# About Thymus Cancer

**Overview**

If you have been diagnosed with thymus cancer or are worried about it, you likely have a lot of questions. Learning some basics is a good place to start.

- What Is Thymus Cancer?

**Research and Statistics**

See the latest estimates for new cases of thymus cancer in the US and what research is currently being done.

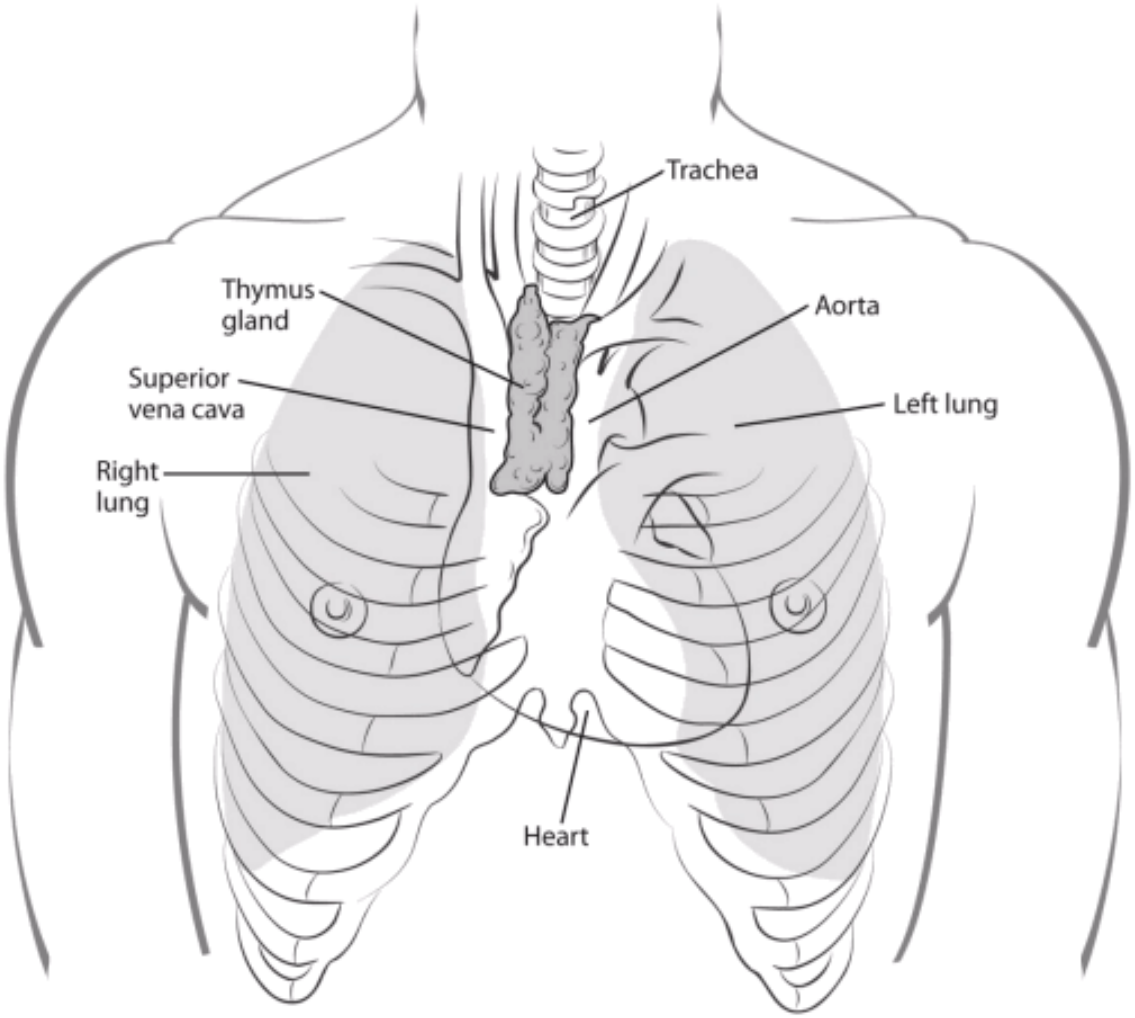
- Key Statistics About Thymus Cancers
- What's New in Thymus Cancer Research?

# What Is Thymus Cancer?

Cancer starts when cells in the body start to grow out of control. Cells in nearly any part of the body can become cancer, and can spread to other parts of the body. To learn more about how cancers start and spread, see What Is Cancer?[1]

Thymus cancers are rare. The thymus is a small organ located just behind the breast bone (sternum) in the front part of the chest. The thymus is in a part of the chest called the *mediastinum*, the space in the chest between the lungs that also contains the heart,

part of the aorta, the esophagus (the tube that connects the mouth to the stomach), part of the trachea (windpipe), and many lymph nodes. The thymus sits just in front of and above the heart.




The thymus is divided into 2 halves, called *lobes*. It has an irregular shape. There are a lot of small bumps called *lobules* on its surface. The thymus has 3 main layers:

- The **medulla** is the inside part of the thymus.
- The **cortex** is the layer that surrounds the medulla.
- The **capsule** is the thin covering over the outside of the thymus.

The thymus reaches its maximum weight of about 1 ounce during puberty. Then it decreases in size during adulthood as it's replaced by fat tissue.

**The thymus is an important part of the body's immune system.** During fetal development and childhood, the thymus is involved in the production and maturation of T lymphocytes (also known as *T cells*), a type of white blood cell. T lymphocytes develop in the thymus and then travel to lymph nodes (bean-sized collections of immune system cells) throughout the body. There they help the immune system protect the body from viruses, fungus, and other types of infections.

The thymus is made of different types of cells. Each kind can develop into different types of cancer:

- Epithelial cells give the thymus its structure and shape. **Thymomas and thymic carcinomas**, which are the main focus of the rest of this document, develop from these cells.
- Lymphocytesmake up most of the rest of the thymus. Whether in the thymus or in other parts of the body, these immune system cells can develop into cancers called Hodgkin disease[2] and non-Hodgkin lymphoma[3].
- Kulchitsky cells, or neuroendocrine cells, are much less common cells that normally release certain hormones. These cells can give rise to cancers called *carcinoid tumors*. This document does not discuss carcinoid tumors of the thymus. Much of the information in Lung Carcinoid Tumor[4] and Gastrointestinal Carcinoid Tumors[5] also applies to carcinoids of the thymus.

## Thymomas and thymic carcinomas

**Thymomas and thymic carcinomas are tumors that start from thymic epithelial cells.** Not all doctors agree about the best way to describe and classify these tumors. In the past, thymomas were sometimes divided into benign (non-cancer) thymomas and malignant (cancer) thymomas, based on whether they had grown beyond the thymus into other tissues or organs. Now, most doctors think all thymomas may become cancer over time, and the best way to predict how likely they are to come back after treatment is to describe whether they have grown into tissues beyond the thymus (and if so, how far). This is done by the surgeon who notes whether or not the tumor is attached to nearby organs and by the pathologist who looks at samples from the margins (edges) of the tumor under the microscope. The system used to describe the stage (extent) of thymomas is covered in How Is Thymus Cancer Staged?[6]

### WHO classification system for thymomas

Most doctors also classify thymomas by how they look under a microscope and by tests done on the tissue samples. This is called the *histologic type*. The system used for this classification, which was developed by the World Health Organization (WHO), assigns letters to the different types of thymomas.

**Type A:** The cells in these tumors are spindle-shaped or oval epithelial cells that are fairly normal looking. This is the rarest type of thymoma, but it seems to have the best prognosis (outlook).

**Type AB:** This type, also known as a *mixed thymoma*, looks like type A but there are also areas of lymphocytes mixed in the tumor.

**Type B1:**This type looks a lot like the normal structure of the thymus. It has a lot of lymphocytes along with normal-looking thymus cells.

**Type B2:** This type also has a lot of lymphocytes, but the thymus epithelial cells are larger with abnormal nuclei (the DNA-containing part of the cell).

**Type B3:**This type has few lymphocytes and mostly made of thymus epithelial cells that look pretty close to normal.

**Type C:**This is the most dangerous form and is also known as *thymic carcinoma*. It contains cells that look very abnormal under the microscope. The cells may no longer even look like thymus cells. These tumors have often grown into nearby tissues and/or spread to distant tissues and organs (metastasized) at the time they are found. This type of thymoma has the worst outlook (prognosis).

Type AB and type B2 are the most common types of thymoma, and type A is the least common. As you go from A to C, the outlook for survival tends to get worse. Type A has the best outlook, and type C has the worst. Still, for most types of thymoma, the stage[7] (extent of growth and spread) is a better predictor of a person's outcome.

## Other cancers in the mediastinum

Other cancers and tumors can occur in the mediastinum. Cancers can start in the esophagus (esophageal cancer[8]), in the heart (and the tissue surrounding it), in the trachea[9], and in the lymph nodes (lymphoma[10]).

Rarely, cancers and tumors known as *germ cell tumors* can also start in the

mediastinum. These come from cells like those found in the testicles and ovaries.

Sometimes the thyroid gland, which is normally in the neck, is misplaced into the mediastinum. This can become enlarged, called a *goiter*. A thyroid tumor or cancer[11] can also develop in the mediastinum.

More often, cancer spreads there from other areas, especially the lungs[12].

## Hyperlinks

1. www.cancer.org/cancer/cancer-basics/what-is-cancer.html
2. www.cancer.org/cancer/hodgkin-lymphoma.html
3. www.cancer.org/cancer/non-hodgkin-lymphoma.html
4. www.cancer.org/cancer/lung-carcinoid-tumor.html
5. www.cancer.org/cancer/gastrointestinal-carcinoid-tumor.html
6. www.cancer.org/cancer/thymus-cancer/detection-diagnosis-staging/staging.html
7. www.cancer.org/cancer/thymus-cancer/detection-diagnosis-staging/staging.html
8. www.cancer.org/cancer/esophagus-cancer.html
9. www.cancer.org/cancer/laryngeal-and-hypopharyngeal-cancer.html
10. www.cancer.org/cancer/lymphoma.html
11. www.cancer.org/cancer/thyroid-cancer.html
12. www.cancer.org/cancer/lung-cancer.html

### References

See all references for Thymus Cancer (www.cancer.org/cancer/thymus-cancer/references.html)

Last Medical Review: October 4, 2017 Last Revised: October 4, 2017

# Key Statistics About Thymus Cancers

Although thymic tumors are the most common tumors in the anterior mediastinum (the front part of the chest cavity), overall they are rare. They occur at a rate of only 1.5

cases for every million people each year in the US. This works out to about 400 cases per year (the exact number diagnosed each year is not known).

Survival statistics for thymomas are discussed in Survival rates for thymus cancer[1].

### Hyperlinks

1. www.cancer.org/cancer/thymus-cancer/detection-diagnosis-staging/survival-rates.html

**References**

See all references for Thymus Cancer (www.cancer.org/cancer/thymus-cancer/references.html)

Last Medical Review: February 7, 2014 Last Revised: March 17, 2015

# What's New in Thymus Cancer Research?

There's always research going on in the area of thymic tumors. Scientists are looking for causes of thymic tumors, and doctors are working to improve treatments.

Because thymic tumors are rare, more information from clinical trials[1] is needed to decide which treatments are best for each type and stage. For instance, the role of chemotherapy[2] in treating thymomas is still being explored. New treatments are also being developed and tested. For example, it's been suggested that hyperthermic intrathoracic chemotherapy (called HITHOC) during surgery might be useful in late stage thymic cancers. But more research is needed.

Researchers are looking for more accurate ways of predicting how aggressive a tumor is so the best treatment can be chosen. Improving imaging tests may also help doctors better decide which tumors can be safely removed with surgery.

Some studies are looking to see if treating with chemotherapy[3](chemo) and/or radiation[4] before and/or after surgery[5] can help keep thymus cancer from coming back.

Removing or destroying all the cancer cells is not the only goal in treating thymomas. Some paraneoplastic syndromes may persist even after the tumor has been treated. Researchers are studying the causes of these syndromes and the best ways to treat them.

While chemotherapy can often help shrink thymus cancers, it doesn't always work and can have serious side effects. Chemo drugs work by attacking fast-growing cells, which is the main cause of their side effects. As researchers have learned more about what makes cancer cells different from normal cells, they have been able to make drugs that target these differences. Many of these drugs are already being used to treat other cancers. Researchers are trying to learn more about the genetic changes in thymus cancer cells. And studies are needed to look at how targeted therapies might be used to treat these cancers. These targeted therapies include anti-angiogenesis drugs (which affect tumors by limiting their blood supply) and anti-growth factor drugs (which interfere with substances some cancer cells make to stimulate their own growth). Some of these drugs are already being used to treat other cancers, and are being studied for use against thymus cancers. These include cetuximab, sunitinib, avelumab, pembrolizumab, erlotinib, and bevacizumab. Others being studied are not yet approved to treat any type of cancer.

## Hyperlinks

1. www.cancer.org/treatment/treatments-and-side-effects/clinical-trials.html
2. www.cancer.org/cancer/thymus-cancer/treating/chemotherapy.html
3. www.cancer.org/treatment/treatments-and-side-effects/treatment-types/chemotherapy.html
4. www.cancer.org/cancer/thymus-cancer/treating/radiation-therapy.html
5. www.cancer.org/cancer/thymus-cancer/treating/surgery.html

### References

Hu B, Rong H, Han Y, Li Q. Do thymic malignancies respond to target therapies? *Interact Cardiovasc Thorac Surg*. 2015;20(6):855-859.

Jackson MW, Palma DA, Camidge DR, et al. The Impact of Postoperative Radiotherapy for Thymoma and Thymic Carcinoma. *J Thorac Oncol*. 2017;12(4):734-744.

National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology. Thymomas and Thymic Carcinomas. Version 1.2017--March 2, 2017.

Remon J, Lindsay CR, Bluthgen MV, Besse B. Thymic malignancies: Moving forward with new systemic treatments. *Cancer Treat Rev*. 2016;46:27-34.

Ried M, Marx A, Götz A, Hamer O, Schalke B, Hofmann HS. State of the art: diagnostic tools and innovative therapies for treatment of advanced thymoma and thymic carcinoma. *Eur J Cardiothorac Surg.* 2016;49(6):1545-1552.

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