Journal of Cancer Diagnosis
ISSN: 2476-2253

Opinion Open Access

Thyroid Cancer: Causes, Symptoms, Diagnosis, and Treatment

James T. Reynolds*

Department of Oncology, Pacific Medical Research Institute, San Francisco, CA, USA

Introduction

Thyroid cancer is a type of cancer that develops in the thyroid gland, a butterfly-shaped organ located at the base of the neck. The thyroid plays a vital role in regulating metabolism, heart rate, and body temperature by producing hormones such as thyroxine (T4) and triiodothyronine (T3) [1]. Although thyroid cancer is relatively rare compared to other cancers, its incidence has been increasing globally due to improved diagnostic techniques and environmental factors [2].

Thyroid cancer is typically classified into different types, each with distinct characteristics, prognosis, and treatment approaches. Most thyroid cancers have a favorable prognosis, especially when detected early. This article explores the causes, risk factors, types, symptoms, diagnosis, and treatment options available for thyroid cancer, along with preventive strategies and future directions in research [3].

Thyroid cancer is a significant health concern that has seen a steady increase in incidence over the past few decades. The thyroid, a small, butterfly-shaped gland located in the front of the neck, plays a crucial role in regulating metabolism through the production of essential hormones [4]. When abnormal cell growth occurs within this gland, it can lead to the development of thyroid cancer, a condition that varies in severity depending on the type and stage of the disease. The global rise in thyroid cancer cases is attributed to a combination of factors, including improved diagnostic techniques, environmental influences, and genetic predispositions [5]. While the prognosis for most types of thyroid cancer is generally favorable, early detection and appropriate treatment remain critical in ensuring positive patient outcomes [6]. Understanding the causes, symptoms, diagnostic methods, and treatment options is essential for both healthcare professionals and patients to navigate this disease effectively. Thyroid cancer encompasses several subtypes, with papillary and follicular thyroid carcinomas being the most common, accounting for nearly 90% of cases. Other types, such as medullary thyroid carcinoma and anaplastic thyroid carcinoma, are rarer but often more aggressive [7]. Risk factors for thyroid cancer include exposure to radiation, iodine deficiency, and a family history of thyroid disease. Many patients with thyroid cancer experience minimal or no symptoms in the early stages, making regular medical check-ups and awareness of potential warning signs vital for timely intervention [8]. Advancements in medical imaging, genetic testing, and molecular profiling have revolutionized the diagnosis and management of thyroid cancer. Fine-needle aspiration biopsy (FNAB) is the gold standard for diagnosing suspicious thyroid nodules, while treatment options range from surgical intervention to targeted therapies and radioactive iodine therapy. With continuous progress in oncological research, novel therapeutic approaches are being developed to enhance treatment efficacy and minimize side effects.

This article provides an in-depth exploration of thyroid cancer, focusing on its causes, symptoms, diagnostic strategies, and treatment modalities. By shedding light on these aspects, we aim to contribute to a better understanding of the disease and promote early diagnosis and effective management strategies.

Causes and risk factors

The exact cause of thyroid cancer remains unknown, but several risk factors have been identified that may contribute to its development. These factors include:

Genetic mutations

Changes in specific genes can lead to uncontrolled growth of thyroid cells, forming tumors. Mutations in genes such as RET, BRAF, RAS, and TP53 are commonly associated with different types of thyroid cancer.

Exposure to high levels of radiation, especially during childhood, is a well-known risk factor for thyroid cancer. Sources of radiation exposure include:

- Radiation therapy to the head and neck during childhood
- Exposure to nuclear accidents or fallout
- Frequent exposure to X-rays and CT scans

Individuals with a family history of thyroid cancer or inherited conditions such as Multiple Endocrine Neoplasia type 2 (MEN2) and Cowden syndrome have an increased risk of developing the disease.

Iodine is essential for thyroid function, and both iodine deficiency and excessive iodine intake can influence thyroid cancer risk. While iodine deficiency is linked to follicular thyroid cancer, excessive iodine consumption may contribute to papillary thyroid cancer.

Thyroid cancer is more common in women than men, with most cases diagnosed in people between 30 and 60 years of age. Hormonal influences may contribute to the higher prevalence in women.

Certain benign thyroid conditions, such as goiter (thyroid enlargement), Hashimoto's thyroiditis, and nodular thyroid disease, may increase the risk of developing thyroid cancer.

Types of thyroid cancer

Thyroid cancer is classified into different types based on the cellular origin and aggressiveness of the tumor. The main types include:

Papillary thyroid carcinoma (PTC)

***Corresponding author:** James T. Reynolds, Department of Oncology, Pacific Medical Research Institute, San Francisco, CA, USA, E-mail: james.reyn_t@gmail.com

Received: 01-Jan-2024, Manuscript No: jcd-25-162266; **Editor assigned:** 04-Jan-2024, PreQC No. jcd-25-162266 (PQ); **Reviewed:** 17-Jan-2024, QC No. jcd-25-162266; **Revised:** 24-Jan-2024, Manuscript No. jcd-25-162266 (R); **Published:** 30-Jan-2024, DOI: 10.4172/2476-2253.1000282

Citation: James TR (2025) Thyroid Cancer: Causes, Symptoms, Diagnosis, and Treatment. J Cancer Diagn 9: 282.

Most common type (80-85% of cases)

Develops slowly and often spreads to lymph nodes in the neck

Has an excellent prognosis with early treatment

Frequently associated with BRAF gene mutations

Follicular thyroid carcinoma (FTC)

Second most common type (10-15% of cases)

More likely to spread through the bloodstream to distant organs such as the lungs and bones

Associated with iodine deficiency and RAS mutations

Hurthle cell carcinoma is a more aggressive subtype of follicular thyroid carcinoma

Medullary thyroid carcinoma (MTC)

Arises from C cells of the thyroid that produce calcitonin

Accounts for 3-5% of thyroid cancers

Can be sporadic or hereditary (linked to RET gene mutations in MEN2 syndrome)

Often diagnosed at a later stage due to its aggressive nature

Rarest and most aggressive form (less than 2% of cases)

Rapidly grows and spreads to other organs, leading to poor prognosis

Difficult to treat due to resistance to standard therapies

Thyroid lymphoma and other rare types

Thyroid lymphoma arises from immune cells in the thyroid and is often linked to chronic lymphocytic thyroiditis (Hashimoto's thyroiditis)

Poorly differentiated thyroid carcinoma is an intermediate form between differentiated and anaplastic thyroid cancer

Early-stage thyroid cancer may not cause noticeable symptoms, but as the tumor grows, the following signs may develop:

A lump or swelling in the neck

Hoarseness or changes in voice

Difficulty swallowing or breathing

Persistent neck pain that may radiate to the ears

Swollen lymph nodes in the neck

Chronic cough not related to a cold

It is essential to seek medical attention if any of these symptoms persist, as early detection significantly improves treatment outcomes.

Diagnosis of thyroid cancer

A healthcare provider will examine the neck for lumps or swelling and assess the patient's medical and family history.

Blood tests

- Thyroid function tests (T3, T4, TSH)
- Calcitonin and carcinoembryonic antigen (CEA) for medullary thyroid carcinoma
- Thyroglobulin levels to monitor treatment response
- Ultrasound: The primary imaging method to evaluate thyroid nodules
- CT and MRI scans: Used to assess cancer spread beyond the thyroid
- Radioactive iodine scan: Determines if the cancer is iodine-avid)

A biopsy is the gold standard for diagnosing thyroid cancer. A thin needle extracts cells from the thyroid nodule for microscopic examination.

Treatment of thyroid cancer

The treatment of thyroid cancer depends on the type, stage, and overall health of the patient.

Thyroidectomy- Removal of the entire thyroid gland

Lobectomy- Removal of one lobe if cancer is localized

Lymph node dissection- If cancer has spread to lymph nodes

Used after surgery to destroy remaining thyroid cells and prevent recurrence. It is effective for papillary and follicular thyroid cancers.

Thyroid hormone therapy

After thyroid removal, patients require lifelong levothyroxine (T4) replacement therapy to maintain metabolism and suppress TSH to prevent cancer recurrence.

Used for advanced or inoperable thyroid cancer, particularly for medullary and anaplastic thyroid carcinomas.

Tyrosine kinase inhibitors (TKIs) such as sorafenib and lenvatinib are used for advanced thyroid cancer.

Chemotherapy is mainly used for aggressive thyroid cancers like anaplastic carcinoma.

The prognosis for thyroid cancer is generally favorable, with a 5-year survival rate of over 98% for papillary and follicular thyroid cancers. However, prognosis worsens for anaplastic thyroid cancer, with survival rates below 10%.

While thyroid cancer cannot always be prevented, risk reduction strategies include:

Limiting unnecessary radiation exposure

Maintaining a balanced iodine intake

Regular thyroid screenings for those with a family history

Ongoing research focuses on genetic therapies, immunotherapy, and precision medicine to improve outcomes for aggressive thyroid cancers.

Conclusion

Thyroid cancer is a complex disease with varying degrees of aggressiveness. Early detection and advances in treatment have significantly improved survival rates, particularly for differentiated thyroid cancers. Awareness, regular screenings, and continued research efforts are crucial in managing and ultimately reducing the impact

of thyroid cancer worldwide. Thyroid cancer remains a complex yet increasingly manageable disease, thanks to advancements in medical science and early detection efforts. While the rise in diagnosed cases has sparked concerns, it is essential to recognize that many cases are treatable, especially when identified at an early stage. The evolution of diagnostic tools, including high-resolution ultrasound and genetic testing, has significantly improved the ability to detect thyroid abnormalities with greater accuracy. Public awareness and routine screening play a crucial role in the early identification of thyroid cancer. Patients with risk factors, such as a family history of thyroid disorders or previous radiation exposure, should remain particularly vigilant. Additionally, healthcare professionals must continue emphasizing the importance of timely medical evaluations when symptoms such as neck swelling, difficulty swallowing, or persistent hoarseness arise.

Treatment for thyroid cancer has evolved to offer a range of effective options tailored to individual patient needs. From minimally invasive surgical techniques to targeted molecular therapies, the medical community has made great strides in improving patient outcomes. Furthermore, ongoing research into immunotherapy and novel drug formulations holds promise for more precise and less invasive treatment modalities in the future.

Ultimately, a multidisciplinary approach that includes endocrinologists, oncologists, and surgeons ensures comprehensive care for thyroid cancer patients. As our understanding of the disease deepens, it is crucial to continue investing in research and education to enhance prevention, early detection, and treatment strategies. Through collaborative efforts between medical professionals, researchers, and public health organizations, the outlook for thyroid cancer patients will continue to improve, leading to better survival rates and quality of life.

References

1. Zadik, Yehuda, Aktaş Alper, Drucker Scott, Nitzan W Dorrit (2012) Aneurysmal bone cyst of mandibular condyle: A case report and review of the literature. J Craniomaxillofac Surg 40: 243-248.
2. Ye Y, Pringle LM, Lau AW (2010) TRE17/USP6 oncogene translocated in aneurysmal bone cyst induces matrix metalloproteinase production via activation of NF-kappaB. Oncogene 29: 3619-3629.
3. Mankin HJ, Hornicek FJ, Ortiz-Cruz E, Villafuerte J, Gebhardt MC, et al. (2005) Aneurysmal bone cyst: a review of 150 patients. J Clin Oncol 23: 6756-6762.
4. Amanatullah DF, Clark TR, Lopez MJ, Borys Dariusz, Tamurian Robert M, et al. (2014) Giant Cell Tumor of Bone. Orthopedics 37: 112-120.
5. Baig R, Eady J (2006) unicameral (simple) bone cysts. Southern Medical Journal 99: 966-976.
6. Milbrandt, Todd; Hopkins, Jeffrey (2007) unicameral bone cysts: etiology and treatment. Curr Opin Orthop 18: 555-560.
7. Rapp Timothy B, Ward James P, Alaia Michael J (2012) Aneurysmal Bone Cyst. J Am Acad Orthop Surg 20: 233-241.
8. Ozyurek Selahattin, Rodop Osman, Kose Ozkan, Cilli Feridun, Mahirogullari Mahir, et al. (2009) Aneurysmal Bone Cyst of the Fifth Metacarpal. Orthopedics 32: 606-609.