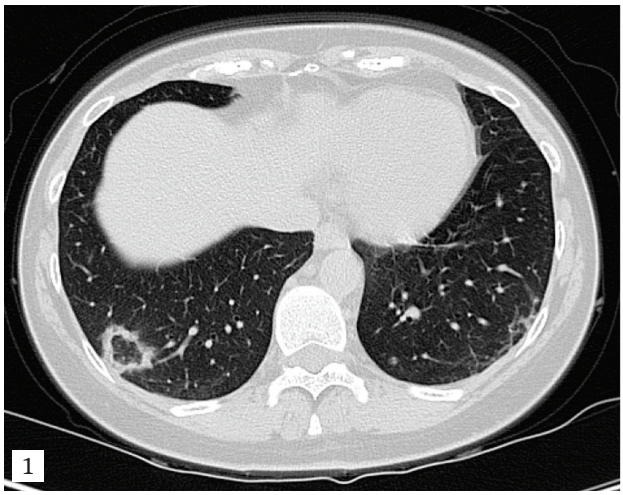
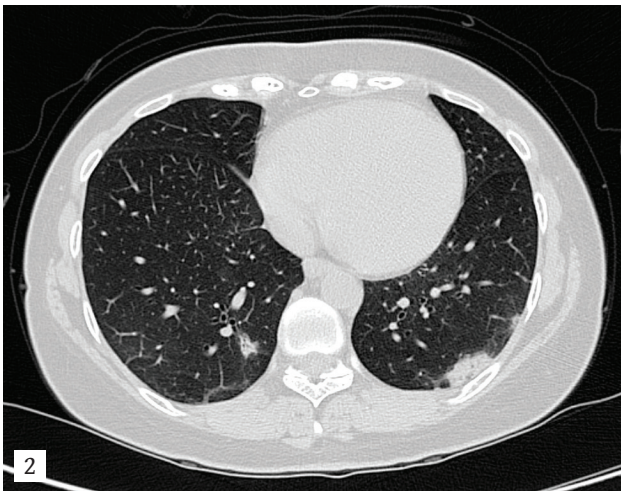




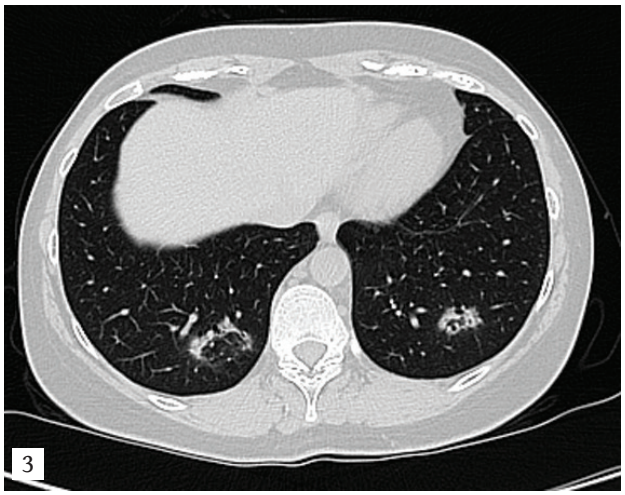
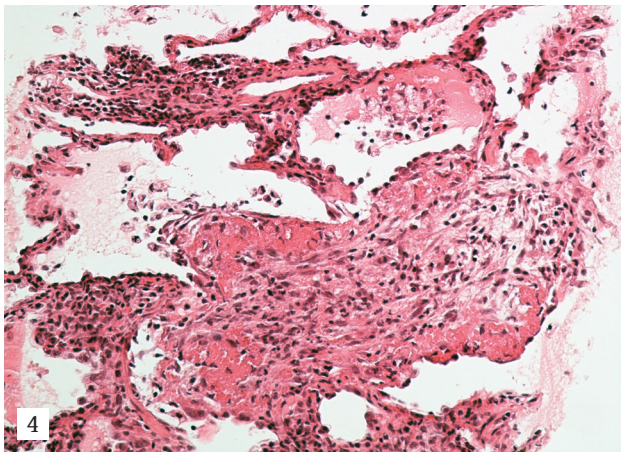


Fig. 1 & 2. *CT scan, lung window, initial presentation*
Fig. 3. *CT scan performed 5 months after the first one*



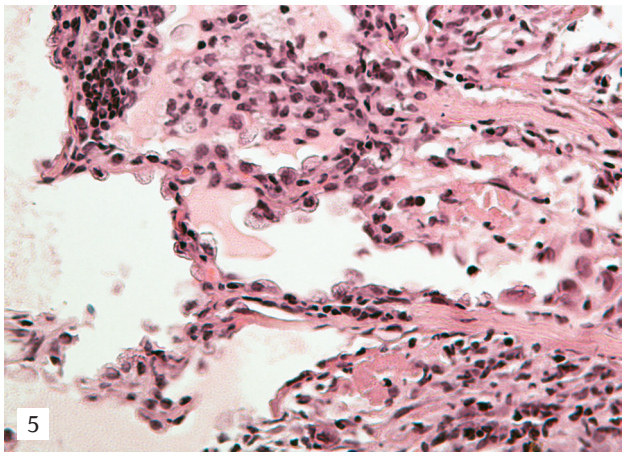


Fig. 4 & 5. *Pathology specimens (HE stain), obtained after CT guided lung biopsy*

PART B

Diagnosis: Organizing pneumonia

Organizing pneumonia (formerly called bronchiolitis obliterans organizing pneumonia - BOOP) represents a non-specific response to lung injury, encountered in various conditions such as infection, drug reaction, aspiration, connective tissue disorders, malignancies, radiation exposure or organ transplantation. There is also an idiopathic form of the disease, named cryptogenic organizing pneumonia (COP), first described by Davison in 1983 and Epler in 1985 [1]. Its incidence is not well documented, but it is rare, and COP is commoner than organizing pneumonia associated with underlying disease. There is some controversy about its categorization as an idiopathic interstitial pneumonia (IIP) as it primarily affects the airspaces rather than the interstitium; however its association with collagen vascular diseases and its overlap with other IIPs justify this inclusion [2]. Organizing pneumonia should be considered as part of the wide spectrum of manifestations of lung injury.

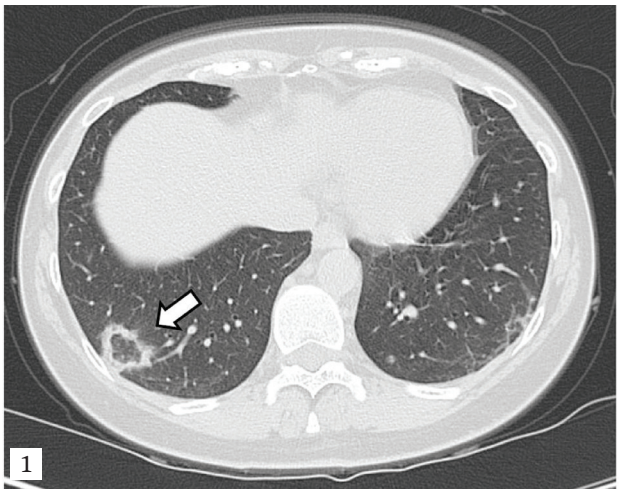
Histologically, organizing pneumonia is characterized by fibroblasts filling terminal airways, alveolar ducts and alveoli to a variable extent. These intraluminal plugs of inflammatory debris consist of granulation tissue, whorls of fibroblasts and myofibroblasts in a connective matrix and are named Masson bodies. There is slight inflammation and thickening of the alveolar walls but there should not be established fibrosis [3]. Usually the inflammation subsides with resorption of matrix in most cases, although there are cases that may progress to fibrosis, respiratory failure and death.

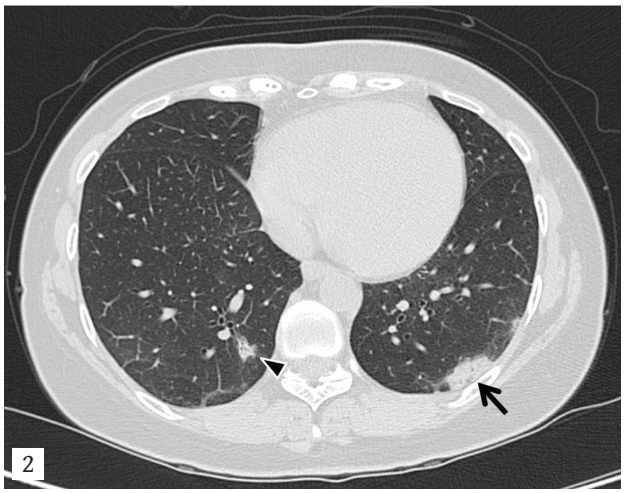
Radiographically organizing pneumonia is characterized by peripheral, mostly bilateral, multifocal opacities with density ranging from consolidation to ground glass opacity. These patchy consolidations tend to regress spontaneously and migrate over time, a pattern that is seen in few other conditions (like eosinophilic pneumonia, pulmonary hemorrhage and vasculitis) narrowing the differential diagnosis. The most usual pattern on CT includes consolidation in peribronchovascular and subpleural distribution, frequently with air bronchograms. These opacities may disappear after treatment with corticosteroids or spontaneously and reappear in a different location. Less frequent patterns may be encountered such as a solitary focal mass or nodule, multiple large or small nodules, a perilobular pattern or a coarse reticular pattern with architectural distortion, the latter occurring in cases showing progression to fibrosis and carrying an unfavorable prognosis [4]. Cavitation of the lesions, linear bands and pleural effusion may also be seen. These patterns may coexist; for instance broad pleural-based consolidation and adjacent acinar nodules.

The reversed halo sign, which is seen in our patient, describes crescentic and ring-like opacities surrounding areas of ground glass attenuation. It is also called the “atoll sign” due to its resemblance to a coral atoll. It was first described in 1996 by Voloudaki et al. [5] in two cases of BOOP and initially was considered specific for this disease, but was subsequently described in a variety of disorders including invasive pulmonary fungal infections, paracoccidioidomycosis, pneumocystis pneumonia, tuberculosis, lymphomatoid granulomatosis, Wegener granulomatosis, sarcoidosis, pulmonary neoplasms and infarction [6]. However, its presence in association with the additional CT findings and the clinical scenario can help the radiologist to provide an appropriate diagnosis.

When faced with patients on chemotherapy, the radiologist should bear in mind the possible adverse reactions of the specific drugs and their radiologic manifestations. Drug induced lung injury affects up to 10% of patients receiving chemotherapy. Cisplatin - contrary to the newer platinum-based oxaliplatin - is not associated with lung injury but can induce thromboembolism particularly in arteries; a transient decrease in diffusion capacity without radiological changes has been reported [7]. Epirubicin and ifosfamide are rare causes of lung toxicity; their toxic effect has been noted in combination with other antineoplastic drugs and is characterized by interstitial pneumonitis.

In our patient, a lung biopsy was performed, under CT guidance, to exclude fungal infection. Following pathologic confirmation of organizing pneumonia, the patient was treated with antibiotics (doxycycline) and corticosteroids (prednisolone) for three months. The lesions gradually resolved but new similar lesions ap-





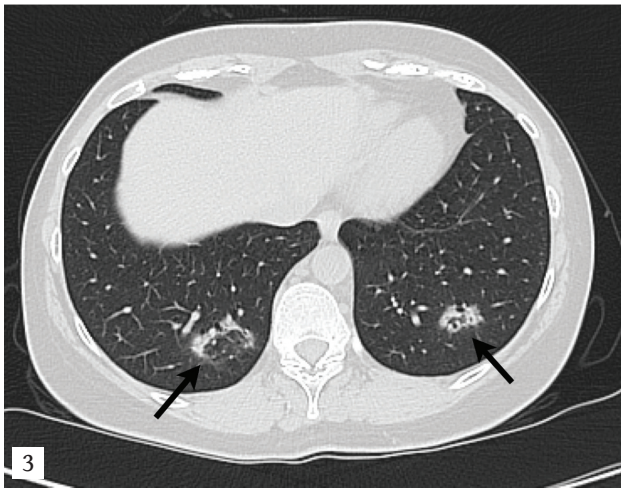
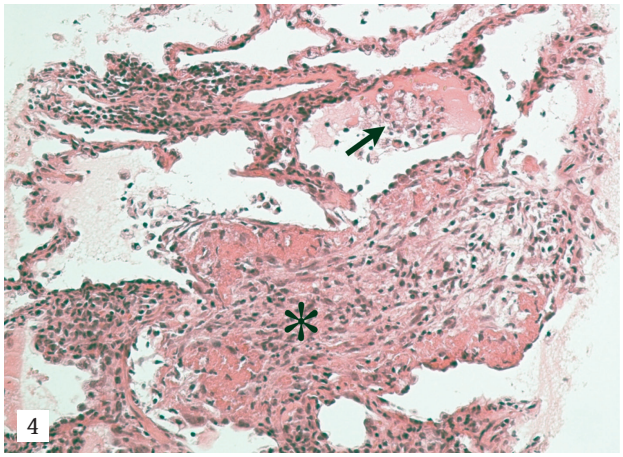


Fig. 1. *On the chest CT, a peripheral irregular ring-shaped opacity surrounding a ground glass area is seen in the right lower lobe (arrow). This is the reversed halo or atoll sign*

Fig. 2. *More cranially, there is a peripheral consolidation with air bronchogram and a broad base to the pleura in the left lower lobe (arrow). On the right a small peribronchovascular opacity is noted (arrowhead)*

Fig. 3. *On the last CT scan, approximately 5 months after the initial examination, the originally described lesions have disappeared but new ones have appeared, with similar imaging characteristics (arrows)*



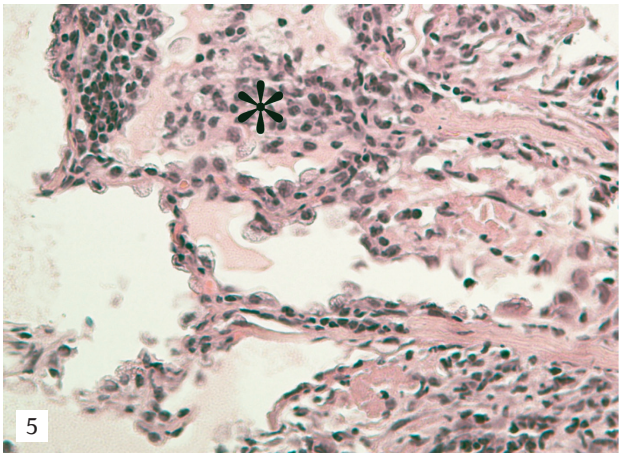


Fig. 4 & 5. *Lung biopsy specimen showing the alveoli filled with serous fluid and foamy histiocytes (arrow), fibroblasts in the septa and nodular lymphocytic aggregates (asterisks), findings "consistent with bronchiolitis obliterans organizing pneumonia"*

peared in different locations, in accordance with the migratory nature of this entity. The relapse was probably due to the short duration of her treatment (therapy is recommended for 6-12 months). Her last CT scan, approximately two and a half years after the initial presentation, was totally clear apart from a linear basal atelectasis. R

Conflict of interest:
The authors declared no conflicts of interest.

KEY WORDS
organizing pneumonia; bronchiolitis obliterans organizing pneumonia; BOOP; atoll sign

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