



CLINICAL CONSIDERATIONS FOR I-131 THERAPY

Oneil Lee, MD, PhD
Kaiser Permanente Orange County
Department of Radiology/Nuclear Medicine

GOAL

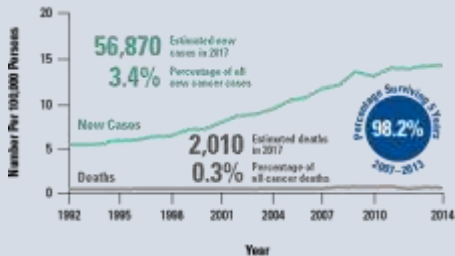
- Understand thyroid cancer: Biology, epidemiology, treatment strategies, and prognosis.
- Be familiar with how to optimize I-131 therapy and minimize radiation exposure.
- Better outcome for patients, better communication with ordering/treating physicians, and minimize radiation exposure to the patient and the general public.

BACKGROUND

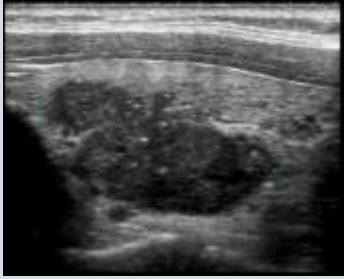
- Thyroid nodules are common: Up to 5% of women and 1% of men with palpable nodules. ¹
- Vast majority are benign (~95%).
- Differentiated thyroid cancers accounts for over 90% of thyroid cancer (85% papillary).

BACKGROUND

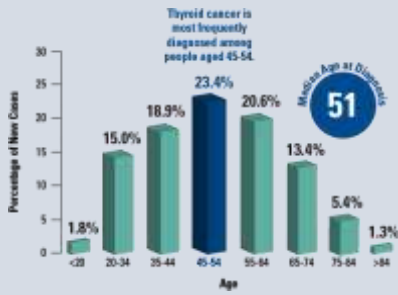
- Thyroid cancer incidence increasing? Maybe or maybe not....
- Thyroid cancer may become 3rd most common cancers in women.
- Most well differentiated thyroid cancers are usually slow growing and respond well to treatment.



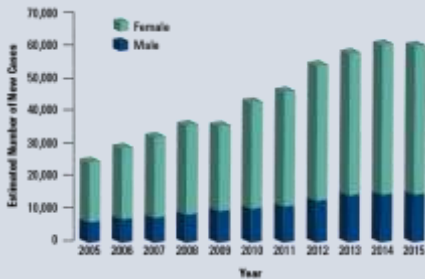
SEER. Cancer Stat Facts: Thyroid Cancer. 2017. <https://seer.cancer.gov/statfacts/html/thyro.html>. Accessed Oct 3, 2017.



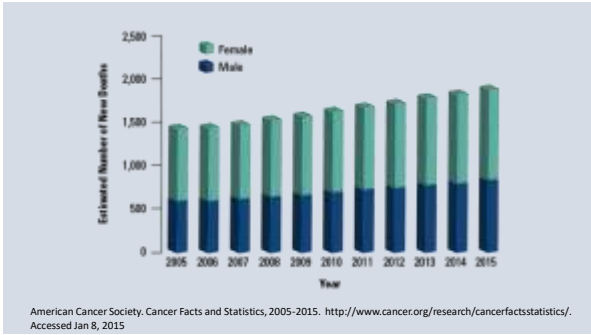
<https://radiopaedia.org/cases/papillary-thyroid-carcinoma-8>



SEER. Cancer Stat Facts: Thyroid Cancer, 2017. <https://seer.cancer.gov/statfacts/html/thyro.html>. Accessed Oct 3, 2017



American Cancer Society. Cancer Facts and Statistics, 2005-2015. <http://www.cancer.org/research/cancerfactsstatistics/>. Accessed Jan 8, 2015



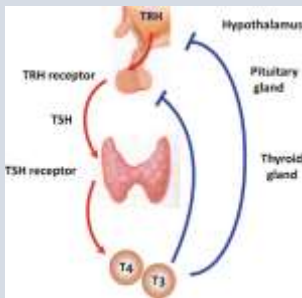


TREATMENT

- Patients with differentiated thyroid cancers usually undergo thyroidectomy and lymph node dissection.
- Differentiated thyroid cancer with cervical metastatic lymphadenopathy in 20-50%.²
- Thyroid cancers categorized and low, intermediate, and high risk according to the 2015 ATA guidelines.³

I-131 THERAPY

- I-131 therapy for remnant ablation, adjuvant therapy, and therapy.
- Pregnancy test.
- Optimal therapy: Low iodine diet for 1-2 weeks prior to therapy (www.thyroid.org), withdrawal (TSH goal of greater than 30 mIU/L) versus Thyrogen, no recent high iodine intake.



<https://media.springernature.com>

I-131 THERAPY

- No food 2 hours before and after the therapy.
- Anti-nausea medication 1 hour before the therapy and several hours after the therapy.
- Avoid food and activities that may cause nausea.
- Lower dose now recommended for remnant ablation according to the 2015 ATA guidelines: 30 mCi. For high risk patients, 75 mCi or higher may be used for adjuvant therapy.

POST I-131 THERAPY

- Post-therapy scan can alter the stage in 8% of patients.⁴
- Potential side-effects of therapy include salivary gland dysfunction (hydration, sour candies, cholinergic agents), dental caries, nasolacrimal duct obstruction, secondary malignancy (routine screening not recommended), and dysphagia.

POST I-131 THERAPY

- Meta-analysis of two large multicenter studies showed that the RR of second malignancies was significantly increased at 1.19 [95% CI 1.04–1.36], $p < 0.010$, relative to thyroid cancer survivors not treated with RAI, although the absolute increase in second primary malignancy risk attributable to RAI is considered to be small.⁵

SPECIAL CONSIDERATIONS

- Pregnancy test should be performed before I-131 therapy. Pregnancy should be avoided 6-12 months following the therapy.
- Lactating women should stop breastfeeding for preferably 3 months before the therapy. Low dose scan could be performed to determine breast uptake.

SPECIAL CONSIDERATIONS

- Menstrual irregularity can occur 4-10 months after therapy. Potential for slightly earlier menopause.
- Long-term rates of infertility, miscarriage, and fetal malformation do not appear to be elevated in women after RAI therapy.⁶
- Fertility and risks of miscarriage or congenital abnormalities in subsequent pregnancies are not changed with moderate RAI activities (~200 mCi).⁷

SPECIAL CONSIDERATIONS

- Men with cumulative dose of greater than 400 mCi should be counseled for potential infertility.
- In men, RAI therapy may be associated with a temporary reduction in sperm counts.⁸
- Some specialists recommend that men wait 3 months (or one full sperm cycle) to avoid the potential for transient chromosomal abnormalities.



RADIATION SAFETY FOR PATIENTS

- Do not travel by airplane or public mass transportation for 5 days. If you travel by airplane within 3 months of the therapy, you may need a document to prove your radioactive treatment which may trigger radiation monitors at security checkpoints.
- Do not go on a long car ride (over 2 hours) sitting close to others (less than 3 feet) for 5 days. If you are a passenger, sit in the back row on the opposite side of the driver.

RADIATION SAFETY FOR PATIENTS

- Do not return to work for 5-7 days (14 days if you work closely with children or pregnant women).
- Avoid direct contact and close proximity to children and pregnant women for at least 14 days, as children and pregnant women are especially sensitive to radiation.
- Maintain a distance of at least 3-6 feet with others as much as possible for 5 days.

RADIATION SAFETY FOR PATIENTS

- Avoid or minimize time spent in public places (such as grocery store, theaters, and restaurants) for 5 days.
- Sleep alone in a separate room/bed for 7 days. No sexual intercourse for 7 days.
- Use a separate bathroom for 5 days.
- Use the bathroom frequently and flush twice for 5 days.

RADIATION SAFETY FOR PATIENTS

- Drink plenty of fluids for the first few days (unless it is not safe to do so for other medical reasons) after the treatment to maintain adequate urination, which will minimize the radiation exposure to yourself and others.
- Chew gum or use sour candy frequently for the first few days to increase production of saliva and minimize radiation exposure to your salivary glands.

RADIATION SAFETY FOR PATIENTS

- Wash kitchenware separately from those used by others for 5 days. If you use disposable utensils, they need to be stored for 2 weeks in a garage before disposing them in the trash.
- Any leftover food should be discarded through the disposal or flushed down the toilet (as appropriate).

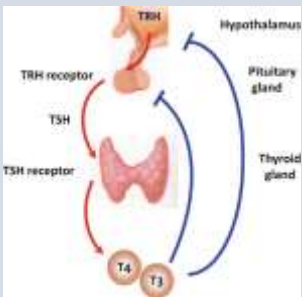
RADIATION SAFETY FOR PATIENTS

- If you vomit within the first 2 hours after the therapy, wear gloves to clean up. Use toilet paper to clean up the material, which can be flushed down the toilet. Also contact the Nuclear Medicine department (at least by the next working day) to determine how much I-131 is still within your body.

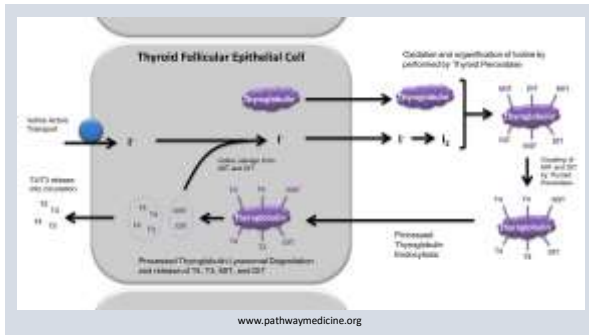


POST-THERAPY FOLLOW UP

- Resume Synthroid with the goal of TSH suppression.
- Thyroglobulin level monitoring.
- I-131 therapy can be repeated if recurrence occurs.
- Differentiated thyroid cancers can become de-differentiated (I-131 negative).



<https://media.springernature.com>



POST-THERAPY FOLLOW UP

- In a meta-analysis of 25 studies that included 789 patients, the sensitivity of ¹⁸F-FDG-PET/CT was 83% (ranging from 50% to 100%) and the specificity was 84% (ranging from 42% to 100%) in non-¹³¹I-avid DTC.⁹
- PET/CT should be considered when thyroglobulin level is greater than 10 ng/ml with a negative I-131 scan.

NON I-131 AVID THYROID CANCER

- Empiric treatment with I-131.
- Surgery.
- External beam radiation.
- Experimental therapy (i.e. kinase inhibitors).



SUMMARY

- Differentiated thyroid cancer increasing in incidence but mostly treatable.
- Treatment strategies and follow up for differentiated thyroid cancer.
- Minimize radiation risks to the patients and the public.



REFERENCES

1. The significance of nontoxic thyroid nodules. Final report of a 15-year study of the incidence of thyroid malignancy. *Vander JB, Gaston EA, Dawber TR. Ann Intern Med. 1968 Sep; 69(3):537-40.*
2. Thyroid cancer nodal metastases: biologic significance and therapeutic considerations. *Grebe SK, Hay ID. Surg Oncol Clin N Am. 1996 Jan; 5(1):43-63.*
3. 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. *Thyroid. 2016 Jan;26(1):1-133. doi: 10.1089/thy.2015.*

REFERENCES

4. Post I-131 therapy scanning in patients with thyroid carcinoma metastases: an unnecessary cost or a relevant contribution? *Souza Rosário PW, Barraso AL, Rezende LL, Padrão EL, Fagundes TA, Penna GC, Purisch S. Clin Nucl Med. 2004 Dec; 29(12):795-8.*
5. Second primary malignancy risk after radioactive iodine treatment for thyroid cancer: a systematic review and meta-analysis. *Sawka AM, Thabane L, Parlea L, Ibrahim-Zada I, Tsang RW, Brierley JD, Straus S, Ezzat S, Goldstein DP. Thyroid. 2009 May; 19(5):451-7.*
6. Prognosis for fertility and ovarian function after treatment with radioiodine for thyroid cancer. *Vini L, Hyer S, Al-Saadi A, Pratt B, Harmer C. Postgrad Med J. 2002 Feb; 78(916):92-3.*

REFERENCES

7. The effects of gonadal irradiation in clinical radiation therapy: a review. *Lushbaugh CC, Casarett GW. Cancer. 1976 Feb; 37(2 Suppl):1111-25*
8. Testicular function after radioiodine therapy for thyroid carcinoma. *Wichers M, Benz E, Palmedo H, Biersack HJ, Grünwald F, Klingmüller D. Eur J Nucl Med. 2000 May; 27(5):503-7.*
9. The role of PET in follow-up of patients treated for differentiated epithelial thyroid cancers. *Leboulleux S, Schroeder PR, Schlumberger M, Ladenson PW. Nat Clin Pract Endocrinol Metab. 2007 Feb; 3(2):112-21.*
