All About Thymoma & Thymic Carcinoma

What is the thymus?

The thymus gland is a small organ that lies under the breastbone, in a part of the body known as the anterior mediastinum. The thymus is part of the immune system and is responsible for the development of T lymphocytes. Lymphocytes travel through the body and help to fight infection. As we age, the thymus regresses, but in some people a remnant remains in adulthood.

What is thymoma/thymic carcinoma?

Thymoma is usually a slow-growing tumor that typically does not spread beyond the thymus gland. It is the most common tumor seen in the anterior mediastinum in adults. Thymic carcinoma, on the other hand, is less common but more aggressive. It is generally more difficult to treat because it tends to spread quickly to other areas of the body. Both tumors typically start in thymic epithelial cells.

Thymoma/thymic carcinoma are both rare types of cancer. There are an estimated 400 cases (combined) per year in the United States, or about 1.5 persons per million diagnosed with thymoma/thymic carcinoma.

The World Health Organization (WHO) has developed a classification system for thymoma. This system defines 6 types of thymoma, based on the cells that make up the tumor. The histological type is used in combination with other factors to determine staging and treatment modalities.

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<thead>
<tr>
<th>Type</th>
<th>Subtype Name</th>
<th>Subtype Characteristics</th>
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</table>
| Type A| Spinde cell or medullary thymoma                                             | • Cell are spindle shaped or oval epithelial cells that appear fairly normal looking
• Accounts for 4-7% of all thymomas
• Approximately 17% of cases may be associated with myasthenia gravis |
| Type AB| Mixed thymoma                                                               | • Cells appear like type A, but also include non-neoplastic lymphocytes.
• Accounts for 28-34% of all thymomas
• Approximately 16% of cases may be associated with myasthenia gravis |
| Type B1| Lymphocyte-rich thymoma (also referred to as lymphocytic thymoma, predominantly cortical thymoma, organoid thymoma) | • Cells show many lymphocytes in the tumor, but the cells of the thymus look healthy.
• Accounts for 9-20% of all thymomas
• Approximately 57% of cases may be associated with myasthenia gravis |
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| B2   | Cortical or polygonal cell thymoma. | - Presence of many lymphocytes and abnormal thymus cells  
- Accounts for 20-36% of all thymomas  
- Approximately 71% of cases may be associated with myasthenia gravis |
| B3   | Epithelial thymoma (also referred to as atypical thymoma, squamoid thymoma and well-differentiated thymic carcinoma). | - Cells contain few lymphocytes and abnormal thymic cells  
- Accounts for 10-14% of all thymomas  
- Approximately 46% of cases may be associated with myasthenia gravis |
| C    | Thymic Carcinoma | - Thymic epithelial tumor  
- Cells looks like carcinomas in other organs  
- Always lack immature lymphocytes  
- Association between myasthenia gravis and thymic carcinoma is rare  
- Several subtypes: squamous cell (epidermoid), basaloid, lymphoepithelioma like, sarcomatoid, clear cell, mucoepidermoid, papillary, undifferentiated |

**What causes thymoma/thymic carcinoma and am I at risk?**

The cause of thymoma is unknown. The risk factors have not been identified. It affects men and women equally, and is most often seen in people 50-60 years old. People with thymoma may have other diseases of the immune system. Myasthenia gravis, an autoimmune condition that causes the muscles to become weak, is the syndrome most often associated with thymoma, and may be present in about 30% of people with thymoma. Conversely, because myasthenia gravis is more common than thymoma, only 10-15% of patients diagnosed with myasthenia gravis also develop thymoma.

**What screening tests are available for thymoma/thymic carcinoma?**

There are no available screening tests for thymoma/thymic carcinoma. Almost half of those who have thymoma/thymic carcinoma have no symptoms when their tumor is found. Thymoma is often found incidentally when an x-ray or CT scan is performed for another reason.

**What are the signs of thymoma/thymic carcinoma?**

About one-third of patients have no symptoms when thymoma/thymic carcinoma is diagnosed. If symptoms are present, they include cough, chest pain, shortness of breath, hoarseness, decreased appetite, and trouble swallowing. Rarely, thymoma/thymic carcinoma tumors can press on the superior vena cava (SVC), leading to a complication called **SVC syndrome**. The SVC is the primary blood vessel that brings blood from the upper body to the heart. Symptoms of SVC syndrome include swelling in the neck, chest and face, swelling of the visible veins in the upper body, headaches and dizziness. SVC syndrome is a serious condition that required immediate medical attention.

Some patients may present with conditions caused by the tumor itself. These include myasthenia gravis, red cell aplasia and hypogammaglobulinemia. These are autoimmune conditions, where the body’s immune system seems to attack itself.

Some other autoimmune diseases have also been linked to thymoma, including lupus, polymyositis, ulcerative colitis, rheumatoid arthritis, Sjogren’s syndrome, sarcoidosis and scleroderma. If you have one of these autoimmune diseases, talk with your healthcare team about screening for thymoma.
How is thymoma/thymic carcinoma diagnosed?

Thymoma is usually diagnosed based on x-ray and images of the chest. Laboratory studies such as routine bloodwork are generally not used. Biopsy is also rarely performed for diagnosis because health care providers can usually make a diagnosis of thymoma based on imaging like x-ray, CT scan or MRI. If there is a question of invasion into other nearby structures in the chest, it may be necessary to obtain a tissue sample of the mass, or biopsy, for examination under a microscope. The biopsy is performed either by insertion of a needle through the chest wall or by a more invasive surgical procedure under general anesthesia. In this procedure, an incision is made above the breastbone and a piece of the tumor is removed. This procedure is sometimes done with the aid of a small camera, or scope, inserted into the chest (called video-assisted thoracoscopy, or VATS).

How is thymoma staged?

Once a thymoma is found, it may be necessary to perform more tests to see if the tumor has spread and so that the appropriate treatment can be recommended. The extent of the tumor spread is also referred to as the "stage."

The Masaoka staging system in the most commonly used system for staging thymoma/thymic carcinoma. Staging via this system takes into account (1) the extent of the disease as seen via CT/MRI, (2) spread of the tumor to nearby tissues, (3) histologic typing (the type of cell).

<table>
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<tbody>
<tr>
<td>Stage I</td>
<td>Non-invasive tumor that has not spread into the outer layer (capsule) of the thymus. Macroscopically and microscopically completely encapsulated</td>
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<tr>
<td>Stage II</td>
<td>Thymoma invades beyond the outer boundary of the thymus and into nearby tissue or the pleura.</td>
</tr>
<tr>
<td>IIA</td>
<td>The tumor is growing into the outer layer of tissue of the thymus. Micropscopic transcapsular invasion.</td>
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<tr>
<td>Stage IIB</td>
<td>The tumor has grown through the outer layer of the thymus and has invaded nearby fatty tissue, the mediastinal pleura or the pericardium.</td>
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<tr>
<td>Stage III</td>
<td>The tumor is growing into nearby tissues and organs in the neck and upper chest area including the pericardium, the lungs, the SVC and/or the aorta.</td>
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<tr>
<td>Stage IVA</td>
<td>The tumor has spread widely through the pleura and/or the pericardium.</td>
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<tr>
<td>Stage IVB</td>
<td>The tumor has spread to distant organs.</td>
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What are the treatments for thymoma/thymic carcinoma?

Surgery

Surgical removal of the tumor is the primary treatment for thymoma/thymic carcinoma. The first step to determine whether or not the tumor is able to be surgically removed (called resectable), which is dependent on a few factors. If the tumor has spread to nearby tissues and organs, it may not be resectable. In addition, the patient may not be able to undergo surgery in light of other, pre-existing medical conditions.

The complete removal of the thymus, a thymectomy, is the most common surgery used in the treatment of thymic cancers. If the tumor is not entirely resectable, your healthcare provider may choose to debulk the tumor. This means trying to remove as much of the tumor as is safely possible. Occasionally, chemotherapy or radiation may be used in these cases before surgery in hopes of reducing the size of the tumor, to aid in its removal.

Radiation Therapy
Thymomas are considered to be sensitive to radiation therapy treatment (which is the use of high-energy x-rays aimed at the tumor or area from where the tumor was removed).

There is no need to use radiation for completely removed noninvasive thymoma tumors (stage I). Radiation is nearly always used in stage III or IV tumors after complete or partial surgical removal of the tumor. Whether radiation is needed after complete surgical removal of stage II tumors is unclear and often dependent on the patient and the specifics of their tumor. Radiation is often recommended in order to decrease the chance that the tumor will come back in the original site. Radiation may be used in any stage of thymoma where it is not technically possible to do a safe and complete surgery.

Chemotherapy

The use of chemotherapy for advanced stage tumors has increased. Some of the most commonly used chemotherapy medications include: cisplatin, doxorubicin, carboplatin, cyclophosphamide, paclitaxel, pemetrexed, 5-FU, gemcitabine and ifosfamide. Corticosteroids are non-chemotherapy medications that are sometimes used in thymoma treatment. Several medications are often used in combination. Two common chemotherapy combinations are: PAC (cisplatin, doxorubicin and cyclophosphamide) or carboplatin with paclitaxel. In some cases, a medication called octreotide can be used in patients with advanced thymoma.

Some thymic cancers may be treated with targeted therapies that focus on specific gene mutations or proteins present in that tumor. Targeted therapies that may be useful in the treatment of thymoma include sunitinib and sorafenib.

Clinical Trials

Clinical trials are designed to determine the value of specific treatments. Trials are often designed to treat a certain stage of cancer, either as the first form of treatment offered, or as an option for treatment after other treatments have failed to work. They can be used to evaluate medications or treatments to prevent cancer, detect it earlier, or help manage side effects. Clinical trials are extremely important in furthering our knowledge of disease. It is through clinical trials that we know what we do today. Talk to your provider about participating in clinical trials in your area. You can also explore currently open clinical trials using the OncoLink Clinical Trials Matching Service.

Follow Up Care and Survivorship

After completion of treatment for thymoma or thymic carcinoma, your healthcare team will monitor you closely. There is no widely accepted follow up schedule for survivors, but likely your team will want to exam you every 3 months for the first 1-2 years after treatment to monitor for late treatment related side effects and possible recurrence. You may also need to have a chest CT scan every 6 months for 1-2 years after treatment.

Fear of recurrence, relationships challenges, the financial impact of cancer treatment, employment issues and coping strategies are common emotional and practical issues experienced by survivors. Your healthcare team can identify resources for support and management of these practical and emotional challenges faced during and after cancer.

Cancer survivorship is a relatively new focus of oncology care. With some 15 million cancer survivors in the US alone, there is a need to help patients transition from active treatment to survivorship. What happens next, how do you get back to normal, what should you know and do to live healthy going forward? A survivorship care plan can be a first step in educating yourself about navigating life after cancer and helping you communicate knowledgeably with your healthcare providers. Create a survivorship care plan today on OncoLink.

Resources for More Information

ThymomaHope.org

Supports research for thymoma through fundraising as well as offering patients/families a space to share their stories about living with thymoma.

www.thymomahope.org

International Thymic Malignancy Interest Group

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