CORRELATION BETWEEN ASTHMA AND TOXOCARA CANIS INFECTION

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CORRELATION BETWEEN ASTHMA AND TOXOCARA CANIS INFECTION (Abstract): The aim of the current study was to examine the relationship between asthma and toxocariasis. Material and methods: We have studied 76 patients with asthma and 88 controls (without asthma) aged 5-16 years. An ELISA test based on the detection of anti-Toxocara canis (E/S antigen) serum immunoglobulin G (IgG) and E (IgE) was done in both groups. Ordinary allergens and E/S antigen of T. canis infections were used to evaluate cutaneous reactivity. Results: Seroprevalence in asthma patients was 68.42% and in the controls 13.63%. This difference was significant. The percentage of asthmatic patients with two anti-Toxocara antibodies was 26.31%, and of 4.54% in controls. All asthma patients with anti-Toxocara IgE had cutaneous reactivity to Ag E/S. Conclusions: Asthma patients with anti-Toxocara IgE and IgG may have toxocariasis. Key words: ASTHMA, HUMAN TOXOCARIASIS, CHILDREN, PARASITOSIS.

Human toxocariasis is a cosmopolite helminthic zoonosis caused by Toxocara canis, a dog nematode that accidentally infects man. Humans normally become infected with Toxocara canis S2 larvae by ingestion of eggs present in soil contaminated by dog faeces (1).

In the small intestine, at the level of duodenum or upper jejunum, eggs hatch to release S2 larvae that penetrate the small intestinal wall and begin to wander throughout the body entering in different tissues and organs: liver, lungs, brain, eyes, heart, kidney, muscle, etc., where they can survive for a long time, up to 11 years, remaining infectious and being free or encapsulated (2). S2 larvae which remain confined to the liver or other tissues and organs do not complete their life cycle in the human body, so they never reach the stage of mature adult worm (3, 4, 5).

A positive diagnosis of toxocariasis is difficult and the confirmation of this manifest or asymptomatic parasitic disease is possible by using ELISA serological test with Toxocara canis S2 larva secretory-excretory antigen for detecting in the blood IgG antibodies against this parasite. ELISA
immunoenzymatic reaction for the detection of circulating anti-Toxocara antibodies has high sensitivity and specificity (3).

The pathogenic action of *T. canis* in the lung parenchyma and asthma production can be explained by the effect of larval migration which results in necrosis, inflammatory reaction, and concomittantly, intratissue *T. canis* excretory/secretory (TES) deposits. The last reaction triggers an immunological cascade that induces inflammatory immune reactions even in the absence of larvae in the lungs. The clinical manifestations of toxocariasis, occurring after a variable period of time, are due to the fact that these larvae tend to remain dormant and continue migration, or to reinvade the tissues after a certain period of time (6, 7).

**MATERIAL AND METHODS**

In the study were enrolled 164 patients admitted to the clinics of Iasi „Sf. Maria” Children Hospital. The study database consisted in information obtained from patients medical records - clinical and laboratory findings and imaging data.

The patients were divided into two groups:

Group I: 76 patients diagnosed with asthma. The clinical signs were bronchoconstriction reversible spontaneously or by the administration of bronchodilator agents, wheezing, cough, dyspnea, and chest pain secondary to airway inflammation.

Group II: controls, including 88 patients infected with *T. canis* without asthma symptoms, but with symptoms of rhinitis (32 patients), dermatitis (26 patients) and rhinosinusitis (46 patients).

Asthma patients were divided into four stages: stage 1 (intermittent asthma) - 53.84%, stage 2 (mild persistent asthma) - 26.92%, stage 3 (moderate persistent asthma) - 7.69% and stage 4 (severe persistent asthma) - 11.53%.

In all patients IgG, IgE, and anti-Toxocara antibodies were determined and cutaneous hypersensitivity tests were done. The obtained data were analyzed and expressed as percentages, and the associations between various factors were interpreted using correlation tests. *Statistica 8.0* software was used for statistical processing of the data.

**RESULTS**

Group I, asthma patients, had a mean age of 9.31 years, 57.9% of them were males and 42.1% females. Seroposivity rate for *T. canis* was 68.4% (52 cases), 24 female patients and 28 male patients.

Group II, controls, had a mean age of 8.12 years and a gender distribution of 27.3% females and 72.7% males. Seroposivity rate for *T. canis* was 13.6% - 12 patients, all males (tab. I).

| TABLE I |
|-----------|-----------|-----------|
| **Results of anti-Toxocara serology in the two groups** | | |
| **Serological markers for toxocariasis** | **Asthma** | **Other symptoms** | **p** |
| IgE (+) | 20 (26.31%) | 4 (4.54%) | <0.01 |
| IgG (-) | 12 (15.78%) | 4 (4.54%) | NS |
| IgE (+) | 20 (26.31%) | 4 (4.54%) | <0.01 |
| IgG (-) | 24 (31.57%) | 72 (86.36%) | NS |

Most asthma patients seropositive for *T. canis* had a positive IgE and IgG distribution of 26.31%.

In the control group, the distribution was uneven, two cases seropositive for *T. canis* associated with symptoms of rhi-
Correlation between asthma and *Toxocara canis* infection

nosinusitis (persistent rhinitis determining a diagnosis of chronic rhinosinusitis) being identified. Of the patients with negative serology for *T.canis*, 31.6% (24 patients), were diagnosed with bronchial asthma, 75% (12 patients) had rhinitis, and 82.6% (38 patients) rhinosinusitis and all allergy tests were positive.

In asthma patients, allergen skin reactivity rate was higher than in controls: 82.6% (66 patients) and 75%, respectively. 22 patients had cutaneous hypersensitivity to *T.canis* ES Ag, sex ratio 1:1.

Of the controls with positive skin reactions (tab. II), reactivity to ES Ag was found in 26 patients: 37.5% in those with a diagnosis of rhinitis, 30.4% with rhinosinusitis, and 23.1% with dermatitis.

**TABLE II**  
*Results of cutaneous hypersensitivity tests in the 2 groups*

<table>
<thead>
<tr>
<th></th>
<th>Asthma</th>
<th>Other symptoms</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Toxocara canis</em> ES Ag</td>
<td>44 (57.89%)</td>
<td>26 (29.54%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Dermatophagia</td>
<td>42 (55.26%)</td>
<td>40 (45.45%)</td>
<td>NS</td>
</tr>
<tr>
<td>Fungi</td>
<td>36 (47.36%)</td>
<td>36 (40.9%)</td>
<td>NS</td>
</tr>
<tr>
<td>Other allergens</td>
<td>32 (42.1%)</td>
<td>36 (40.9%)</td>
<td>NS</td>
</tr>
<tr>
<td>No reactivity</td>
<td>10 (13.15%)</td>
<td>22 (25%)</td>
<td>NS</td>
</tr>
</tbody>
</table>

All patients with asthma and seropositive for anti-Toxocara IgE (32 cases) showed skin reactivity to ES Ag. Similar results were seen in 4 cases belonging to the control group (tab. III). 70% (28 patients) asthma patients with positive IgG markers for T.canis showed positive skin reactivity to ES Ag.

Of the controls positive for anti-Toxocara IgG (8 patients), 6 had positive skin tests. Of the patients with asthma and negative *T. canis* serology (28 patients), 4 had positive skin reactivity to ES Ag.. Of the patients in the control group with negative serology for both immunoglobulins (76 cases), 16 reacted to *T.canis* ES Ag inoculation.

**TABLE III**  
*Results of cutaneous hypersensitivity test to ES Ag according to the positivity of serologic markers*

<table>
<thead>
<tr>
<th>Serologic markers for toxocariasis</th>
<th>Ag E/S (+)</th>
<th>Ag E/S (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Asthma</td>
<td>Other symptoms</td>
</tr>
<tr>
<td>IgE (+)</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>IgG (-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IgE (+)</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>IgG (+)</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>IgE (-)</td>
<td>4</td>
<td>26</td>
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</tbody>
</table>

**DISCUSSION**

In the group of asthma patients we noticed a positive correlation between anti-Toxocara IgE and/or IgG serological markers. In this study the determinations of anti-Toxocara IgE and/or IgG revealed a statistically significant association with asthma manifestations. This allows us to say that in asthma the clinical manifestations are more severe and aggravated on the atopic background determined by *T.canis* infection.

In the present study we found a correlation between the presence of anti-Toxocara IgE and skin reactivity both in asthma patients and controls. The results regarding IgG reactivity are not statistically significant to allow us to demonstrate a correlation between asthma, toxocariasis, and skin reactivity.

Antigenic specificity to cutaneous aller-
gens with negative serology for *T. canis* was below 20% in both study groups. The relationship between the presence of anti-Toxocara IgE, skin reactivity to ES Ag, and asthma is significant.

Migrating larvae can cause host sensitization to ES Ag with increasing IgE specificity. IgE couples to bronchial cell membrane and causes the release of an alveolar mediator that induces bronchial mucosa inflammation, and consequently bronchial asthma. A significant association between toxocariasis and high IgE levels was reported by other authors (8, 9, 10).

Asthma patients present skin reactivity to common allergens, but this reactivity is not significantly higher than in controls. On the other hand, reactivity of asthma patients to ES Ag is significantly different from that found in the control group. Although these results do not demonstrate a causal relationship, they express a significant association between cutaneous hypersensitivity to *T. canis* ES Ag and asthmatic background.

**CONCLUSIONS**

The present study demonstrates an association between asthma and toxocariasis and suggests the need to include this parasitic disease in the differential diagnosis of asthmatic syndrome. Determination of anti-Toxocara IgE and IgG becomes essential in the diagnosis of such patients.

Based on literature data should be consider toxocariasis when a patient, especially children older than 3 years, has asthma, hepatomegaly, hypereosinophilia, elevated IgE level, and positive epidemiology (11).

**REFERENCES**