Role of Positron Emission Tomography and Nuclear Medicine in the Diagnosis and Treatment of Thyroid Cancer

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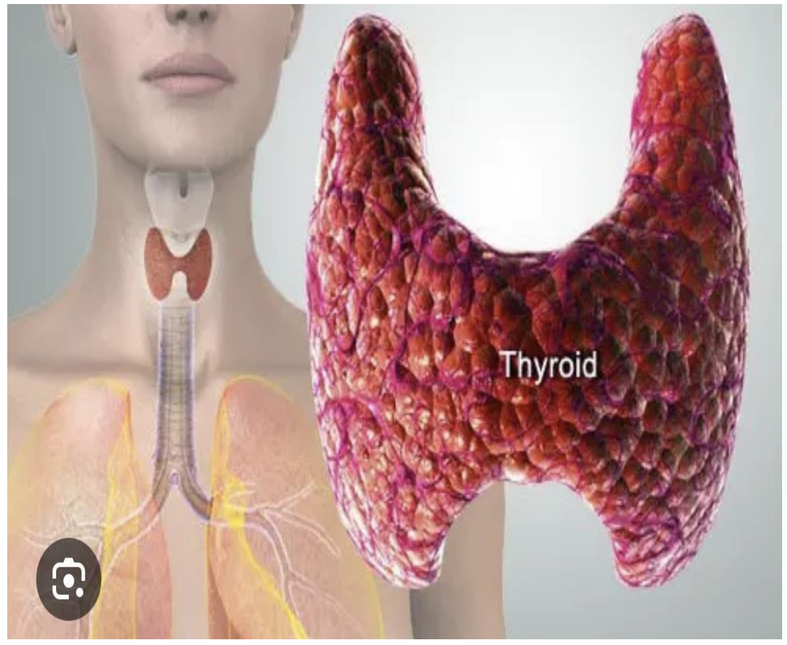
Introduction

- The thyroid gland is located in the front of the neck below the Adam's apple and resembles a butterfly with two lobes: left and right.
- The thyroid gland produces hormones that regulate metabolism, heart rate, blood pressure, and body temperature.
- Lumps and nodules on the gland can impair its ability to regulate and perform its functions.
- The thyroid is made up of two main cells ; Follicular and C-cells.
- The majority of thyroid cancers are classified as differentiated cancers, where the cancer cells resemble normal thyroid cells.
- Diagnostic scans and early detection can visualize these cells.



Summary

- The thyroid gland plays a crucial role in the body's metabolic processes.
- Lumps and nodules can impair the gland's performance.
- Understanding the gland's intricate structure and cellular makeup is vital for diagnosing and treating thyroid conditions, including cancer.
- Advanced screening methods, such as PET/CT scans are important for early detection.
- Treatment options like RAI have proven effective for many patients, often leading to successful cancer elimination.
- Ongoing advancements in understanding and techniques emphasize the importance of early detection and tailored treatments.

Causes, Detection, and Diagnosis

- Genes determine how cells operate, while DNA is the chemical that composes these genes.
- Cancer arises from changes or mutations in the DNA within our cells.
- Malfunctioning genes can lead to uncontrolled cell production and growth.
- Most thyroid cancers are detected early through imaging test such as:
  - Ultrasound
  - Fine Needle Aspiration
  - PET/CT scans
- Cancer cells are more metabolically active and absorb more glucose.
- PET scans use radiolabeled glucose to detect area of increased metabolic activity, highlighting cancerous areas with brighter signals on the scan.
- PET/CT imaging is useful for identifying thyroid cancer due to the hyper uptake of glucose by cancer cells.

Treatment

- Radioactive Iodine (RAI) can be effective in treating papillary or follicular thyroid cancer that has metastasized to the neck or other regions.
- Elevated levels of thyroid –stimulating hormone (TSH) are important for maximizing RAI effectiveness, as TSH encourages thyroid and cancer cells to absorb radioactive iodine.
- RAI is administered in a nuclear medicine department, most commonly taken orally as a pill or liquid, but can be given via injection
- RAI uses radioactive iodine (I-131), which is absorbed by thyroid and cancer cells. As I-131 decays, it emits radiation that destroys these cells.
- After treatment, the body emits low levels of radiation for some time, possibly requiring isolation to protect others.

References

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