

## Findings in Chest High-Resolution Computed Tomography in Severe Asthma

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**Palabras clave:** tomografía computarizada, bronquiectasias, asma grave, comorbilidades.

About 3-10% of asthmatic patients have severe asthma (SA) -step 5-6 of GEMA and 4-5 of GINA- [1,2].

Chest high-resolution computed tomography (CHRCT is the use of thin-section CT images ( $\leq 1.5$ -mm slice thickness acquired at 10-20 mm intervals through the lungs) with a high spatial frequency reconstruction algorithm to detect and characterize diseases that affect the pulmonary parenchyma and small airways. Following the development and widespread availability of multidetector CT (MDCT) scanners capable of acquiring near-isotropic data throughout the entire thorax in a single breath-hold. This permits the acquisition of volumetric single breath-hold data sets, allowing spaced, contiguous, and/or overlapping CHRCT images to be reconstructed [3].

Imaging tests (IT) play a crucial role in the study of asthma, especially in SA. IT main indication is to identify possible complications and comorbidities such as bronchiectasis that should be appropriately assessed in patients with SA [4].

The aim of our study was to describe the findings in the CHRT images in an SA population and assess the relation between presenting bronchiectasis and some characteristics of these patients.

A descriptive and retrospective study was carried out in routine clinical practice. We evaluated the lesions found in the CHRCT performed on patients studied in the SA unit from the Allergology section at General University Hospital of Ciudad Real.

CHRCTs were requested in asthmatic patients with atypical course to rule out complications or comorbidities. CHRCT images were informed by the radiologist who randomly corresponded (radiologists did not know the aim of our study).

Demographic and clinical characteristics were assessed in patients with bronchiectasis such as; age, sex, asthma duration (years), atopy (defined as have at least one positive prick-test), body mass index, smoker or not, ACT, FENO, FEV1, FEV1 / FVC, FEF25-75%, eosinophil cationic protein (ECP), peripheral blood eosinophil count (PBEC), gastroesophageal reflux (GER), asthma exacerbation in previous year (AEPY).

CHRCT was performed on 121 patients. (Details available online: Table 1).

58 patients (47.9%) had a normal CHRCT image and that was pathological in 63 (52.1%). The findings were: bronchiectasis (19%), atelectasis and / or lamellar fibrosis (18.2%), emphysema areas (8.3%), ground glass images (7.4%), centrilobular nodules (5%), bronchial wall thickening (BWT) (5%), hiatal hernia (5%), mucosal impaction and / or image on tree in sprout (4.1%), air trapping (3.3%), interstitial weft increase (2.5%), pulmonary infiltrate (2.5%), mosaic attenuation pattern (1.65%), pulmonary nodules (1.65%), pericardial effusion (1.65%). Others (one patient each one) (0.8%) Extrapulmonary nodule. Pleural thickening, lung abscess, tracheocele, arterial calcification (possible pulmonary thromboembolism), azygous lobe and endothoracic goiter. Patients with normal CHRCT showed FEV1 above 80%, that difference didn't reach statistical significance.

5 of the 23 patients (21.7%) who had bronchiectasis met clinical criteria for allergic bronchopulmonary aspergillosis (ABPA) [5].

Regarding bronchiectasis and the characteristics of the patients, patients with bronchiectasis showed higher values in age, AEPY, FENO and PBEC, in contrast, bronchiectasis was associated with fewer FEV1 values.

The most common findings in asthma are BWT, air trapping and bronchiectasis [6].

Machado et al [7] found that the most frequent radiological lesion was BWT (69.7%), followed by bronchiectasis (45.9%). Sánchez-Cuéllar et al [8] found 71% BWT and 73.8% bronchiectasis.

In our serie, the most frequent finding was bronchiectasis (19% of patients with SA and 36.6% of pathological CHRCT) followed by atelectasis and / or lamellar fibrosis: 22 (18.2%). The few cases of BWT found (5%) and the lower frequency of bronchiectasis (19%) are striking. Perhaps it is related to the fact that our study was retrospective and performed in routine clinical practice, while the mentioned authors conducted their studies prospectively or insisting on the need to report certain patterns. In our serie, radiologists were not informed of the need to accurately report each imaging pattern. The presence of BWT could reflect bronchial and peribronchial inflammation. That pattern does not only appear in symptomatic patients or those with SA. Gupta et al [9] found a prevalence of 62% and it is related to the severity of asthma, as did Machado, who found BWT in 88.9% of SA, 78.6% in moderate asthmatics and 40% in the mild patients (6).

Bronchiectasis appear as a consequence of infection, inflammation, and repair of the airway, which finally leads to the destruction of the bronchial wall and irreversible dilation. CHRCT is currently the gold standard technique for its diagnosis. CHCRT

specificity and sensitivity is greater than 90%. Bronchiectasis is not necessary synonym of ABPA.

In our serie, 21.7% of patients with bronchiectasis fulfilled clinical criteria for ABPA. If we exclude patients with ABPA the results were similar in asthmatics with or without bronchiectasis except in PBEC and FENO values that were higher. That results weren't statistically significant probably because it was a small sample (five patients).

The frequency of bronchiectasis in asthma is variable. A high frequency of bronchiectasis has been found in patients with SA and impaired lung function. Machado et al found bronchiectasis in 77.7% of severe asthmatics, 42.9% of the moderate asthmatics and 20% of the mild ones (6). Sanchez-Cuellar [8] found bronchiectasis in 73.8% of subjects with 3 or more AEPY and who impaired lung function. Gupta et al [9] found bronchiectasis in 40% of patients with SA and it was associated with more AEPY and impaired lung function. Harmanci found that the presence of bronchiectasis was inversely related to FEV1 values [10]. Similar results were observed in our patients. Oguzulgen et al. [11] found that asthmatics with bronchiectasis showed worse lung function, greater severity and more AEPY than asthmatics without bronchiectasis. Bronchiectasis were more frequent in older patients, associated with lower FEV1 values, higher FENO, more AEPY and greater eosinophilia. A Padilla-Galo found that almost a third of patients with SA had bronchiectasis and it was related with lower FENO values.[12]

We conclude that in our SA patients the cost-effectiveness of CHRCT requests was high: More than a half of patients had pathological CHRCT images. The most frequently detected alteration was bronchiectasis followed by atelectasis and / or

laminar fibrosis and emphysema areas. ABPA must be ruled out in case of bronchiectasis finding.

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The authors have declared no conflicts.

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