Case Report

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TANAFFOS

Halo Sign and Reverse Halo Sign in a Patient with Primary Lung Adenocarcinoma: A Case Report

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Background: The halo sign and reverse halo sign are two computerized tomography scan views based on the placement of ground glass opacity. These two views have various differential diagnoses, but infections are known to be the most important differential diagnosis in both views. Lung adenocarcinoma, one of the deadliest tumors of both genders, can be included in the differential diagnosis. Nevertheless, we decided to report this case since both of these features were present in the same patient.

Case Presentation: A 51-year-old man presented with gradual symptoms such as shortness of breath and myalgia, with a history of smoking and coronavirus disease 2019. In his computerized tomography scan, two views of the halo sign and the reverse halo sign were seen along with other lesions. In further investigations, due to his lack of recovery, a biopsy was prepared. Finally, with a definitive diagnosis of lung adenocarcinoma, we treated the patient appropriately.

Conclusion: When a patient presents with a halo sign and reverse halo sign on a computerized tomography scan and has a smoking history, it is necessary to take a biopsy of the observed lesions to rule out primary lung carcinoma.

Keywords: Reversed halo sign; Adenocarcinoma of the lung; Tomography X-ray computed; Lung neoplasms

INTRODUCTION

According to the Global Cancer Observatory in 2020, lung cancer has been reported as the deadliest cancer accounting for nearly one-fifth of deaths caused by cancers. In terms of prevalence based on gender, this cancer ranks first in men and second in women after breast cancer (1). The views available in the lung computerized tomography (CT) scan of patients with adenocarcinoma include solid nodules and subsolid types (2).

The appearance of the halo sign is a nodular opacity that can be a mass or hemorrhage surrounded by a ground glass opacity (GGO) appearance. This view is the main characteristic of infection with Aspergillus fungus (3). The atoll or reverse halo sign (RHS), first reported in organizing pneumonia, is an opacity surrounded by a mass (4). In their differential diagnosis, both of these views can have two categories: infections such as mucormycosis and cryptococcosis, and non-infectious such as tumors and pulmonary infarction (5).

Lung adenocarcinoma is among the unknown differential diagnoses of halo sign and rarely for its reverse form. As far as we know, due to the coincidence of these two views, the present case is a unique adenocarcinoma diagnosis in a patient with a halo sign and RHS.

CASE SUMMARIES

A 51-year-old man presented with complaints of shortness of breath, night sweats, dry cough, and malaise for three months. He has traveled to Iraq in the last six months and lives with a pet dog. In addition, the patient

was infected with coronavirus disease 2019 (COVID-19) last year with a positive polymerase chain reaction (PCR) and recovered without hospitalization. His physical examination found no abnormality except mild hypoxia (low O_2 saturation) and scattered crackle in the left lung. CT scan revealed bilateral multifocal consolidations and ground glass opacities demonstrate both peripheral and central distribution (Figure 1).

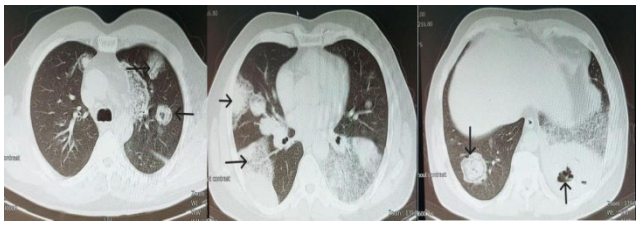

Figure 1. Axial chest CT scan view revealed: halo signs (right arrow), reverse halo sign (left arrow), target shape appearance (down arrow), and cavitary changes (up arrow)

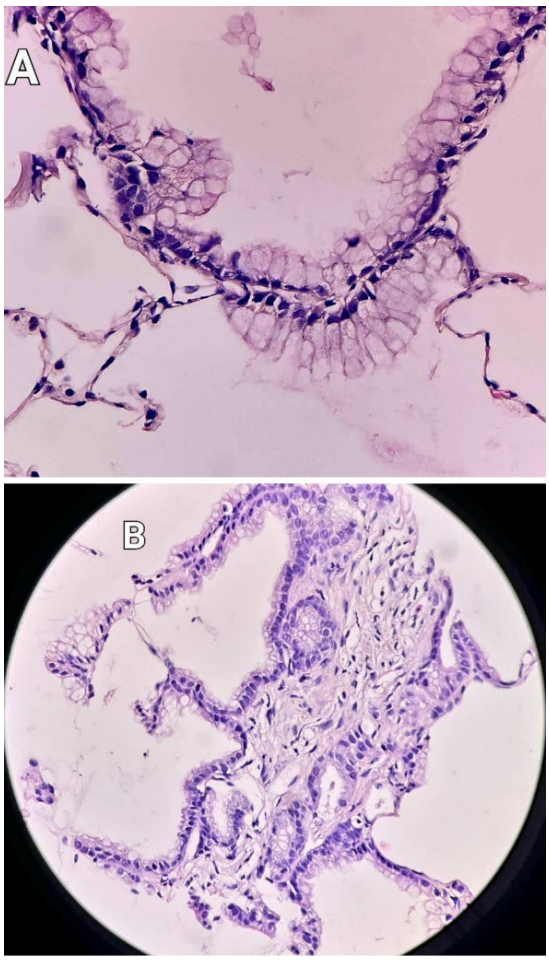

Figure 2. Pathological report. A: Lower magnification shows mostly a lepidic pattern and few glands lined by atypical mucinous cells. B: Higher magnification reveals atypical mucinous cells lined alveolar spaces (lepidic pattern)

Some demonstrate lobar involvement, and others show multifocal patchy parenchymal involvement. The patient was treated with antibiotics with a provisional diagnosis of pulmonary infection. Further bronchoscopy, bronchoalveolar lavage (BAL), and transbronchial lung biopsy (TBLB) were performed for definite diagnosis and the sample was sent to a pathologist. The pathology report shows primary lung adenocarcinoma. Histopathologic examination of the tumor exhibits mucinous adenocarcinoma with the acinar and lepidic pattern that are immunoreactive for TTF1 and NapsinA (Figure 2).

The complementary investigation, CT-guided biopsy, also confirmed adenocarcinoma.

DISCUSSION

Halo sign and RHS are not disease-specific, and the review of clinical symptoms is essential to narrow the differential diagnosis. Halo signs can result from the spread of inflammatory cells, bleeding, or lepidic growth of some tumors (5). This aspect is also more reported than primary tumors from secondary tumors to the lung, especially metastases from the GI tract. For example, in the study of Aissaoui et al., it is mentioned that the halo sign in CT of patients who had metastases from the pancreas is more common than other views of the alveolar pattern. This pattern is related to lepidic growth in pathology reports of lung metastases from the pancreas (6).

The growth pattern of lung adenocarcinoma is divided into five types: acinar, papillary, solid, lepidic, and micropapillary. Among these cases, as studies have mentioned, the dominant lepidic form has better 5-year survival than the rest of the growth patterns. Solid and micropapillary growth patterns are worse than others, with a 5-year survival of 55% (7). The appearance of a halo sign in our patient also had a predominant lepidic growth pattern. Although this growth pattern is in a primary invasive tumor, it is much less likely to metastasize to lymph nodes than solid and micropapillary forms (8). During the patient's follow-up after about four months, he received his fifth round of chemotherapy. The patient was treated with carboplatin and a pemetrexed

chemotherapy regimen.

The prevalence of halo sign and RHS views in patients with lung adenocarcinoma has not been well investigated. We reviewed two retrospective studies that have reported on this. In the study by Marchiori et al. in 2012, they examined the RHS views in CT scan from 2000 to 2010 in three hospitals from three different countries. They found that among all patients (79 patients) who had this view, two infectious (41 patients) and non-infectious (38 patients) groups were divided. Among 38 patients, only 3 (7.89%) patients were diagnosed with lung adenocarcinoma (9). The exciting thing mentioned in this study is that the clinical characteristics of these patients in terms of chronic cough and progressive disease progression are similar to ours. In addition to this view, in the patient's CT scan report, other lesions such as masses, solid nodules, and GGO views have also been seen. Besides having both RHS and halo sign views, our patient also had other lesions such as cavitary changes and GGO. In another study by Zhang et al. in 2018, they included 226 patients according to the inclusion and exclusion criteria between 2011 and 2017. Of these, 109 patients had lung adenocarcinoma. Only seven patients (6.42%) had a halo sign. They also mentioned that this view is significantly more in patients with focal organizing pneumonia than in patients with lung adenocarcinoma (10). According to the two abovementioned studies, it is clear that the prevalence of this disease is rare in patients with a halo sign and even reversed view, and this case is almost unique in that it has both of them together.

In a similar case report conducted by Rampinelli et al., in ten-year CT scan follow-ups, a 73-year-old woman witnessed changes without increasing or decreasing the size of the RHS form to the halo sign view at three-time points (11). Considering that our patient was a smoker (35 packs/year) and had a history of exposure to chemicals during his military service, it is possible that asymptomatic changes in his lung occurred years ago. This presence of two views with each other should be justified in this way. Therefore, more investigations and reports are needed, especially regarding the association of these two views with each other.

CONCLUSION

Primary lung adenocarcinoma should be considered in patients with halo sign and RHS in CT scans. Especially, when the patient presents with gradual symptoms and smoking, it is necessary to perform a biopsy of the observed lesions.

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