EDUCATIONAL COMMENTARY – OVERVIEW OF AUTOIMMUNE DISEASE

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Learning Outcomes
Upon completion of this exercise, the participant will be able to:

- describe the function of the components of the immune response.
- discuss the immune response in autoimmunity.
- associate laboratory tests with specific autoimmune disorders.

A basic understanding of the immune system is a prerequisite for understanding autoimmunity. The immune system has two functions. One is to protect the body from invading organisms such as bacteria, viruses, fungi, and toxic substances. The other is to differentiate self from non-self. The immune response is a powerful system consisting of many components that work together to protect us from infectious diseases.

A primary component of the immune system is WBCs (leukocytes), which attack the invading organism and destroy its ability to cause disease. Early in life, the body’s immune system must learn to distinguish between self (its own cells and tissues) and non-self (foreign or invading organisms and toxic substances). Immune tolerance is developed and shields self cells from attack by components of the immune system.

The primary leukocytes involved in immunity are the neutrophils, B lymphocytes, and T lymphocytes. Neutrophils provide the body with its major defense against bacterial infections through a process called phagocytosis. The neutrophil engulfs the foreign particle, processes it, and kills it. Phagocytosis and other naturally occurring mechanisms are components of the nonspecific or innate immune response. Innate responses are not dependent on recognizing a specific invading organism. The strength of the immune response is consistent regardless of the organism involved, and no memory for the offending organism is developed.

The adaptive immune response is specific for every invading pathogen (disease-producing organism). The adaptive immune system has the ability to recognize foreign organisms and other substances including those that have not yet been discovered. Certain T cytotoxic lymphocytes that are specific for the foreign organism attach to the organism and kill it. T-helper lymphocytes produce signaling substances that activate B lymphocytes to produce antibodies specific to the invading foreign organism. The antibodies coat the foreign organism and make phagocytosis more effective. Antibodies can also neutralize damaging toxins produced by bacteria, neutralize viruses, and activate complement that can
kill the organism. After exposure to a foreign organism, memory for the cell surface markers of the organism is developed. Upon subsequent exposure to the same pathogen, the adaptive immune response is stronger and faster. These characteristics provide the basis for the prevention of infectious disease through vaccination.

In some people, something triggers the immune response to begin attacking self cells or tissues. Immune tolerance to self is impaired, and antibodies and T cytotoxic lymphocytes cause damage to self. Inflammation is produced and leads to tissue damage. The result is an autoimmune disease. The cause of autoimmunity is not well understood. A genetic link that predisposes individuals to autoimmune diseases is recognized. Autoimmunity is also thought to be connected to exposure to certain drugs and other factors. Hormones may play a role because autoimmune diseases occur much more commonly in women than in men. For example, Hashimoto thyroiditis occurs 50 times more often in women than in men.

More than 80 disorders are classified as autoimmune diseases. Often patients become very frustrated when specific diagnoses take many years to establish. Difficulty in diagnosis occurs because there are so many different autoimmune diseases, many of the diseases have similar symptoms, and even in a specific autoimmune disease, patients may display varying symptoms. Compounding the problem is the aspect that some patients may acquire more than one autoimmune disease.

Diagnosis of autoimmune diseases is not based on laboratory test results alone. Physical examination of the patient, symptoms, radiologic findings, and laboratory results must support a diagnosis.

Many patients experience chronic symptoms, i.e., they have periods with acute symptoms followed by periods of remission. Other patients have symptoms that are persistent and progressively worsening. Autoimmune diseases can be treated to reduce the symptoms and to reduce the strength of the immune response, but there are no cures. Some treatments also lessen the damage to the affected organ(s).

The Table describes common autoimmune diseases and indicates common laboratory testing associated with diagnosis and treatment of the disease. These tests are not positive in all cases of the specific autoimmune diseases listed.
### TABLE. Selected Autoimmune Diseases: Tissue, Autoantibody, and Laboratory Tests.

<table>
<thead>
<tr>
<th>Autoimmune Disease</th>
<th>Tissue Affected</th>
<th>Autoantibody Produced</th>
<th>Laboratory Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rheumatoid arthritis</td>
<td>Joints, sometimes bones, lung, skin</td>
<td>Anti-IgM or anti-IgG directed against IgG in synovial fluid</td>
<td>Rheumatoid factor (RF) Anti-cyclic citrullinated peptide (anti-CCP) Antinuclear antibody (ANA)</td>
</tr>
<tr>
<td>Graves’ disease</td>
<td>Thyroid</td>
<td>Anti-thyroid stimulating hormone receptors</td>
<td>T₃, thyroid-stimulating hormone (TSH), anti-thyroperoxidase (anti-TPO)</td>
</tr>
<tr>
<td>Hashimoto thyroiditis</td>
<td>Thyroid</td>
<td>Anti-thyroglobulin</td>
<td>T₃, TSH, anti-TPO</td>
</tr>
<tr>
<td>Systemic lupus erythematosus</td>
<td>Systemic (skin, joints, kidneys, nervous system, etc.)</td>
<td>Antibody directed against nuclear material of cells</td>
<td>Antinuclear antibody (ANA) Anti-double-stranded-DNA (anti-ds-DNA) C-reactive protein (CRP) Erythrocyte sedimentation rate (ESR)</td>
</tr>
<tr>
<td>Sjögren’s syndrome</td>
<td>Salivary glands, tear glands</td>
<td>Antibody directed against moisture-producing glands</td>
<td>ANA Anti- Sjögren’s syndrome antigen A (anti-SS-A) and anti-SS-B RF</td>
</tr>
<tr>
<td>Celiac disease</td>
<td>Gastrointestinal tract</td>
<td>Antibody against gluten and gliadin found in grains; also reacts with intestinal wall villi</td>
<td>Anti-tissue transglutaminase antibody (anti-ITG), IgA CRP ESR</td>
</tr>
</tbody>
</table>

Autoimmune diseases are a serious challenge to the physician. Accurate diagnosis of a specific disease often takes 5 or 6 years. Most of the diseases cause tissue damage due to the inflammation that is produced when autoantibodies or T cytotoxic lymphocytes attack self cells. Treatment addresses the symptoms and often reduces tissue damage but does not result in a cure. Laboratory testing is helpful in the diagnosis and treatment of autoimmune disease but is not used as a single diagnostic tool.

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