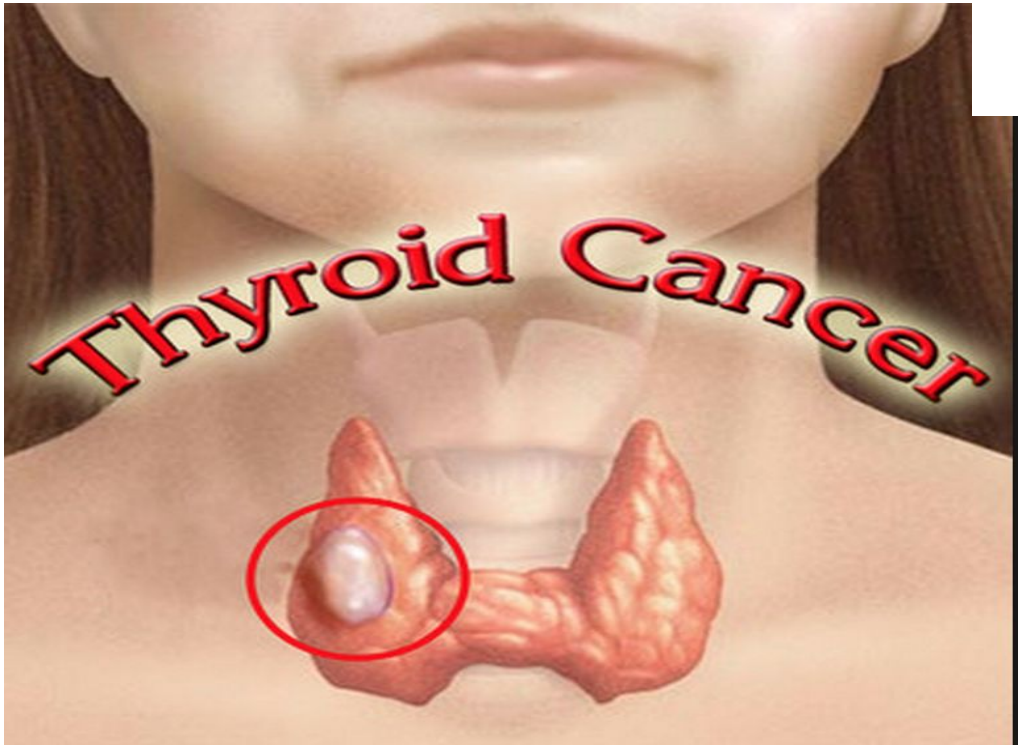


Dr. Nodelman Marina

Thyroid cancers

- ~1% of new cancer diagnoses in the USA each year
- the incidence is 3 times higher in women than in men
- the disease peaks in the 3th and 4th decades of life

Thyroid malignancies classification

<u>Thyroid follicular epithelial-derived cancers</u>

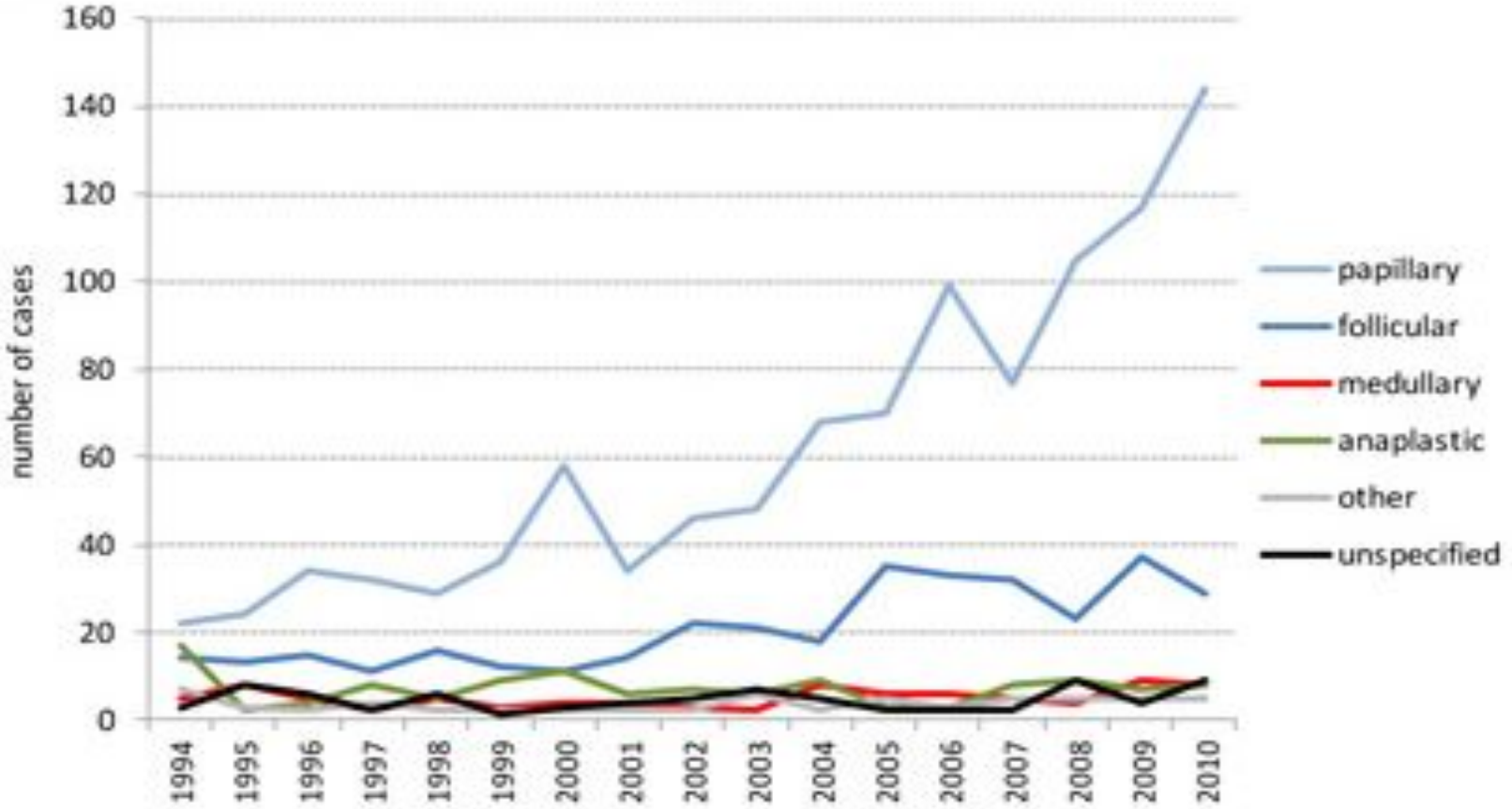
- Papillary carcinomas (PTC) 80%
- Follicular carcinomas (FTC) 10%

} differentiated

- Anaplastic carcinomas 1-2% (undifferentiated)

- Medullary thyroid carcinomas (MTC) 5-10%
- Primary thyroid lymphomas (rare)
- Primary thyroid sarcomas (rare)
- Mts to thyroid

Total number of the histological subtypes of thyroid cancer diagnosed per year



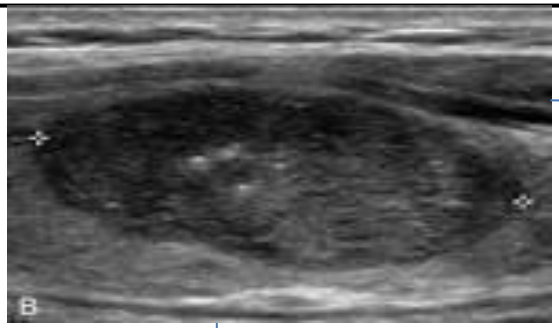
Clinical picture of thyroid cancer

painless, palpable, solitary thyroid nodule

- ~4-7% of the general population
- on US: thyroid nodules in 20-70% of randomly selected individuals
- 5-10% of solitary thyroid nodules are malignant
- solitary nodules are most likely to be malignant in males and patients younger than 30 or older than 60
- rapid growth, hoarseness, dysphagia are suspicious
- pain generally benign (hemorrhage, s/ac thyroiditis)

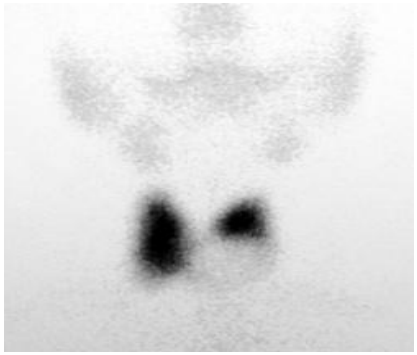
Investigation of thyroid nodules

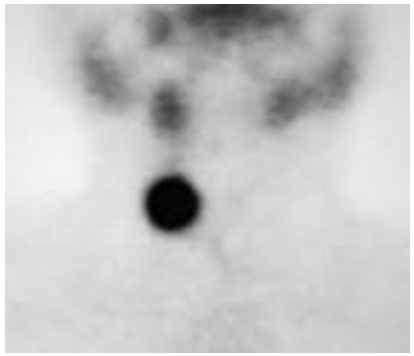
US of thyroid + TSH



TSH depressed

Tc scan





TSH normal or high

FNA under US

Cold" nodule"

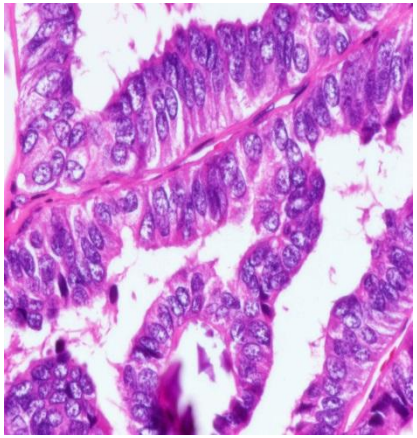
Hot" nodule"

Follow-up

Bethesda system diagnostic categories for reporting thyroid cytopathology

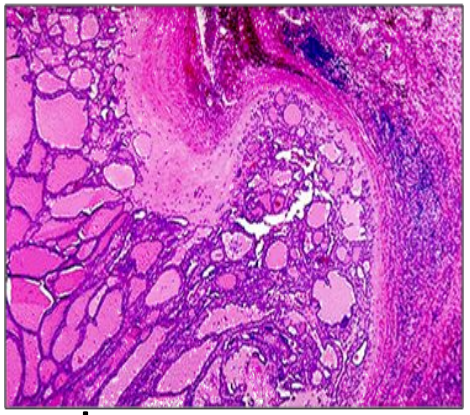
Bethesda class	Diagnostic category	Cancer risk	?What to do
I	Nondiagnostic (unsatisfactory)	1 to 4%	repeat FNA
II	Benign	0 to 3%	follow-up
III	Atypia of undetermined significance (AUS) or follicular lesion of undetermined significance (FLUS)	5 to 15%	follow-up repeat FNA genetic test operation
IV	Follicular neoplasm (or suspicious for follicular neoplasm)	15 to 30%	
V	Suspicious for malignancy	60 to 75%	operation
VI	Malignant	97 to 99%	operation

Papillary carcinoma



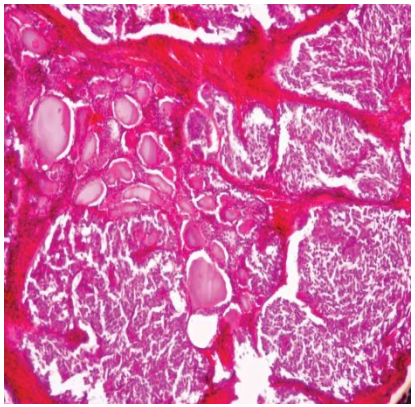
- the most common thyroid malignancy (80%)
- well-differentiated, slow-growing
- produce Thyroglobulin
- Iodine sensitive
- may be multicentric or bilateral (up to 50%)
- locally-invasive (trachea,rec. laryngeal nerves, esophagus)
- regional metastasis: cervical lymph nodes
  (clinically evident LN 30%, microscopic LN 50%)
- distant metastasis (5%-10%): lungs, bones
- aggressive histology: tall cell, insular, columnar, Hürthle cell

Follicular carcinoma



- the second most common (10%)
- well-differentiated, slow-growing
- produce Thyroglobulin
- Iodine sensitive
- is differentiated from benign follicular adenoma by tumor capsule invasion and/or vascular invasion
- locally-invasive
- cervical metastases are uncommon
- higher rate of distant mts (~20%): lung and bone

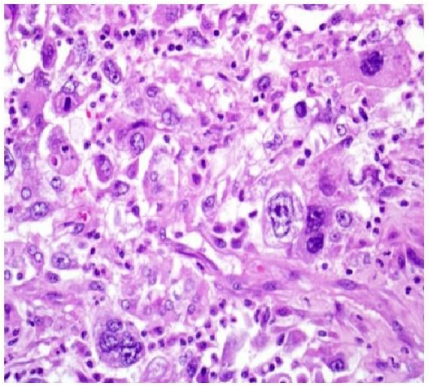
Medullary Carcinoma

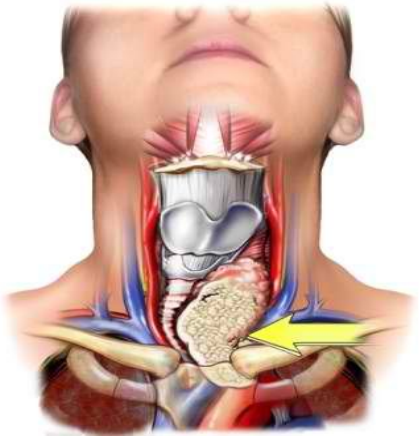


- ~5% of all thyroid malignancies
- arise from the parafollicular C-cells
- 25% occur familially (MEN 2A, MEN 2B, FMTC)
- produce Calcitonin
- not sensitive to Iodine
- metastasis to the cervical lymph nodes is common (50%)
- tumor markers: Calcitonin, CEA
- Chemotherapy, TKI-inhibitors
- 10-year survival rate is 65% overall

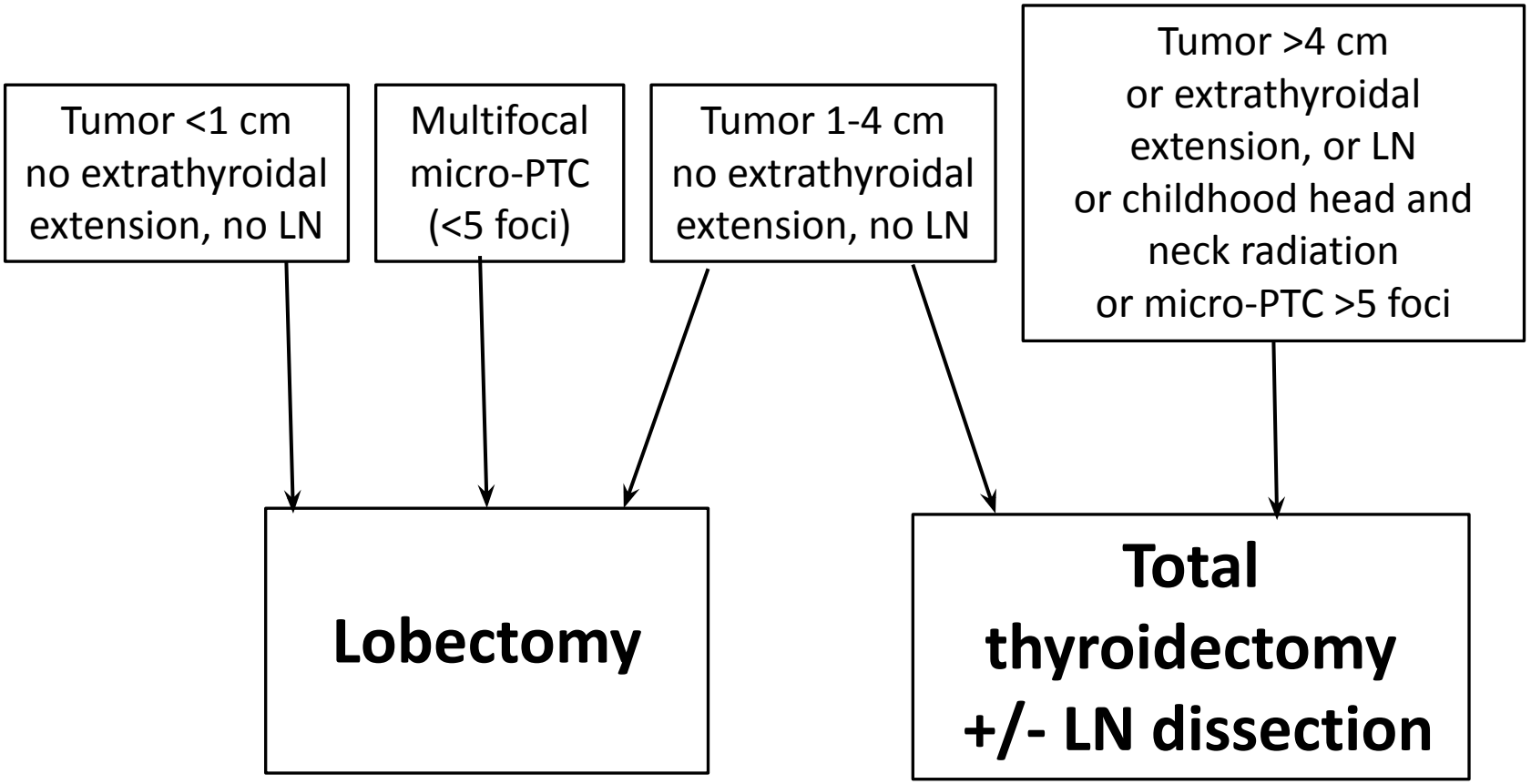
Anaplastic Carcinoma

- one of the least common (~1.6%)
- most aggressive and one of the worst survival rates of all malignancies in general
- age 60-70
- rapid growth, hoarseness and dyspnea
- large and invasive tumor
- lung and other mts
- most patients die within 1 year despite all treatment efforts





Surgical treatment of PTC/FTC



Complication of surgical treatment

- Hemorrhage
- Infection
- Reccurent laryngeal nerve injury (up to 10%)

  Bilateral vocal cord parapysis (0.5%)
- Hypoparathyroidism (transient, permanent 2%)
- Seroma
- Dysphagia

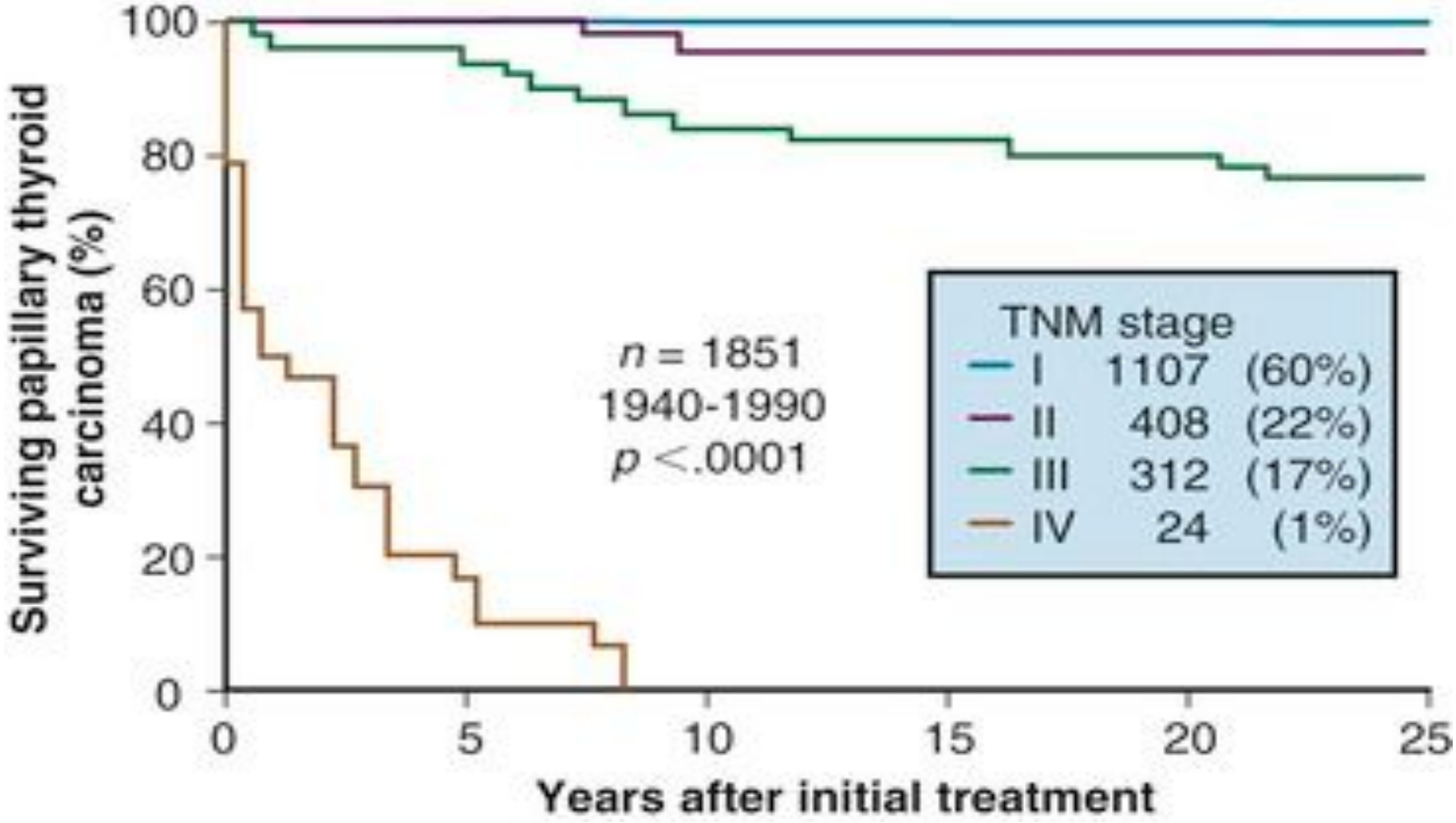
TNM staging of differentiated and anaplastic thyroid carcinoma, 2017

Papillary, follicular, poorly differentiated, Hurthle cell and anaplastic thyroid carcinoma	
T category	**T criteria**
TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
T1	Tumor ≤2 cm in greatest dimension limited to the thyroid
T1a	Tumor ≤1 cm in greatest dimension limited to the thyroid
T1b	Tumor >1 cm but ≤2 cm in greatest dimension limited to the thyroid
T2	Tumor >2 cm but ≤4 cm in greatest dimension limited to the thyroid
T3	Tumor >4 cm limited to the thyroid, or gross extrathyroidal extension invading only strap muscles
T3a	Tumor >4 cm limited to the thyroid
T3b	Gross extrathyroidal extension invading only strap muscles (sternohyoid, sternothyroid, thyrohyoid, or omohyoid muscles) from a tumor of any size
T4	Includes gross extrathyroidal extension
T4a	Gross extrathyroidal extension invading subcutaneous soft tissues, larynx, trachea, esophagus, or recurrent laryngeal nerve from a tumor of any size
T4b	Gross extrathyroidal extension invading prevertebral fascia or encasing the carotid artery or mediastinal vessels from a tumor of any size
NOTE: All categories may be subdivided: (s) solitary tumor and (m) multifocal tumor (the largest tumor determines the classification).	
Regional lymph nodes (N)	
N category	**N criteria**
NX	Regional lymph nodes cannot be assessed
N0	No evidence of locoregional lymph node metastasis
N0a	One or more cytologically or histologically confirmed benign lymph nodes
N0b	No radiologic or clinical evidence of locoregional lymph node metastasis
N1	Metastasis to regional nodes
N1a	Metastasis to level VI or VII (pretracheal, paratracheal, or prelaryngeal/Delphian, or upper mediastinal) lymph nodes. This can be unilateral or bilateral disease.
N1b	Metastasis to unilateral, bilateral, or contralateral lateral neck lymph nodes (levels I, II, III, IV, or V) or retropharyngeal lymph nodes
Distant metastasis (M)	
M category	**M criteria**
M0	No distant metastasis
M1	Distant metastasis

Thyroid Cancer Classification: prognostic stage groups

>45 years	**<45 year**	**Papillary or follicular thyroid cancers**
T1, N0, M0	Any T, any N, M0	Stage I
T2 or T3, N0, M0	Any T, any N, M1	Stage II
T4, N0, M0 or any T, N1, M0	-	Stage III
Any T, any N, M1	-	Stage IV
All cases are stage IV	All cases are stage IV	**Anaplastic thyroid cancer**
Medullary thyroid cancer		
T1, N0, M0		Stage I
T2–T4, N0, M0		Stage II
Any T, N1, M0		Stage III
Any T, any N, M1		Stage IV

Cause-specific survival according to pathologic TNM stage



# of ATA risk stratification to estimate risk persistent/recurrent disease

Low-risk	Intermediate-risk	High-risk
No local or distant mts - All macroscopic tumor - has been resected No aggressive histology - No vascular invasion - No ^{131}I uptake outside - the thyroid bed No or ≤5 pathologic LN -	- Microscopic invasion into the perithyroidal tissues - Cervical LN mts - Aggressive histology or vascular invasion - >5 pathologic LN < 3 cm - Multifocal micro-PTC with *BRAF* mutation	- Macroscopic invasion - Incomplete resection with gross residual disease - Distant metastases - High postoperative TG - Pathologic LN>3 cm - FTC with extensive vascular invasion
Lobectomy/Total Thyroidectomy Initial TSH 0.1-0.5 if TG+ 0.5-2.0 if TG- or after lobectomy Radioiodine ablation not routinely recommended	Total thyroidectomy Initial TSH 0.1-0.5 Radioiodine ablation suggested to selected patients (microscopic or vascular invasion, significant LN mts, aggressive histology)	Total thyroidectomy Initial TSH <0.1 Radioiodine ablation recommended

Monitoring during the first year after thyroid surgery

Low-risk	Intermediate-risk	High-risk
Non-stimulated Tg 6 mo Neck US 6-12 mo Diagnostic WBS - MRI, CT – PET-CT -	Non-stimulated Tg 6 mo Neck US 6-12 mo Diagnostic WBS +/- MRI, CT – PET-CT -	Non-stimulated Tg 6 mo Neck US 6-12 mo Diagnostic WBS +/- MRI, CT, PET-CT if Tg elevated or high clinical suspicion

Excellent response: no clinical, biochemical, or structural evidence of disease

:Biochemical incomplete response
Abnormal Tg or rising Tg antibody values

:Structural incomplete response
Persistent or newly-identified locoregional or distant mts

: **Indeterminate response**
.Nonspecific biochemical or structural findings that can't be classified as either benign or malignant

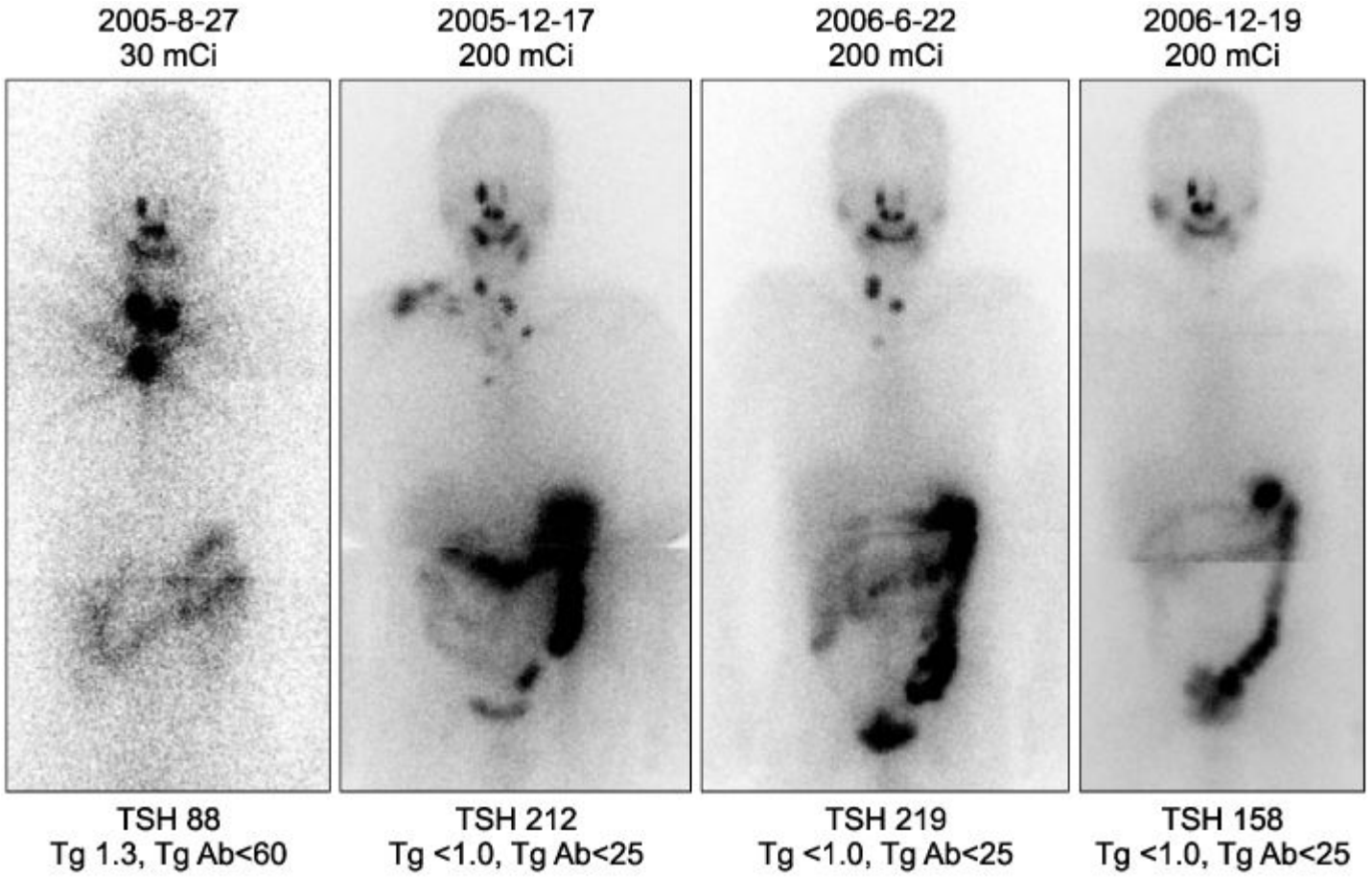
Ongoing monitoring after first year

Indeterminate response	Structural incomplete response	Biochemical incomplete response	Excellent response High-risk patients	Excellent response Low-risk patients	
0.1-0.5	0.1>	0.1-0.5	0.1-0.5	0.5-2	TSH
mo 6-12	mo 6	mo 6	6-12 mo	mo 12-24	Non-stim Tg
mo for 5 y 6-12	yearly for 5 y	yearly for 5 y	y 1/1-2 for 5 years	y 1/3-5	US thyroid
+	-	+	-	-	Stimul. Tg
-	+	-	-	-	Diagnostic WBS

Treatment options for recurrent/metastatic disease

- more extensive resection
- radioiodine, if scans demonstrate uptake
- systemic chemotherapy (thyrosine kinase inhibitors)
- external radiotherapy
- radiofrequency ablation of cervical, osseous, and pulmonary metastases
- palliative embolization of bone metastases

Whole body scan after serial I131 therapies in a patient with PTC



There is no “lucky” cancer.
.Cancer is cancer