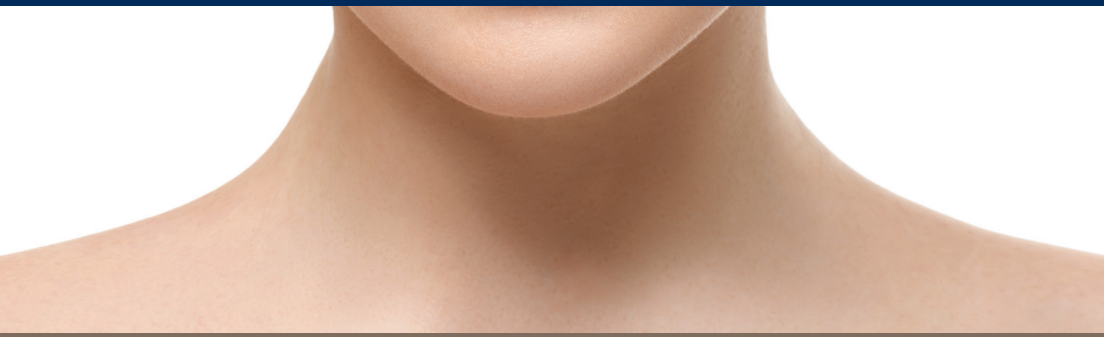
Thyroid Cancer **Basics**



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www.thyca.org

Thyroid Cancer Basics

This handbook gives an overview of basic facts about thyroid cancer, its diagnosis, and typical treatment options.
While this handbook contains important information about thyroid cancer, your individual course of testing, treatment, and follow-up may vary for many reasons.

Writers, Editors, and Reviewers. This handbook combines the significant efforts of Members of ThyCa's Medical Advisory Council as well as numerous additional thyroid cancer specialist physicians, researchers, patients, and caregivers. We greatly appreciate everyone's expertise and support.

Medical Advisory Council. ThyCa is fortunate to have a distinguished Medical Advisory Council of more than 50 professionals, who are world recognized experts in thyroid cancer. They provide valuable counsel and support of ThyCa's goals in education, treatment and research. Our web site **www.thyca.org** has details.

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Please note: *The information in this handbook is intended for educational purposes and is for general orientation. It is not intended, nor should it be interpreted, as medical advice or medical instructions or to replace your doctor's advice. You are advised to consult your own medical doctor(s) for all matters involving your health and medical care.*

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E-mail to publications@thyca.org

Introduction—You Are Not Alone

A thyroid cancer diagnosis can be difficult. Please be reassured that you are not alone.

Our goal is to offer help, hope, and support to:

- Strengthen your knowledge through education
- Help you feel part of a community of survivors as you cope with emotional and practical concerns
- Introduce you to the many free services, information resources, and events that can help you

This handbook is for anyone coping with a thyroid cancer diagnosis.

This handbook gives you:

- Basic facts and helpful tips for coping with **any type of thyroid cancer**
- More details about treatment and follow-up for differentiated thyroid cancer (papillary, follicular, and several variants). More than 9 of every 10 people with thyroid cancer have differentiated thyroid cancer.

1. About Thyroid Cancer: Basic Facts

- Thyroid cancer is the most common endocrine cancer.
- Thyroid cancer is a malignant tumor or growth originating within the thyroid gland. It is also called thyroid carcinoma.
- Thyroid cancer is one of the few cancers that has increased in incidence over recent years. More than 53,000 people will be newly diagnosed with thyroid cancer in the United States in 2018. More than 300,000 people will be newly diagnosed worldwide in the same year. In the United States, more than 600,000 people are living with thyroid cancer.
- Thyroid cancer occurs in all age groups, from young children through seniors. About 2 of every 3 people diagnosed with thyroid cancer are between ages 20 and 55.
- Thyroid cancer is more common in women than in men. More than 7 of 10 people diagnosed with thyroid cancer are female.
- The cause of most thyroid cancer is unknown.
- People have a higher chance of getting thyroid cancer if they were exposed to large amounts of radiation during childhood, or received radiation treatment for medical problems in the head and neck area at a young age. The cancer may not occur until 20 years or more after the radiation exposure. However, most people with such exposure do not get thyroid cancer, and most people with thyroid cancer did not have such exposure.
- The prognosis for any individual with thyroid cancer depends on several factors. These include the type of thyroid cancer, the tumor size, whether the disease has spread (metastasized) to other parts of the body (especially distant sites), and the patients' age at the time of diagnosis.
- Thyroid cancer is usually highly treatable when found early.

2. Types of Thyroid Cancer

There are four types of thyroid cancer: **papillary, follicular, medullary, and anaplastic.**

Differentiated Thyroid Cancer: Papillary and Follicular

- **Papillary** and **follicular** thyroid cancers are referred to as *differentiated thyroid cancer*, which means that the cancer cells look and act in some respects like normal thyroid cells.
- Papillary and follicular thyroid cancers account for more than 90% of all thyroid cancers. They tend to grow very slowly.
- Their **variants** include **tall cell, columnar**, **diffuse sclerosing, hobnail, solid, follicular variant of papillary,** and others. **Hürthle cell cancer** is another differentiated thyroid cancer. Another variant is **poorly differentiated thyroid carcinoma**, which has also been called **insular.** Some variants tend to grow and spread more aggressively than typical papillary or follicular thyroid cancers.
- If detected early, most papillary and follicular thyroid cancers can be treated successfully. Their treatment and management are similar and are based on staging and individual risk levels.
- **Papillary** thyroid cancer is the most common type of thyroid cancer. It accounts for about 80% of all thyroid cancers. Papillary thyroid cancer generally grows very slowly, but can often spread to lymph nodes in the neck. It also can spread elsewhere in the body.
- **Follicular** thyroid cancer accounts for about 10-15% of all thyroid cancers. Treatment will be discussed later in this handbook. Hürthle cell thyroid cancer, sometimes considered a variant of follicular, accounts for about 3% of all thyroid cancers.
- Follicular thyroid cancers usually do not spread to the lymph nodes, but in some cases can spread to other parts of the body, such as the lungs or bones.
- Treatment for follicular thyroid cancer is similar to treatment for papillary.

- Hürthle cell cancer (also known as oncocytic or oxyphilic) is less likely than other differentiated thyroid cancer to absorb radioactive iodine, which is often used for the treatment of differentiated thyroid cancer.
- A protein called **thyroglobulin** (abbreviated **Tg**) is used as a marker for whether all of the differentiated thyroid cancer has been successfully removed. Determining the Tg level in your blood by periodic testing will help your doctors determine how well you are doing with your treatment. Some patients produce anti-thyroglobulin anti-bodies **(TgAb),** which are not harmful but which mask the reliability of the Tg value.

Medullary Thyroid Cancer (MTC)

- **Medullary** thyroid cancer (MTC) accounts for about 2 - 3% of all thyroid cancers. It develops in the C cells of the thyroid gland. Medullary thyroid cancer is easier to treat and control if found before it spreads to other parts of the body. Sometimes it spreads before a thyroid nodule is discovered.
- The two types of medullary thyroid cancer are **sporadic** and **familial**.
- **Sporadic** MTC is diagnosed in approximately 80% of all MTC cases and occurs in individuals without an identifiable family history.
- **Familial** MTC may be associated with hypercalcemia and adrenal tumors (i.e., pheochromocytoma).

- **Genetic testing should be done for all people diagnosed with medullary thyroid cancer.** Genetic testing is considered the standard of care and is not a research test. If it is determined that the patient has familial medullary thyroid cancer, the immediate family members should be tested to determine whether there are genetic factors that can predict the development of MTC. The testing focuses on the RET proto-oncogene.
- In individuals with these genetic changes, including infants and children, removal of the thyroid gland before cancer has the chance to develop has a very high probability of being a preventive cure. Nearly 100% of patients who are found to have a mutation (an abnormal sequence in the RET proto-oncogene) will eventually develop MTC. The specific mutation can be used to determine when the thyroid gland should be removed.
- Medullary thyroid cancers usually make calcitonin and carcinoembryonic antigen (CEA), which can be measured by blood tests.
- Medullary thyroid cancer does not have the ability to absorb iodine. Because of this, radioactive iodine treatment should not be used to treat MTC.
- The treatment for MTC is surgery. The long-term prognosis is not as positive as for differentiated thyroid cancer.
- However, in recent years, newer medicines have been tested in clinical trials and show promise for treating medullary thyroid cancer that is progressing.
- Caprelsa® (vandetanib) and Cometriq® (cabozantinib) have been approved by the FDA (U.S. Food and Drug Administration) for selected patients with advanced medullary thyroid cancer.
- Information about treatments and clinical trials for MTC, plus videos with MTC experts, support groups, and the free handbook *Medullary Thyroid Cancer* are available on www.thyca.org

Undifferentiated Thyroid Cancer—Anaplastic Thyroid Cancer (ATC)

- **Anaplastic** thyroid carcinoma (ATC) is the least common type of thyroid cancer. It accounts for only about 1% of all thyroid cancers.
- It is seen more commonly in people over age 60 than in younger people.
- In many people, it is seen together with other forms of thyroid cancer, including differentiated thyroid cancer.
- Anaplastic thyroid cancer is also referred to as *undifferentiated* thyroid cancer. This means that the cells do not look or behave like normal thyroid cells. As a result, these tumors are resistant to radioactive iodine.
- This rarest type of thyroid cancer is difficult to control and treat because it is very aggressive and can spread rapidly within the neck and to other parts of the body.
- Information about treatments and clinical trials for ATC, plus videos with ATC experts, support groups, and the free handbook *Anaplastic Thyroid Cancer* are available on www.thyca.org.

3. Prognosis in Thyroid Cancer

Although a cancer diagnosis of any kind can be scary, the most common forms of differentiated thyroid cancer (papillary and follicular) have a very high long-term survival rate (over 90%), especially when diagnosed early.

While the prognosis for most people with thyroid cancer is very good, the rate of recurrence or persistence can be up to 30%, and recurrences can occur even decades after the initial treatment.

Therefore, it is important that you have regular follow-up examinations to detect whether the cancer has recurred. Health monitoring should continue throughout your lifetime.

4. Thyroid Nodules and Their Evaluation

Symptoms of a Thyroid Nodule

- Thyroid nodules are very common. Most are benign (not cancerous).
- Less than 10% of thyroid nodules in adults are cancerous. In children, 20% to 30% of thyroid nodules are likely to be cancerous.
- Thyroid cancer is usually painless and without symptoms in its early stages.
- Unless there is an obvious neck mass that can be seen, most nodules are detected by chance during a routine physical examination or during a doctor visit for an unrelated purpose.
- Some symptoms that may appear include:
  - Hoarseness that has no known cause and does not go away, or an unexplained chronic cough
  - Difficulty breathing or shortness of breath
  - Difficulty swallowing or an unusual sensation (a "lump") when swallowing
  - Nodule (lump) or growth in the neck
  - An abnormally large lymph node (a "swollen gland") that fails to spontaneously shrink over a few months' time

More about Nodules

Evaluating a Nodule and Diagnosing Cancer

Steps in evaluating a thyroid nodule may include:

- Physical examination. This should include a laryngeal exam (checking the vocal cords).
- History. Among topics to cover are childhood head and neck radiation therapy, exposure to ionizing radiation from fallout in childhood or adolescence, familial thyroid cancer, syndromes in a first-degree relative (such as Cowden's disease or MEN 2), rapid nodule growth, or hoarseness.
- Neck ultrasound
- Thyroid function lab tests—blood tests of TSH
- Fine needle aspiration (FNA) biopsy, often under ultrasound guidance
- Thyroid scan with low-dose radioactive iodine or technetium
- Chest X-ray
- CT (computerized tomography) without iodine contrast—or other imaging techniques
- Calcitonin testing: Not routinely done.
- Other blood testing involving molecular markers, for patients with indeterminate thyroid nodules

Points to keep in mind:

- Your doctor will determine the diagnostic tools to use for you. Don't hesitate to ask questions about the merits of each tool.
- The fine needle aspiration (FNA) is the most reliable way to determine whether a nodule is benign, definitely cancerous, or possibly cancerous. Usually, only nodules 1 centimeter or larger will be evaluated by FNA.
- The FNA cannot always determine whether cancer is definitely present. In this situation, testing for molecular markers is often used to determine whether the nodule is probably cancer. In some situations, the tissue analysis after thyroid surgery is used to determine the diagnosis.

5. Staging Thyroid Cancer, and Risk Levels

Your doctor needs to know the stage of the disease and your risk level to plan your treatment.

The stages are I, II, III, and IV (or use the common numbers 1, 2, 3, and 4). The stage refers to the cancer's size, type, and whether and where it has spread at the time of diagnosis. Your surgery (if you have surgery) and further testing will determine the stage of your cancer.

The reference book *Thyroid Cancer: A Guide for Patients* notes that: "Tumors classified as Stage I or II are typically considered to be 'low risk' tumors with excellent to good prognosis, whereas Stage III or IV tumors are often described as 'high risk,' implying a higher risk of residual disease after initial treatment, or recurrence. Fortunately, the overwhelming majority of patients will fall into Stages I and II and have an excellent prognosis with little risk for recurrence or death from their disease."

Each type of thyroid cancer has its own staging system. Here is a brief overview. Staging is a helpful topic to discuss with your physician. Guidelines from the American Thyroid Association and other professional organizations give further details.

Notes about Staging Systems:

1. **The staging system discussed here applies only to adults with thyroid cancer.** The staging system in pediatric patients has some differences from the staging for adults.
2. **There are many staging systems.** None is perfect or captures all the essential issues that prognosticate for thyroid cancer. Also, the staging systems are static, focusing on only one point in time. They do not reassess the patient 2 years or 12 years after treatment. Because of these limitations, physicians do not rely on staging systems very much.
3. Your risk level is an additional factor that receives consideration.

Differentiated Thyroid Cancer Staging (Papillary, Follicular, and their Variants)

Patients under age 55 years are considered lower risk than patients age 55 years or older. This age was changed in January 2018 from 45 to 55 by the American Joint Commission on Cancer. However, there is no single "cutoff" point for age. A recent article noted that after age 35, thyroid cancer mortality increases with increasing age.

Stage I

- *In patients younger than 55 years of age:* Cancer (any size) is located in the thyroid gland. It may also be present in nearby neck (cervical) lymph nodes and/or nearby neck tissue. However, it has not spread to distant sites.
- *In patients 55 years of age or older:* Cancer is located in the thyroid gland only and is less than 4 centimeters (about 2 inches) in size. It is not in nearby neck tissue or lymph nodes. It has not spread to any distant sites.

Stage II

- *In patients younger than 55 years of age:* Cancer has spread beyond the thyroid and neck area (i.e., there are distrant metastases).
- *In patients 55 years of age or older:* Cancer is either over 4 centimeters (about 2 inches) in size or else is any size and has spread to lymph nodes or into strap muscles in the nearby neck tissue, but has not spread to distant sites.
- *Can*cer is in the thyroid only and is over 4 centimeters (about 2 inches) in size. It has not spread to lymph nodes, nearby neck tissue, or distant sites.

Stage III

- *Patients 55 years of age or younger are Stages I or II only.*
- *In patients 55 years of age or older:* The tumor is any size and cancer has spread to nearby cervical lymph nodes and nearby neck tissue, subcutaneous tissue, larynx, trachea, esophagus, and/or recurrent laryngeal nerve but not to distant sites, or else the tumor s larger than 4 centimeters but has not spread outside the thyroid gland other than minimally to nearby neck tissue but not to distant sites.

Stage IV

- *In patients 55 years of age or older:* Cancer has spread to other parts of the body outside the neck area, such as lungs and bones, or has extensively invaded nearby tissues in the neck (other than nearby neck lymph nodes), including large blood vessels.

Risk Levels in Differentiated Thyroid Cancer

The 2015 American Thyroid Association Guidelines explain risk of a recurrence or of persistent disease in people with differentiated thyroid cancer. Risk level is an important factor in decision-making regarding treatment and follow-up testing.

Briefly:

- **Low Risk** of recurrence or persistent disease means: no cancer in nearby tissue or outside the thyroid bed other than 5 or fewer small involved lymph nodes (under 0.2 centimeters), and cancer that is not one of the variants.
- **Intermediate Risk (Medium Risk)** means some tumor in nearby neck tissue at the time of surgery, more than 5 lymph node metastases 0.2 to 3 centimeters in size, or a tumor that's a variant or has vascular invasion.
- **High Risk** means extensive tumor outside the thyroid, distant metastases, incomplete tumor removal, or a cancerous lymph node over 3 centimeters in size.

Staging Versus Risk Level. The staging determined after the initial diagnosis stays the same. However, the risk level can and often does change over time depending on your cancer's response to the treatment received and the results found during follow-up testing and monitoring. Thus, your risk estimate may be continually modified over time. For example, a patient who is intermediate risk and has an excellent response to treatment may be reclassified as low risk.

Medullary Thyroid Cancer Staging

- **Stage I:** Tumor 2 centimeters or smaller; no disease outside the thyroid gland
- **Stage II:** Tumor is more than 2 centimeters; minimal disease outside the thyroid gland
- **Stage III:** Tumor of any size with some positive lymph nodes
- **Stage IV:** Tumor of any size with metastases outside the neck or with extensive cancer outside the thyroid

Anaplastic Thyroid Cancer Staging

• Any anaplastic thyroid cancer is considered to be Stage IV. It may be Stage IVA (entirely within the thyroid), or Stage IVB (extension outside the thyroid or cervical lymph node metastases, or Stage IVC (distant metastases).

6. Treatments for Thyroid Cancer

Your treatment will be tailored to your own circumstances, including your type of thyroid cancer, whether it has spread to local lymph nodes or distant sites (lung or bone most likely), your age at diagnosis, as well as other factors.

Thyroid cancer treatments include:

- Surgery—usually the first step for treating any thyroid cancer.
- For some people with very small papillary or follicular thyroid cancer, watch and wait may be recommended, with periodic testing to determine whether the cancer has changed in size. Watch and wait is called "active surveillance."
- Radioactive iodine ablation for many people with differentiated thyroid cancer (papillary and follicular).
- Thyroid hormone replacement therapy for anyone who has had their thyroid gland removed (or supplemental therapy for anyone who has had partial removal of the thyroid)
- External beam radiation – for some patients.
- Chemotherapy, including new targeted therapies for some patients, sometimes in a clinical trial.
- There are additional treatment modalities, such as radiofrequency ablation, and percutaneous ethanol (alcohol) injections, for selected circumstances.
- New treatments being studied for advanced thyroid cancer include immunotherapy through drugs called checkpoint inhibitors, and other forms of immunotherapy.
-

Points to keep in mind:

- Treatment aims to remove all or most of the cancer and help prevent the disease from recurring or spreading.
- Treating thyroid cancer often uses two or more of these treatment approaches.
- Discuss your situation and your treatment with your physician so that you understand what is recommended and why.

7. Thyroid Cancer Surgery

Surgery is generally the first and most common treatment for thyroid cancer. Sometimes it is the only treatment.

A surgeon will remove as much of the thyroid cancer as possible through one of the following operations:

- Lobectomy: Removal of the lobe in which thyroid cancer is found. Biopsies of lymph nodes in the area may be done to see if they contain cancer.
- Near-total thyroidectomy: Removal of all but a very small part of the thyroid.
- Total thyroidectomy: Removal of the entire thyroid.
- Lymphadenectomy or neck dissection: Removal of lymph nodes in the neck that contain thyroid cancer. This is generally separated into central lymph node dissection and lateral lymph node dissection.

Points to keep in mind:

- The best outcomes and fewest complications are achieved when surgery is performed by a very experienced thyroid surgeon. For adults, this means a surgeon who does 100 or more thyroid surgeries per year. However, a surgeon who does this many surgeries may not be available to you. A study published in March 2016 concluded that a surgeon needs to do at least 25 surgeries per year to significantly lower complications, compared to fewer surgeries per year.
- When you meet with the surgeon, ask how often he or she performs thyroid surgery, and more specifically how often he or she performs thyroid cancer surgery.
- You doctor may assess your voice before surgery and ask you to describe your voice as well. The ATA guidelines recommend this assessment.
- **The initial surgery is the most important part of your treatment.**

Surgery for Differentiated Thyroid Cancer (Papillary and Follicular)

- Prior to surgery, the American Thyroid Association (ATA) and European Thyroid Association (ETA) Guidelines advise getting a neck ultrasound, in both adults and children, to carefully inspect the lymph node compartments in the lateral and central neck for metastases. Some surgeons also use other imaging such as CT scans.
- Treatment for differentiated thyroid cancer that is over a very small size usually begins with a total thyroidectomy or near-total thyroidectomy. For a smaller papillary tumor or an indeterminate solitary nodule, a lobectomy or else monitoring (watch and wait) may be sufficient.
- In addition, at surgery the surgeon normally inspects the neck for enlarged lymph nodes.
- The surgeon may alter the extent of the initial surgery, depending on the tumor size and whether or not there are lymph node metastases and/or tumor in nearby neck tissues. Tumor in the soft tissues of the neck can usually be removed without injuring neck muscles or the recurrent laryngeal nerve, which powers the vocal cords.
- The surgeon removes abnormal-appearing or biopsy-proven metastatic lymph nodes. Both the ATA and ETA Guidelines suggest total removal of entire groups of lymph nodes within one or another neck compartment if at least one malignant lymph node is found.
- Some surgeons prophylactically remove all the lymph nodes in the central neck when the patient has a very aggressive tumor.

Surgery for Medullary Thyroid Cancer

- Surgery to remove the thyroid gland is the treatment of choice for medullary thyroid cancer.
- The surgeon removes lymph nodes in the neck in almost all people with medullary thyroid cancer when the diagnosis is made preoperatively.
- Treatment options for MTC are further discussed in the Medullary Thyroid Cancer Handbook and Site: www.thyca.org/mtc/

Surgery for Anaplastic Thyroid Cancer

- Surgery is done in some people with anaplastic thyroid cancer.
- Treatment options for ATC are further discussed in the Anaplastic Thyroid Cancer Handbook and Site: www.thyca.org/atc/

After Surgery— Possible Risks

The more experienced a surgeon is at performing thyroid surgery, the lower the risk of complications. However, complications can occur even for the most experienced surgeon.

Some Risks:

- Temporary or permanent hoarseness or loss of voice, resulting from damage to the laryngeal nerve, a nerve that is located next to the thyroid gland.
  - A change in the voice quality is usually temporary. In rare cases it is permanent.
  - A number of corrective measures are possible if the nerve is damaged.
  - If both nerves are injured, some patients will have breathing problems and require a tracheotomy, although this is rare.
- Low calcium levels in the blood due to damage to the parathyroid glands.
  - There are 4 parathyroid glands that are located on the back portion of the thyroid gland. During thyroidectomy, the surgeon will carefully locate the glands and try to leave them in place without damaging them.
  - Symptoms of low calcium levels are muscle spasms as well as tingling and numbness, especially in your hands or feet. Damage to the parathyroid glands results in a condition called hypoparathyroidism.
  - Decreased function of the parathyroid glands (hypoparathyroidism) is treated with calcium and a special form of vitamin D called calcitriol.
  - Most frequently, the condition is temporary (transient) and treatment with calcium and calcitriol is often only needed for a period of 2 to 4 weeks.
  - However, in a small percentage of patients, surgery can result in lifelong hypoparathyroidism and the lifelong need

for calcium and calcitriol replacement. The U.S. Food and Drug Administration (FDA) has approved Natpara® (parathyroid hormone) for patients who cannot be well controlled on calcium supplements and vitamin D alone.

- Infection. This is a very rare complication. It is treated with antibiotics.
- Bleeding. This is rare and is controlled at the time of the operation or afterward.
- As with all surgical procedures, it is ideal to find a surgeon who specializes in this area to help reduce the risks and ensure the best outcome.

Recovery from Surgery

- Most thyroid surgery requires only one night's stay in the hospital.
- Your doctor will give you instructions for care of your incision, as well as what activities are appropriate and when you can resume your normal activities.
- Your doctor will also give instructions for when you should call. You should be given the time and date of your post-surgery appointment before you leave the hospital.
- Pillows in the hospital, during your ride home, and at home will aid your comfort.
- Rest, good nutrition, enough fluids, and brief walking times will also aid your recovery.
- For more information about surgery, visit www.thyca.org. Also, the reference book *Thyroid Cancer: A Guide for Patients,* has chapters by two thyroid surgeons on thyroid surgery and re-operative thyroid surgery.
- ThyCa's free support groups and one-to-one support are helpful resources for discussing experiences and tips for coping before and after your surgery. Support is available both one-to-one and in groups —in person, by phone, and online.

8. How the Stage and Risk Level Affect the Treatment of Papillary, Follicular, or Variants

The treatment your doctor will recommend depends on the stage of differentiated thyroid cancer and your level of risk for recurrent or persistent disease. Stage I and II are usually low risk, while Stage III and IV are usually intermediate and high risk.

The treatment recommended for you may differ from the general statements below, for reasons related to your individual circumstances. For example, for papillary microcarcinomas (under 1 centimeter), one option being studied is active surveillance (watch and wait, with periodic testing), rather than surgery.

It is very important to discuss your individual treatment plan with your doctor.

Low Risk

- In some patients, watch and wait may be recommended rather than surgery.
- Surgical removal via a lobectomy or near-total/total thyroidectomy,
- A central compartment neck dissection may also be done. This means surgical removal of lymph nodes next to the thyroid.
- In the lowest-risk patients, surgery may be the only treatment. The cure rate for lowest-risk patients with only surgery is excellent.
- Some patients receive radioactive iodine (RAI) treatment after the thyroidectomy. Many patients do not receive radioactive iodine. The patient's age and other factors affect the decision about RAI.
- Your doctor will prescribe thyroid hormone replacement therapy if you have a thyroidectomy, with a dosage appropriate for a low-risk patient. See Section 10.

Intermediate Risk

- Surgical removal is usually a near-total/total thyroidectomy, plus a central compartment neck dissection (surgical removal of lymph nodes next to the thyroid). If the cancer has spread to other lymph nodes in the neck, a modified radical neck dissection is often done. This is a more extensive surgical removal of lymph nodes from the neck.
- Radioactive iodine treatment is generally given to eliminate any remaining thyroid tissue after surgery and to treat any undetectable cancer remaining in the neck.

- Your doctor will prescribe thyroid hormone replacement therapy if you have a thyroidectomy, with a dosage appropriate for an intermediate-risk patient. See Section 10.
- As noted above, your risk level may change over time, based on your response to treatment. When the response to treatment is excellent, your risk level may change to low.

High Risk

- Surgical removal is usually a near-total/total thyroidectomy, plus a central compartment neck dissection (surgical removal of lymph nodes next to the thyroid) and possibly a modified radical neck dissection.
- Radioactive iodine treatment is usually given.
- Your doctor will prescribe thyroid hormone replacement therapy if you have a thyroidectomy, with a dosage appropriate for a high-risk patient. See Section 10.
- Some patients may receive external beam radiation.
- Some patients may receive chemotherapy for metastatic differentiated thyroid cancer that is progressing and does not take up radioactive iodine. The drug may be Lenvima® or Nexavar®, which have been approved for use in the United States and many other countries, or else another drug in a clinical trial.
- As noted above, your risk level may change over time, based on your response to treatment.

Treatment of Recurrent or Persistent Papillary, Follicular, or Variants

- If papillary or follicular thyroid cancer remains or comes back as shown by testing 6 months to a year after the initial treatment, the treatment generally depends on where the cancer is, as well as its size and extent.
- Surgery is usually the first choice if the cancer appears to be removable by surgery.
- Radioactive iodine treatment may also be used, either alone or with surgery.
- If the cancer does not show on a radioactive iodine scan but is found by other imaging tests such as an MRI or PET scan, external beam radiation may be warranted.
- Other treatment approaches include ethanol ablation, stereotactic radiation, and thermal ablation (radiofrequency ablation and cryoablation).

- Lenvima® (lenvatinib) and Nexavar® (sorafenib) have been approved by the FDA (U.S. Food and Drug Administration) and in some other countries for selected patients with advanced progressing differentiated thyroid cancer (papillary, follicular, variants) that is not responsive to radioactive iodine.
- Chemotherapy or an immunotherapy approach in a clinical trial may be tried if the cancer has spread to several places and does not take up radioactive iodine (this happens for some patients, and the cells are called non-iodine avid or simply non-avid).

9. Radioactive Iodine Ablation Treatment for Differentiated Thyroid Cancer

You may receive radioactive iodine (also known as radioiodine, I-131 or RAI) some weeks after surgery to eliminate (ablate) any remaining papillary or follicular thyroid cancer cells or normal thyroid tissue that the surgeon could not remove. Ablation also aims to eliminate any thyroid cancer cells that may have spread to other parts of the body.

Eliminating the remnant of normal thyroid tissue will make it easier to do the ongoing monitoring for any possible recurrence. RAI ablation has also been shown to improve survival rates if the cancer has spread to the neck or other parts of the body.

Whether or not RAI is recommended depends upon certain factors involved in your tumor staging and risk level. Your doctor will discuss the benefits and risks with you. RAI is usually not recommended for low-risk patients (see the section on Staging).

If RAI is part of your treatment, you will probably receive it between 3 and 6 weeks after your surgery. You will swallow the RAI in the form of either one or more capsules (pills) or a liquid.

RAI works because the thyroid gland needs iodine and absorbs it from the bloodstream. When you swallow the RAI (the isotope I-131), it goes through your bloodstream to your thyroid tissue. The radiation destroys thyroid cells, both cancerous and normal thyroid cells, with minimal effects on the rest of your body.

The dosage of I-131 is measured in millicuries. The dose for remnant ablation may range from 30 millicuries to 100 millicuries. Sometimes the dose is higher (100 to 200 millicuries) for people with more extensive disease. Very rarely, the dose may be larger still.

It is also worth noting that RAI is usually safe in patients allergic to seafood or X-ray contrast dyes, both because the allergy generally results from the protein or compound containing iodine, not iodine itself, and also because the amount of iodine in RAI is very small compared to iodine in other sources.

Preparation for RAI

Raising Your TSH Level

Your TSH level (thyroid-stimulating hormone, or thyrotropin) must be well above the normal range for RAI treatment to be the most effective. This is because TSH stimulates the thyroid tissue, both normal and cancerous, to take up iodine, including the RAI.

Another reason to increase your TSH level is that thyroid cancer cells do not take up iodine as well as normal thyroid cells do. Increasing your TSH level before your RAI treatment helps the cancer cells better absorb the RAI.

There are two ways to increase your TSH level. The two ways are equally effective. Your doctor may have reasons for recommending one option over the other, related to your situation.

1. **Withdrawal from Thyroid Hormone Replacement:** You stop taking thyroid hormone replacement pills for a period of 3 to 6 weeks before your RAI. Stopping the pills will cause your TSH to rise to a level of 30 or higher, far above the upper end of the normal range. You will be significantly hypothyroid. You will probably feel symptoms of hypothyroidism.
   OR
2. **Thyrogen® Injections:** Thyrogen® is the brand name of thyrotropin alfa (rhTSH), recombinant human TSH. Receiving injections of this drug a few days prior to ablation raises your TSH level rapidly. Therefore, you do not experience weeks of hypothyroidism.

What It May Feel Like To Be Hypothyroid During Withdrawal from Thyroid Hormone Replacement

Although the hypothyroid state resulting from option 1 (withdrawal) is temporary, lasting a few weeks, it can cause one or more symptoms. These can include tiredness, weight gain, sleepiness, constipation, muscle aches, reduced concentration, emotional changes resembling depression, and others. Some people experience mild symptoms. Other people experience severe symptoms.

During withdrawal from thyroid hormone, to reduce symptoms of hypothyroidism, your doctor may prescribe a short-acting thyroid hormone called Cytomel™ (T3) for a few weeks. You will be required to stop taking it for about 2 weeks before receiving RAI to make sure your TSH level is high enough for the RAI treatment.

As noted above, both methods of increasing TSH have shown comparable success rates for remnant ablation. As a result, Thyrogen® is increasingly used so that patients avoid experiencing hypothyroidism.

Dental Care Before RAI
Many doctors recommend a dental cleaning before RAI.

Pre-Treatment Scan: A Step for Some People
At some centers, for some patients, another step in preparing for RAI is a whole-body radioiodine scan.

- The goal of this scan is to determine the extent of any remaining thyroid tissue or thyroid cancer that needs to be destroyed.
- The results of this scan are used to help your doctor determine the appropriate ablation dosage of radioactive iodine to administer in the treatment process.
- For this scan, you will swallow a very small dose of radioiodine, either I-131 or another form, I-123.

Pre-Treatment Ultrasound: A Step for Some People
For some patients, an ultrasound may be done when preparing for RAI, to help your doctor determine the appropriate dosage.

The Low-Iodine Diet
The short-term low-iodine diet is another part of preparing to receive radioactive iodine for papillary or follicular thyroid cancer or one of their variants. The diet, recommended by the American Thyroid Association, increases the effectiveness of the radioactive iodine treatment.

- This diet lasts for about 1 to 2 weeks before your radioiodine, and for about 1 – 2 days afterward.
- This diet reduces your consumption of regular iodine so that when the radioactive iodine is given for treatment, any remaining thyroid cells, including thyroid cancer cells, will be "hungry" for iodine. These cells will then more readily absorb the radioactive iodine, which will eventually destroy them.
- A low-iodine diet has less than 50 micrograms of iodine per day. It is low in iodine, not "no-iodine." Iodine is not related to sodium, so this diet is different from a "low-sodium" diet. The normal recommended daily allowance for iodine is 150 micrograms per day. Most people in the United States consume much more than 150 micrograms daily.
- The foods and beverages you consume will have small amounts of iodine that total less than 50 micrograms each day.
- There are slight variations in guidelines from different doctors. The ThyCa diet and guidelines have received input and review by numerous thyroid cancer specialists.

Brief Overview
See www.thyca.org and the Free ThyCa *Low-Iodine Cookbook* for details, over 420 recipes, and easy snacks and meal tips.

Not Allowed—Avoid These Foods and Ingredients
- Iodized salt, sea salt, and any foods containing iodized salt and sea salt
- Seafood and sea products, including carrageenan, agar-agar, algin, alginate, and nori

- Dairy products
- Egg yolks or whole eggs or foods with whole eggs
- Bakery products with iodine/iodate dough conditioners or high-iodine ingredients. Low-iodine items are fine.
- Red Dye #3, erythrosine (or E127 in Europe)
- Most chocolate (due to milk content). Cocoa powder and some dark chocolates are allowed
- Soybeans and soybean products (however, soy oil is allowed)
- Iodine-containing vitamins and food supplements
- If you take a medication containing iodine or red dye #3, check with your physician.

Allowed Foods and Ingredients

- Fresh fruits and vegetables, unsalted nuts and nut butters, whites of eggs, fresh meats (provided no broth injected) with some diets limiting intake to 6 ounces a day, grains and cereal products without high-iodine ingredients (some diets limit to 4 servings a day), pasta without high-iodine ingredients
- Sugar, jelly, jam, honey, maple syrup, black pepper, fresh or dried herbs and spices, all vegetable oils (including soy oil),
- Sodas (except with Red Dye #3 or E127 in Europe), cola, diet cola, non-instant coffee, non-instant tea, beer, wine, other alcoholic beverages, lemonade, fruit juices

- **Read the ingredient list on all packaged foods. Check with your physician about any medications you are taking.**

Note that sodium is not an issue. What is to be avoided is the added iodine found in iodized salt, which is widely used, especially in processed foods.

It's preferable to avoid processed foods while on the diet, if possible, because food manufacturers are not required to list the iodine content. Therefore, if salt is a listed ingredient, you have no way of knowing whether it's iodized or non-iodized. This does not apply to foods that naturally contain sodium without salt as an ingredient.

There are many foods you can eat while on the low-iodine diet. It is a good idea to cook meals yourself, using fresh ingredients, including fruits, vegetables, and unprocessed meats.

- Detailed information, tips, meal ideas, and snack ideas are on www.thyca.org.
- You are also welcome to download the **FREE Low-Iodine Cookbook** on www.thyca.org. It has over 420 recipes from over 200 thyroid cancer survivors and caregivers.

Shortly Before You Receive Your RAI

Some doctors routinely prescribe anti-nausea medication before you receive the RAI. This is because some people experience nausea the first day after receiving I-131 therapy. You also may request anti-nausea medication if it is not given routinely.

After Your RAI — In Hospital or At Home

After you receive your RAI treatment dose, you may be sent home immediately, or you may stay in the hospital for one or more days, depending on factors such as the dose you receive.

In some centers, patients stay for a few hours after receiving RAI and then go home later in the same day.

Your center may give you written information about its guidelines for release. Your home circumstances, such as whether there is an infant or a young child at home, may affect the decision about going home or staying in the hospital for a day or more after your treatment dose.

The RAI that is not taken up by the remaining thyroid tissue is eliminated from the body through your perspiration, saliva, feces, and urine. Most radiation from the RAI is gone in about one week.

The First Day

Ask your doctor about ways to protect your salivary glands, which also absorb the RAI. Ways include sucking on sugar-free lemon candy or eating certain foods. Your doctor will have instructions on what to do, and when to do it. Ask also about how much fluid to drink.

Research is under way on these topics. ThyCa's web site will add information as it becomes available from our medical advisors.

In the Days After RAI

Tips and Precautions

Below are tips and precautions to take during and after the RAI ablation treatment to help protect yourself, your family members, your co-workers, and other people from being unnecessarily exposed to the radiation.

The precautions listed below are for the days after your RAI. More guidelines and tips are on www.thyca.org, given to ThyCa by our medical advisors, and in guidelines from the American Thyroid Association and in the reference book *Thyroid Cancer: A Guide for Patients*.

Please note that your physician and hospital may have different guidelines. Discuss any questions and concerns with your doctor.

While You Are Isolated in the Hospital or at Home

- You will remain in your hospital room with the door closed until you are released from isolation by the radiation safety officer.
- If you are on medication, please let your doctor know. You will probably start taking your thyroid hormone pills one to two days after your RAI.
- You will likely remain on the low-iodine diet. If you're in the hospital, consider bringing some low-iodine foods such as fruit and unsalted nuts, in case the hospital meals include some high-iodine foods. The hospital may not have any choices. You may be able to order kosher, vegetarian, or diabetic diets. The dishes and eating utensils will stay in the room with you, probably to be placed in plastic bags provided.
- You may want to bring some reading materials such as newspapers or magazines that can be left behind. The hospital room will probably have a television.
- You may bring your eyeglasses, contact lenses, or personal medically-related equipment. Do not bring items such as a laptop computer, because it may become contaminated and have to stay in the hospital for pick up at a later date.
- **Being isolated after RAI may feel lonely and emotionally difficult, although it should not be physically painful**.

- It is helpful to prepare for the experience. We encourage you to use the telephone to communicate with your friends and family.
- Your nurse will check in with you frequently by telephone or intercom to assess how you are doing.
- To avoid any contamination of your own clothes by perspiration please wear a hospital gown and slippers during your hospital stay.
- You may be given instructions on fluid intake.
- You may be advised to take laxatives in order to reduce the amount of radiation exposure to your intestinal tract.
- You may be asked to shower and wash your hair frequently to help remove the radiation excreted through perspiration.

Traveling Home, and When at Home

Use the following guidelines regarding distance, time, and hygiene:

- Stay at least 3 feet away (about 1 meter) from everyone except for short periods totaling less than 1 hour each day, for approximately the first 5 days. Stay at least 6 feet away most of the time. Stay this distance from small children or pregnant women for 8 days. Keep your distance from pets as well. Do not kiss anyone.
- Your doctor should give you more specific guidelines on how long to avoid close contact. The number of days will depend on whether you have small children at home, pregnant women at your workplace, and other factors.
- Do not sit next to someone in an automobile or public transportation for more than one hour. Sit in the back seat of an automobile, on the opposite side from the driver, if possible.
- Sleep in a separate room, or at least 6 feet away from any other person. Use separate bath linen and launder these and underclothing separately for one week.
- Use separate eating utensils or disposable eating utensils. Wash eating utensils separately for one week. Do not prepare food for others.
- Rinse the sink and tub thoroughly after using them. Shower every day.
- Wash your hands with soap and plenty of water every time you use the toilet. Flush the toilet each time you use it, and wash the toilet seat. Males should sit when urinating to avoid

splashing urine for one week.
- Discuss with your doctor how long you should wait before starting a pregnancy after your treatment (usually at least two months for males and 6 to 12 months for females).
- If you are breastfeeding, it should be discontinued before receiving RAI, and should not be resumed. However, breastfeeding can be done after subsequent childbirths.
- If you need to travel by plane or other transportation after receiving RAI, carry an information card or letter of explanation from your doctor. This is because radiation detection devices used at locations such as airports, bus and train stations, trash collection sites, and some international borders and in some buildings may detect low radiation levels. Carry the card or letter with you for at least 3 months after receiving RAI.
- Visit www.thyca.org for more information.

Your Home Dental Care After RAI

- Follow-up care after RAI is important to neutralize the changed acidity of your saliva.
- Upon noticing any change in taste or saliva, stop using commercial toothpastes and mouthwashes and change to ultra-soft toothpastes and mouthwashes without alcohol, phenol, or whitening agents.
- A good alternative to commercial products is baking soda for use as a scrubbing agent and baking soda mixed with water as mouthwash—to be used 4-5 times daily. For mouthwash, mix one heaping teaspoon of baking soda with 10 ounces of water.
- It is important to floss daily.

Post-Therapy Scan

Between 2 and 10 days after your RAI treatment, you will have a whole body scan (WBS), also known as an I-131 scan. You will have this scan in the nuclear medicine department of the hospital or community radiology center.

- This scan usually takes between 30 minutes and one hour.
- You will be fully clothed. You will lie still on a narrow bed that moves slowly through the scanner, or else the scanner will move over you while the bed remains still.

- In some centers, a nuclear medicine doctor meets with you after the scan. Or, you may receive the results from your family doctor or endocrinologist at a later meeting or on the telephone.
- In nearly everyone (98% of people) the scan will show a small amount of thyroid tissue, because it is difficult for surgeons to remove every tiny bit of the thyroid. The nuclear medicine report may refer to this as "normal uptake in the neck." The scan will also show uptake in your salivary glands and digestive tract.
- This scan will also provide information about whether and where there is any remaining thyroid cancer.

The Months After RAI

Within 3 weeks, only traces of RAI remain in your body. However, it may take several months for the RAI to have its full effects on any remaining thyroid tissue, both cancerous and non-cancerous. This is because the radiation affects the cells gradually.

Potential Side Effects of RAI Treatment

Side effects of the RAI treatment may include:

- A burning sensation or tenderness in the neck area
- Nausea and upset stomach (and rarely, vomiting)
- Swelling and tenderness of the salivary glands
- Taste changes (usually temporary)
- Dry mouth
- Reduction in tear production

If pain, tenderness, or nausea occur, they will usually happen soon and be short-term. However, sometimes the other side effects last longer or will not occur until several months after the treatment.

- **RAI treatment often causes a slightly metallic taste** in the mouth, even when not eating, or changes the way certain foods taste. Taste changes usually disappear gradually. However, some people experience them for several months. Others report that the taste changes disappear and then recur several weeks later.

Tips for Coping with Some Side Effects of RAI

Speak with your doctor for recommendations on these topics.

- **Tenderness in your neck area** can generally be treated with over-the-counter pain relievers.
- **Dry mouth sometimes occurs.** If symptoms persist, ask your doctor about products that help ease the problem, such as gels and sprays. In some people, especially after higher RAI doses, the impact on salivary glands, and hence the dry mouth, can be permanent. This can increase the risk of tooth decay. Therefore, it is important that you visit your dentist regularly.
- If you experience **dry eyes or reduced tear formation**, discuss this with your doctor. If you wear contact lenses, ask your doctor how long you should stop wearing them.
- **Rarely, salivary glands and/or tear ducts may swell** and become blocked. If this occurs, you should tell your doctor immediately to learn what will help.

Other Potential Side Effects of RAI

- **Temporary or permanent decreases in blood cell counts** can also occur. You will probably not experience symptoms. Counts usually recover, at least to the normal range, if not to their full pre-treatment level. Blood tests can be done several weeks after RAI to make sure that your blood counts are in the normal range.
- Any person receiving RAI treatment may have a slightly higher risk of developing certain other cancers in the future. Doctors generally agree that the risk increases after several doses totaling 500-600 millicuries rather than after a single dose.
- **Special concerns for men**. Men who receive large cumulative doses of RAI may have lower sperm counts or, rarely, become infertile. Discuss banking sperm with your doctor if it is likely that your treatment plan may include more than one dose of RAI.
- **Special concerns for women**. Some women may have irregular periods for up to a year after treatment. The ATA guidelines recommend that women avoid becoming pregnant for at least 6 months to a year after treatment.
- **If you are pregnant when diagnosed.** If you are pregnant when diagnosed with thyroid cancer, your doctor will have specific instructions related to your pregnancy. A woman who is pregnant or breastfeeding should never receive RAI in any form (I-123 or I-131). Most pregnant women can postpone surgery until after pregnancy. If surgery is necessary sooner, it is usually performed in the second trimester (22 weeks of pregnancy). Also, pregnant women should not be treated with external beam radiation or chemotherapy until after the baby is born.

You should always discuss your individual circumstances and risks factors with your doctor.

10. Medication: Thyroid Hormone Replacement Therapy

If your thyroid was removed surgically, you will receive thyroid hormone replacement therapy (levothyroxine – T4) for the rest of your life.

- **If you have medullary or anaplastic thyroid cancer,** you will receive a dose to keep your thyroid stimulating hormone (TSH) within the normal range.

- **If you have papillary, follicular, Hurthle cell, or one of their variants,** your dose of thyroid hormone replacement will be set for a target TSH level tailored to your individual risk of persistent or recurrent disease. Your doctor will order blood tests periodically to ensure that you are on the proper dose of thyroid hormone replacement.
  - **Low-Risk Patients:** The 2015 American Thyroid Association Guidelines recommend that the goal for your initial TSH level usually be 0.5 to 2.0 mU/L, which is within the normal range. For some patients, the goal is 0.1 to 0.5 mU/L, which is just below or near the low end of the normal range. This lower TSH goal may change over time to 0.5 to 2.0 mU/L, based on response to treatment.
  - In**termediate-Risk Patients:** The initial TSH goal is 0.1 to 0.5 mU/L. This goal may change to a level within the normal range if you have an excellent response to treatment.
  - **High-Risk** Patients: The dose will be high enough to suppress the thyroid stimulating hormone (TSH) below the range that is normal for someone not diagnosed with thyroid cancer. The goal is to prevent the growth of cancer cells while providing essential thyroid hormone to the body. At first, your TSH will probably be suppressed to below 0.1 mU/L. The level may later change to 0.1 to 0.5, depending on your body's response to the treatment.
  - ThyCa's web site www.thyca.org has more information on this topic. The American Thyroid Association's Guidelines for Differentiated Thyroid Cancer, issued in 2015, give specific recommendations. These guidelines are available

to download free on www.thyca.org or on request from ThyCa.

- An American Thyroid Association flyer notes that in some patients who do not feel completely normal on T4 (levothyroxine) alone, a combination of T4 with a small amount of T3 (triiodothyronine) for a trial period of 3 – 6 months "is reasonable to determine if combination T4 and T3 therapy will help." (thyroid.org/thyroid-hormone-treatment) Cytomel is the brand name for T3.
-

Know Your Pills

- **Wherever you obtain your prescriptions, always double check your pills when you receive them** to be sure that you are getting what your doctor prescribed. Do this for all of your prescriptions, not just levothyroxine.
- Levothyroxine is the pharmaceutical name for synthetic thyroid hormone prescribed for people who have been treated for thyroid cancer. Several brand-name synthetic levothyroxine preparations are currently available. Although all of these medications are synthetic levothyroxine, they are not identical. The manufacturing processes differ, as do the fillers and dyes. These differences may affect the absorption of the drug.
- For this reason, thyroid cancer specialist physicians recommend that thyroid cancer patients consistently take levothyroxine from the same manufacturer. If you need to change manufacturers for some reason, you should have your thyroid levels checked 6-8 weeks later, because your TSH may have changed and no longer be at the level recommended by your physician.
- Another point to remember is that levothyroxine is temperature-sensitive, especially if above room temperature. Picking up pills at a local pharmacy helps avoid temperature extremes.
- **Store your levothyroxine pills away from heat, humidity, and light.** When the weather is warm or sunny, don't leave them in a parked car, because it can become too hot. When traveling, keep your pills from becoming exposed to heat.

- Take your levothyroxine every day at the same time, under similar circumstances. Most people take their pill first thing in the morning. It is best to take it with a full glass of water, an hour before eating anything or drinking any other beverage. This will ensure proper absorption, because food, minerals, vitamins, and other medications can interfere with absorption.
- After taking your levothyroxine, it is also recommended that you wait about 4 hours before taking any calcium supplements and/or vitamins containing iron. Other medications may interfere with the absorption of levothyroxine—check with your doctor or pharmacist.
- Read the information provided by your pharmacist and tell your physician if you experience any of the symptoms noted on the bottle.
- Following your thyroidectomy it may take one or more dosage changes to find the dosage level that is correct for you.

For more information, visit the Know Your Pills page of www.thyca.org or ask us for a free handout.

In addition, a video with a thyroid cancer expert on ThyCa's YouTube Channel explains thyroid hormone replacement research, including research on T4 (levothyroxine), T3 (triiodothyronine), and NDT (natural desiccated thyroid). https://www.youtube.com/watch?v=yEhPYOkvj7M

11. Understanding Your Blood Tests

During the first year after your treatment, your physician may order blood tests several times to make sure you are on the right dosage of thyroid hormone replacement.

Blood testing also helps monitor for persistent or recurrent cancer.

After the first year, your doctor may order blood tests less often.

Among events that may affect your dosage of thyroid hormone replacement are weight gain or loss, pregnancy, and menopause. However, you will generally be on the same dosage for long periods of time.

Differentiated Thyroid Cancer.

There are three main blood tests:

- **Thyroid Stimulating Hormone (TSH).** See the section above on thyroid hormone replacement therapy.
- **Thyroglobulin (Tg):** Thyroglobulin is a protein produced by thyroid cells (both normal and cancerous cells). After removal of the thyroid gland, Thyroglobulin can be used as a "cancer marker." Its number should be as low as possible. Sometimes this is termed "undetectable." After your surgery and RAI, it may take months or years for the Tg number to come down to zero or undetectable.

  A positive Tg test indicates that thyroid cells, either normal or cancerous, are still present in your body. Depending on the level of Tg in your blood, your doctor may want to monitor you more closely with other tests or scans and/or prescribe additional treatment.

  If you did not receive RAI, your Tg level will probably be detectable. This is because some remnant thyroid tissue nearly always remains in your neck after surgery. If you had a lobectomy rather than a thyroidectomy, your remaining lobe will almost certainly produce Tg. However, it is still helpful to follow your Tg levels over time. If Tg levels increase, your

doctor may recommend further imaging studies to locate the source.

From time to time, your doctor may recommend what is called a "stimulated Tg" measurement. This means that your TSH is elevated, by withdrawal from thyroid hormone or by receiving injections of the drug Thyrogen, and then your Tg is measured. Thyroglobulin testing can be more accurate when your TSH level is elevated.

- **Anti-thyroglobulin anti-bodies (TgAb):** Some people produce anti-thyrogloblin antibodies. These are not harmful. However, they mask the reliability of the Tg value. If you have TgAb, imaging studies may be used to monitor for persistent or recurrent disease. Sometimes the antibodies disappear over time, although not always.

In addition to these tests described above, some doctors will also recommend the measurement of Free T4. If so, discuss this with your doctor.

Medullary Thyroid Cancer

For people with medullary thyroid cancer, regular blood tests will measure calcitonin and CEA levels and any changes over time.

Anaplastic Thyroid Cancer

For people with anaplastic thyroid cancer who have had their thyroid gland removed, the blood testing for TSH is to monitor that the TSH is in the normal range.

If You Have Hypoparathyroidism

If you experienced parathyroid loss or damage during your thyroid surgery, maintaining proper calcium levels will be an ongoing concern. You will have your blood calcium levels monitored, and will receive further instructions.

12. External Beam Radiation

External beam radiation is sometimes given:

- As an added treatment in addition to the primary treatment, or
- As a curative treatment when the cancer cannot be removed by surgery, or
- As a palliative approach to relieve symptoms and improve quality of life.

It is most often used for cancer that returns after initial treatments, especially if there is evidence that the cancer cells do not take up radioactive iodine, or to treat bone metastases from cancer that has spread.

More about External Beam Radiation Therapy:

- External beam radiation therapy uses high-energy rays to destroy cancer cells. A machine directs a carefully focused beam of radiation at the cancer.
- This therapy usually involves treatments 5 days a week for about 6 weeks.
- Each treatment takes only a few minutes. The set-up time takes longer, because precision is required to direct the beam of radiation to the appropriate area.
- The side effects depend mainly on how much radiation is given and which part of your body is treated. The radiation can destroy nearby normal tissue as well.
- Radiation to the neck may cause a dry, sore mouth and throat, hoarseness, and/or trouble swallowing. Many patients will have skin irritation similar to a sunburn – the skin in the treated area may become red, dry, and tender.
- Fatigue, especially in the later weeks of treatment, is also a common side effect.
- The side effects usually go away after the treatment ends.

13. Chemotherapy, Including Targeted Therapies and Immunotherapy

Chemotherapy is used for advanced differentiated thyroid cancer that no longer responds to other treatments, as well as for anaplastic thyroid cancer and medullary thyroid cancer.

Some newer forms of chemotherapy are called targeted therapies. Immunotherapy through the use of checkpoint inhibitors and other forms of immunotherapy is also being studied.

- Chemotherapy involves the use of drugs to destroy cancer cells or to stop the pathways or mechanisms that allow them to grow and divide.
- These drugs act in a systemic fashion. This means that they enter the bloodstream and are circulated throughout the body, reaching cancer cells or pathways to cancer, wherever they may be.
- Some treatments slow disease progression, while others stop it, reduce it, or eliminate it completely.
- Chemotherapy drugs are given by injection into a vein, by injection into a muscle, or as a pill.
- Chemotherapy may be received in an outpatient clinic, in the hospital, at the doctor's office, or at home. Some people may need to stay in the hospital following treatment.
- During treatment you will be monitored for side effects and to determine the result of the chemotherapy. Your dose may be adjusted during your treatment.
- Side effects depend mainly on which drugs are given, and the dose. Your doctor can suggest ways to prevent or control many of these side effects.
- Most side effects go away or reduce after the treatment ends.
- Side effects may include fatigue, increased chance of infections due to low blood counts, loss of appetite, mouth sores or other sores or rash, changes in bowel habits, nausea, neuropathy, and others.
- Specific chemotherapy drugs may have other specific side effects that require monitoring.
- The length of treatment varies, depending on the drug and how effective it has been for a particular person. Some people receive a maintenance dose of a drug on a long-term basis.

- Lenvima® (lenvatinib) and Nexavar® (sorafenib) have been approved by the FDA (U.S. Food and Drug Administration) and in some other countries for selected patients with advanced progressing differentiated thyroid cancer (papillary, follicular, variants) that is not responsive to radioactive iodine.
- Caprelsa® (vandetanib) and Cometriq® (cabozantinib) have been approved by the FDA (U.S. Food and Drug Administration) for selected patients with advanced medullary thyroid cancer.
- Immunotherapy through the use of checkpoint inhibitors and other forms of immunotherapy is also being studied.

14. Clinical Trials

If conventional treatments are not successful, you might discuss participating in a clinical trial with your doctor.

- A clinical trial is a research study where physicians try treatment that has theoretical promise, but has not been proven to work. During clinical trials physicians systematically collect information to find out whether the treatment works.
- Making the decision about participation is not easy. On the one hand, it offers hope of increased longevity or a cure. Clinical trials also result in knowledge that might help others. On the other hand, clinical trials often involve drug side effects, and travel and expense. These can reduce a person's quality of life.
- This is a personal decision best reached by consideration and discussion with your doctors, family, and friends.
- Clinical trials take place in many different locations—in cancer centers, other major medical centers, community hospitals and clinics, physicians' offices and veterans' and military hospitals.
- Clinical trials usually involve travel to one or more research centers funded for the trial. The cost of the trial itself is usually free, but physician care fees, medical tests, travel, and lodging are not usually covered. However, there are often hotels with special patient/caregiver rates. Some areas have special residences that are supported by charitable donations and that may ask for a small fee from the patient.

- **More Information:** You will find more information about clinical trials in the Clinical Trials section of ThyCa's web site www.thyca.org. Included are links to the National Cancer Institute Clinical Trials Web page, plus helpful tips from ThyCa volunteers who have participated in clinical trials.

15. Long-Term Monitoring

After your treatment, you will receive life-long monitoring. This is for two main reasons.

- First, long-term monitoring is important to make sure that your dose of thyroid hormone replacement is appropriate—neither too low nor too high for your specific needs.
- Second, you will receive testing to find out if there is persistent disease or possible recurrence. Many people with differentiated thyroid cancer experience persistent disease or a recurrence, sometimes many years after the initial treatment. The prognosis for any person with a recurrence is better if it is discovered early. This is why life-long monitoring is important.
- The exact type of monitoring, and how often it takes place, depends on the size of the original tumor and whether the cancer had spread locally or distantly, as well as other factors.
- People free of disease receive less monitoring or testing than those with evidence of persistent disease.
- Also, testing is spread out and becomes less frequent when the patient becomes free of disease. You and your doctor should discuss a plan to fit your situation.

Monitoring will most likely include:

- **Physical neck examination,** including feeling the thyroid bed area. Typically, this is done every 3 to 6 months for the first 2 years, and at least once a year thereafter.
- **Blood tests.** Certain blood tests will determine if you are on the right dosage of thyroid hormone replacement. Your medication dose may change over time. Blood testing is also useful to monitor for cancer recurrence. The blood tests will depend on your type of thyroid cancer.

- **Neck ultrasound.** This test is increasingly used because it is a very sensitive way to find potential disease in the neck. It involves moving an instrument along your neck, without any pain, and there is no radiation exposure associated with it.

Also, for people in medium-risk or high-risk circumstances, long-term monitoring may sometimes include:

- **RAI Whole Body Scan** for people with papillary or follicular thyroid cancer, or a variant. This is generally a "stimulated" scan, with your TSH elevated. Therefore, it will be done either after thyroid hormone withdrawal (you stop taking your pills for a period of time), or after you receive Thyrogen injections. Either method will raise the level of thyroid stimulating hormone (TSH). The low-iodine diet is followed for about two weeks before this scan.
- **CT Scan,** particularly of the head and neck and/or the chest. If you have papillary or follicular thyroid cancer, CT testing will generally be done without contrast dye because the dye is very high in iodine. If the test reveals cancer, the use of contrast would delay potential RAI treatment until the iodine could be cleared from the body.
- **MRI,** particularly of the head and neck and/or the chest. The contrast dye used in an MRI is gadolinium and does not contain iodine.
- **PET/CT Scan.** A PET scan or combined PET/CT scan is sometimes done when blood testing in someone with differentiated thyroid cancer reveals Thyroglobulin levels above a certain measure, but the disease does not show up on an ultrasound or an RAI whole body scan.
- **Chest X-ray.** An X-ray may be used for low-risk patients whose initial cancer was treated via a lobectomy.

After Your Testing. If your testing shows persistent or recurrent disease, your treatment may include some or all of the treatments discussed earlier.

Each Time. Each time you are tested, discuss the results and your future testing or treatment needs with your doctor.

16. Background About the Thyroid Gland: Some Questions and Answers

Why is the thyroid gland important?
The thyroid gland affects how we feel and how our body functions.

The thyroid gland is an endocrine gland. It produces hormones that circulate in your blood to the rest of your body.

Where is the thyroid gland and how big is it?
The thyroid gland is located in the front of your neck, just below the voice box or Adam's apple. You usually cannot feel your healthy thyroid gland through your skin.

This gland is small. In an adult, it usually weighs one half to three fourths of an ounce (14 to 20 grams). It is about an inch wide (2.5 centimeters). It is shaped like a butterfly, with one "wing"(lobe) on each side of the windpipe (trachea). The two lobes are connected by a thin piece of tissue called the isthmus.

The thyroid gland contains 2 important types of cells. These are thyroid follicular cells and C cells (also referred to as parafollicular cells). C cells produce calcitonin, a specific hormone that helps to regulate the body's use of calcium.

Differentiated thyroid cancer and anaplastic cancer are cancers of the follicular cells. Medullary thyroid cancer is cancer of C cells.

Parathyroids. Also important are four small glands behind the thyroid gland—the parathyroids. They produce parathyroid hormone, important in regulating your body's calcium levels.

What does the thyroid gland do?
The thyroid hormones affect each body tissue, depending on the nature of the tissue. Your bloodstream carries thyroid hormones to all parts of your body.

A main effect of thyroid hormones is to regulate your body's metabolism. Thyroid hormone regulates the rates of metabolism of carbohydrate, protein, and fat; growth and development; and physical and mental development and function. In the heart, thyroid hormone affects the heart rate.

People with thyroid nodules that are possibly cancer usually have normal levels of thyroid hormone. Also, most people with low or high levels of thyroid hormone do not have cancer.

Thyroid disorders involving low or high thyroid hormone levels are much more common than thyroid cancer. Too little thyroid hormone in the bloodstream can result in a condition known as *hypothyroidism*, which causes metabolism to slow down, and may leave the person feeling tired. Too much thyroid hormone in the bloodstream can result in a condition known as *hyperthyroidism*, which causes metabolism to speed up, and can result in an increased heart rate, among other things.

Hypothyroidism and hyperthyroidism are not usually related to thyroid cancer. However, anyone who has them should discuss treatment with their doctor, because each can have a serious negative impact on a person's overall health.

What are symptoms of a thyroid nodule?
Many people with a thyroid nodule do not experience symptoms. Most thyroid nodules are benign, not cancer.

Symptoms can include a lump or nodule in the front of the neck; hoarseness; a cough; and/or difficulty speaking, swallowing, or breathing. Other possible symptoms can include swollen lymph nodes and/or pain in the throat or neck. It is important to discuss these symptoms with your doctor, so that testing can be done.

What is thyroid cancer?
Cancer is a term used for diseases in which abnormal cells divide without control and are able to invade other tissues. Cancer cells can spread to other parts of the body through the blood and lymph systems.

Thyroid cancer begins in thyroid cells. Growths within the thyroid gland are called nodules. Thyroid nodules are common. Most thyroid nodules are benign, but about 1 in 20 is cancerous.

An abnormally enlarged thyroid gland is known as a goiter. There can be several causes for the enlargement, for example, not getting enough iodine in your diet. However, most of the time a goiter is not cancerous.

What causes thyroid cancer?
It's not known why some people develop thyroid cancer and others do not. However, it is clear that no one can catch thyroid cancer from another person.

People with certain risk factors are more likely than others to develop thyroid cancer. However, most people with the most common risk factors do not develop thyroid cancer.

Some risk factors include:

- Exposure to certain radiation, particularly during childhood.
- Personal or family history of goiter.
- Some inherited genetic syndromes.

17. Finding the Right Doctor for You

Treating thyroid cancer often involves a team of physicians, with one physician as the team leader. You will likely see several doctors in addition to your family doctor.

They may include an endocrinologist; a surgeon; a nuclear medicine specialist; and, for some people with aggressive or metastatic disease, a medical oncologist or radiation oncologist. A pathologist will also be involved.

Here are some points to consider:

- If you have one of the common types of thyroid cancer (papillary and follicular diagnosed at an early stage), many physicians have extensive knowledge and experience.
- If you have a less common type or situation with your thyroid cancer (such as medullary, anaplastic, pediatric, a rare variant of papillary or follicular, or advanced disease), more specialized expertise is important.
- You and your caregivers need physicians who are willing to consult with specialists if needed.
- A doctor treating thyroid cancer must be open to reviewing the latest treatment guidelines and research literature, as well as discussing treatment options with researchers and experienced clinicians, including (if needed) those involved in clinical trials of new treatment.
- ThyCa's web site has links to professional associations with lists of their member physicians involved in thyroid cancer care. Participants in online support groups also share names of specialists involved in their own care.

18. Tips for Preparing for Appointments

(Adapted from material from Washington Hospital Center in DC)

1. Bring a picture ID, your health insurance card if you have one, and your referral, if required by your insurance.
2. Bring a summary of your health history, including reports from all thyroid cancer doctors. Examples: pathology report from FNA, scan/imaging results, surgical report, with related pathology report.
3. Bring a list of medications you are taking. This includes prescription medications, over-the-counter medications, and nutritional supplements, including dose (strength) and frequency (number of times you take it each day).
4. Cancer treatment may be a very stressful process. It is helpful to write down your questions so that you don't forget to ask about anything that is important to you. You may also find it helpful to make notes of the doctors' answers/instructions.
5. Keep your notes and records in a loose-leaf 3-ring binder, or in file folders, to help organize them.
6. Plan to arrive 15 minutes before your appointment. You may have to wait for your appointment because doctors cannot predict how much time they need to spend with each patient.
7. Bring something to keep you busy and calm while you wait.

19. Tips for Communicating and Remembering What Your Doctor Says

- Having good communication with your doctors is one of the keys to getting good medical care.
- You want the best care. You are coming to the doctor for medical care, not for you to find a new friend.
- Take a family member or friend to the appointment. Two sets of ears are better than one.
- Take notes.
- Ask for an explanation of unfamiliar terms and definitions.
- Ask for a visual aid. Seeing what your doctor is talking about on a chart or visual aid will help you remember.
- Ask if the doctor has any printed information to give you.
- Ask questions. Be your own advocate. Let your doctor know what is most helpful.
- *(Adapted from tips at ThyCa support group meetings and from Teamwork: The Cancer Patient's Guide to Talking With Your Doctor by L.R. Brusky and others.)*

20. Questions You May Want To Ask

For more questions to ask during your appointments, go to www.thyca.org and put "questions to ask" in the Search box.

Remember also, every patient's treatment is different. The answers will depend on your individual situation.

About the Cancer

- What kind of thyroid cancer do I have?
- What is the stage of my thyroid cancer?

About Any Treatment Being Discussed

- What are my treatment options? What are the advantages and disadvantages of the treatment recommended?
- How will I know if the treatment is working?
- What are possible short-term side effects? What are the possible long-term side effects? What can help prevent side effects? What will help me cope with them if they occur?
- What happens when my treatment is over?
- How will the treatment change my day-to-day life?

More Possible Topics To Discuss:

- Surgery
- Radioactive Iodine (I-131) After Surgery *(for many people with differentiated thyroid cancer)*
- Other Treatments *(for people with any type of thyroid cancer that is aggressive or has spread)*
- Long-Term Follow-Up Care
- Thyroid Hormone Replacement Therapy
- About my prognosis

Points to keep in mind:

- Ask questions. The medical visits are for you. Also, you do not have to find all answers immediately.

- Some answers may change over time, based on changes in your personal medical situation and research advances.

21. Living with Thyroid Cancer

Each person's journey with thyroid cancer is unique. Please remember, you are not alone. ThyCa is here to help you cope with the challenges of all the aspects of this disease.

Many patients and caregivers have found it helpful to consider these questions, suggested by oncologist A. B. Weir, M.D., in *"When Your Doctor Has Bad News."*

- How will I learn to live with my illness?
- Who am I now? How can I matter?
- Do I have a new mission?
- What gifts can I give?
- How do I best prepare my loved ones to live with my illness?
- Can this type of life be my finest hour?

We invite you to find support and education from ThyCa's free local support groups, free online groups, one-to-one support matched by diagnosis, and special events.

22. For more information:

- **Visit ThyCa's web site www.thyca.org.** It receives review and input from over 50 thyroid cancer experts. It provides detailed information about all types of thyroid cancer, over 70 videos with experts, free publications, web pages of local and online support groups, details about one-to-one support, and links to further resources. Information is available in English, Chinese, French, Greek, Hebrew, Italian, Japanese, Portuguese, Russian, and Spanish.
- **Check the Events Calendar on www.thyca.org.** It lists seminars, workshops, and webinars sponsored by ThyCa and other organizations, and the annual International Thyroid Cancer Survivors' Conference.
- **The illustrated 439-page reference book *Thyroid Cancer: A Guide for Patients* (2nd edition, 2010).** In-depth reference by more than 30 medical professionals, plus patients and caregivers. Also available in Chinese and Spanish. Editors: Douglas Van Nostrand, M.D., Leonard Wartofsky, M.D., Gary Bloom, and Kanchan P. Kulkarni, M.D.

23. Thyroid Cancer? ThyCa can help.

We are an internationally recognized, medically advised organization providing **free** support services to people with thyroid cancer.

- **For patients and caregivers** — We offer information and understanding to patients and their families when they need it most.
- **For the public** — We promote awareness for early detection, and provide outreach and education year-round. We sponsor Thyroid Cancer Awareness Month each September.
- **For professionals** — We provide this free handbook, patient brochures and wallet cards, free downloadable Low-Iodine Cookbook, and more materials to give to patients. Plus research funding, with grant recipients selected by an expert panel of the American Thyroid Association.

Free Services & Resources: Award-winning web site • Person-to-person support • Local support groups • Online support groups • Awareness brochures • Seminars, workshops • Annual International Conference • Over 70 Videos with Experts; YouTube Channel • Online newsletter • Free Handbooks on all types of thyroid cancer • Low-Iodine Cookbook • Materials in 10 languages • Facebook, Twitter • More

Please contact us for more information and free materials:

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Toll-free 877-588-7904 • Fax 630-604-6078
P.O. Box 1102, Olney, MD 20830-1102

ThyCa: Thyroid Cancer Survivors' Association, Inc., is a nonprofit 501(c)(3) organization of thyroid cancer survivors, family members, and health care professionals, advised by distinguished thyroid cancer specialists and dedicated to support, education, communication, awareness for early detection, and thyroid cancer research fundraising and research grants.

Thyroid Cancer Basics

Visit www.thyca.org to download this handbook, which is available in English, Chinese, Italian, Russian, or Spanish.

Visit iTunes or GooglePlay to download this handbook in ePub format.

Our materials are provided free of charge to anyone who needs them. E-mail us at thyca@thyca.org and we will be happy to mail you individual copies or bulk quantities.

Courtesy of

ThyCa: Thyroid Cancer Survivors' Association, Inc.

ThyCa is a 501(c)3 nonprofit organization. We welcome your tax-deductible donations to help us continue providing support and educational materials to anyone dealing with thyroid cancer.

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