



SOLCA
NÚCLEO DE QUITO

**1^{ER} SIMPOSIO INTERNACIONAL DE
CÁNCER DE TIROIDES Y METABOLISMO**



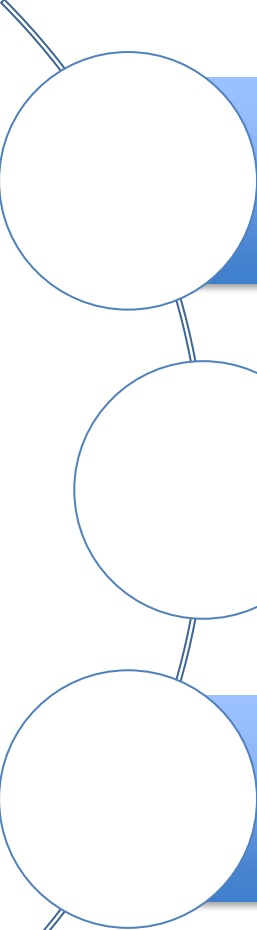
CANCER DE TIROIDES IMAGEN MULTIMODAL Y ESTADIFICACION

Dra. Jenny Chamorro O.

Temática



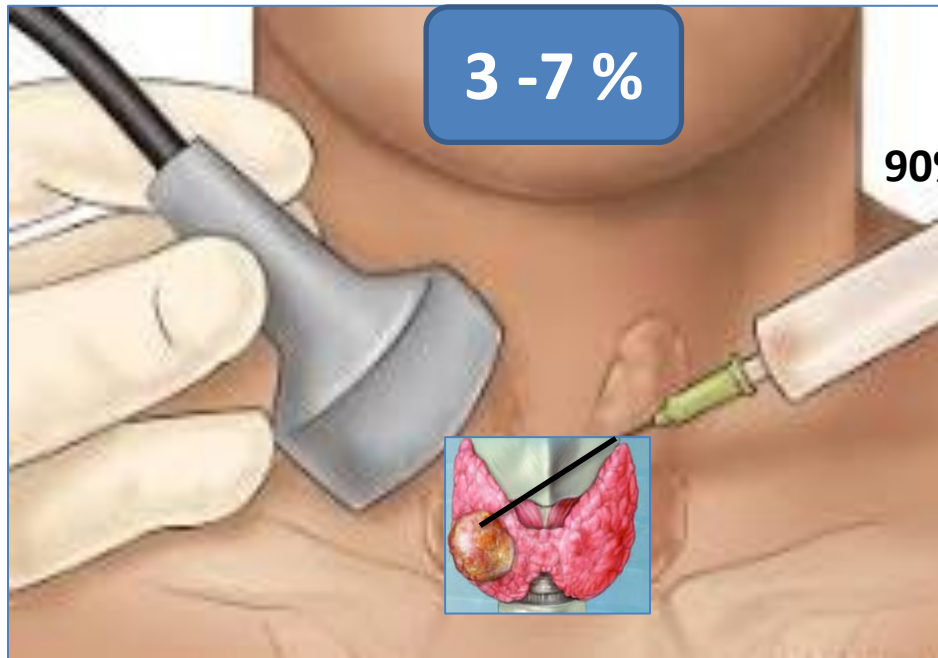
NÚCLEO DE QUITO



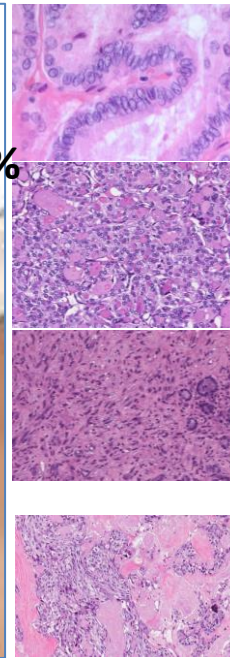
Describir hallazgos de imagen relevantes para el manejo clínico y quirúrgico.

Revisión de la clasificación TNM actualizada.

Introducción



90%



Papilar 81%. SV 99%

Folicular 12%. SV 95%

Anaplásico 2%. SV 8%

Medular 5%. SV 82%

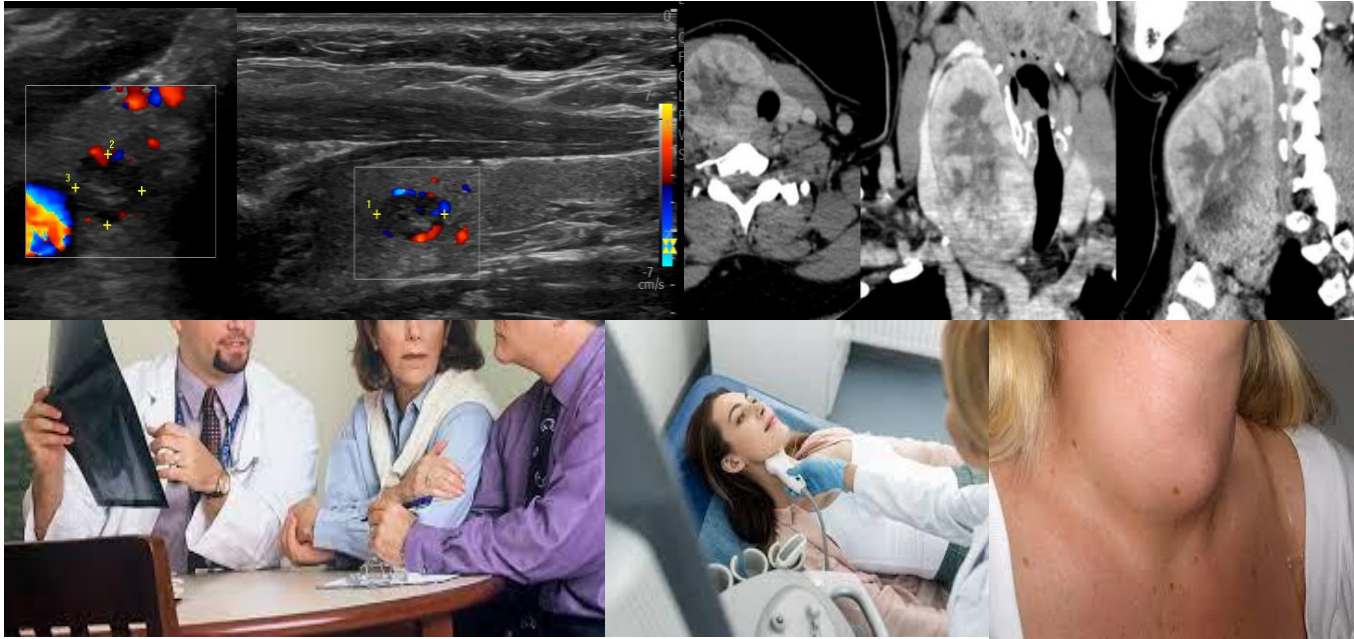
Edad > 60

Metástasis CDT 10%

Mortalidad mCDT 65 y 75 % a 5 y 10 a

Neuroimag Clin N Am 31 (2021) 285–300
Endocrine-Related Cancer (2022) 30, e220293

Métodos de imagen



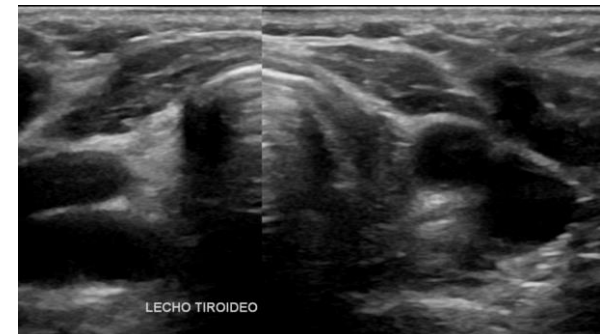
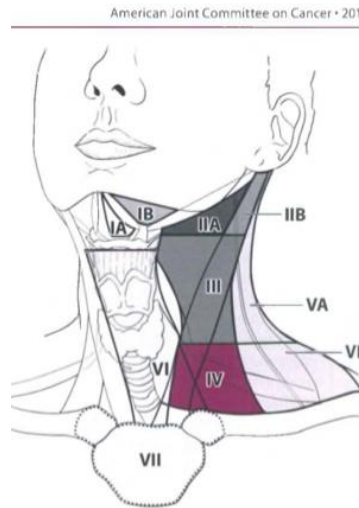
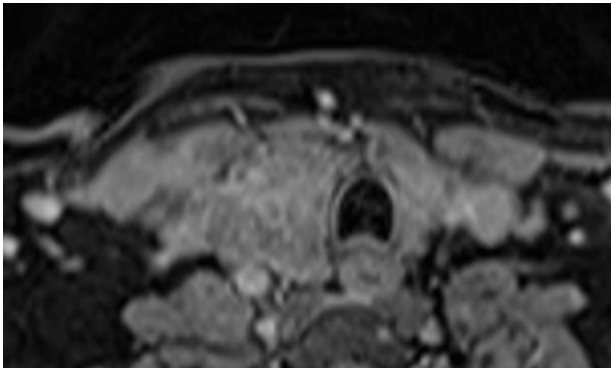
- Planificación quirúrgica
- Vigilancia de rutina
- Evaluación de la sospecha de recurrencia

Imagen prequirúrgica

EET

N2
> 8 mm

Cirugía
CDT: T y N



ACR. Criterios apropiados

Variant 5. Preoperative evaluation of differentiated thyroid cancer.

Procedure	Appropriateness Category	Relative Radiation Level
US thyroid	Usually Appropriate	0
CT neck with IV contrast	Usually Appropriate	☼☼☼
MRI neck without and with IV contrast	May Be Appropriate	0
CT neck without IV contrast	May Be Appropriate	☼☼☼
MRI neck without IV contrast	May Be Appropriate	0
FDG-PET/CT whole body	Usually Not Appropriate	☼☼☼☼
CT neck without and with IV contrast	Usually Not Appropriate	☼☼☼
I-123 scan whole body	Usually Not Appropriate	☼☼☼
I-131 scan whole body	Usually Not Appropriate	☼☼☼☼
In-111 somatostatin receptor scintigraphy whole body	Usually Not Appropriate	☼☼☼☼

J Am Coll Radiol 2019;16:S300-S314.

ACR. Criterios apropiados

Variant 7. Suspected recurrence of differentiated thyroid cancer.

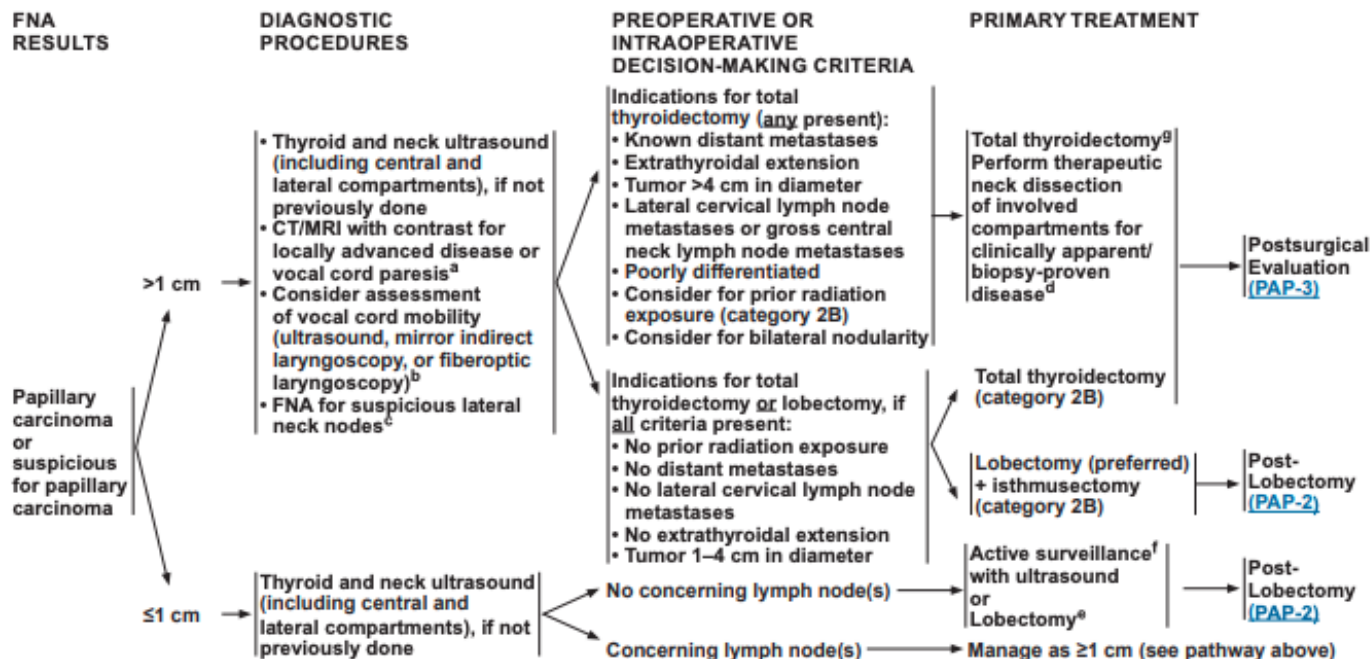
Procedure	Appropriateness Category	Relative Radiation Level
CT neck with IV contrast	Usually Appropriate	⚡⚡⚡
US thyroid	Usually Appropriate	0
I-123 scan whole body	Usually Appropriate	⚡⚡⚡
MRI neck without and with IV contrast	Usually Appropriate	0
CT chest with IV contrast	May Be Appropriate	⚡⚡⚡
CT chest without IV contrast	May Be Appropriate	⚡⚡⚡
FDG-PET/CT whole body	May Be Appropriate	⚡⚡⚡⚡
I-131 scan whole body	May Be Appropriate	⚡⚡⚡⚡
CT neck without IV contrast	May Be Appropriate	⚡⚡⚡
MRI neck without IV contrast	May Be Appropriate	0
CT chest without and with IV contrast	Usually Not Appropriate	⚡⚡⚡
CT neck without and with IV contrast	Usually Not Appropriate	⚡⚡⚡
In-111 somatostatin receptor scintigraphy whole body	Usually Not Appropriate	⚡⚡⚡⚡



NCCN Guidelines Version 4.2023

Thyroid Carcinoma – Papillary Carcinoma

NCCN Evidence Blocks™



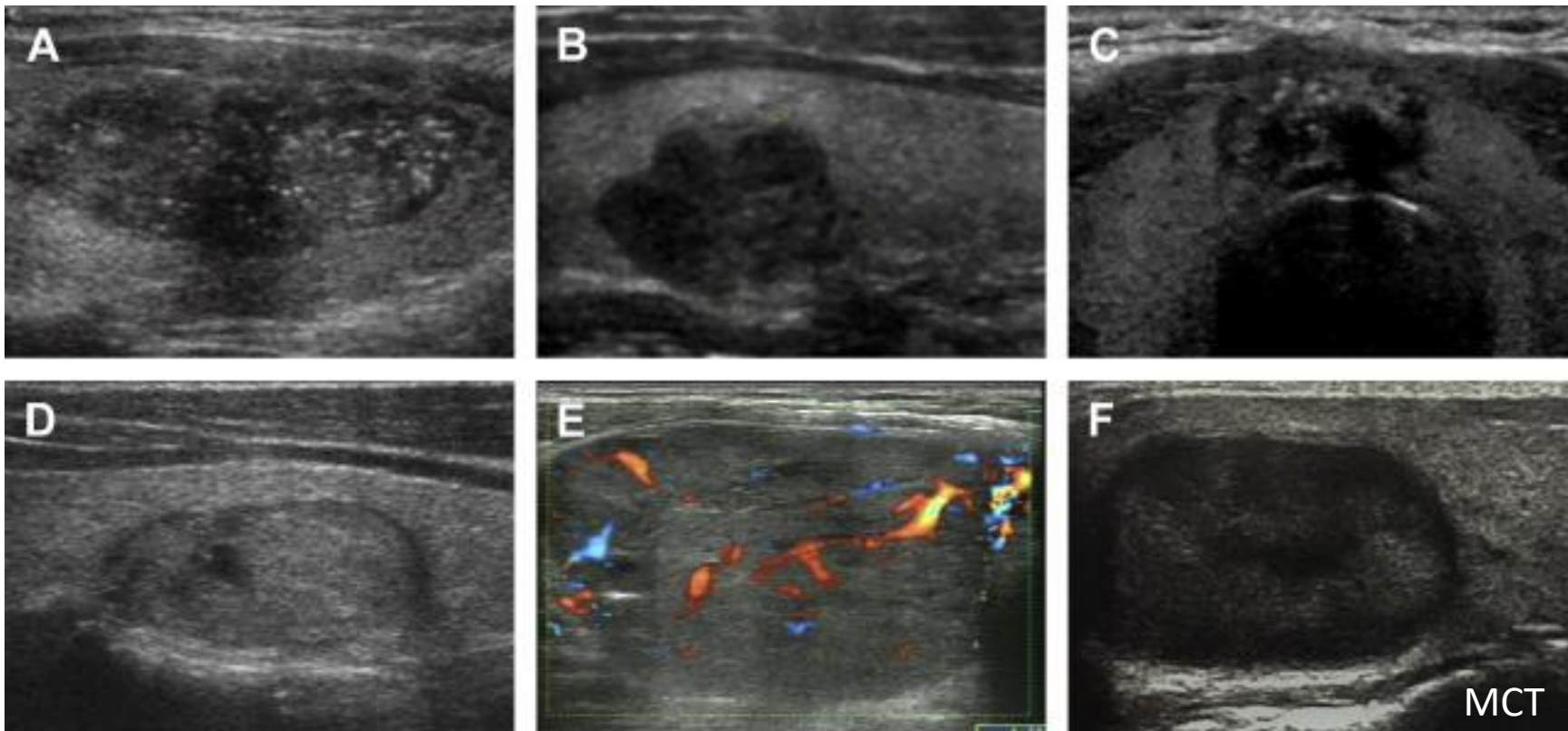
^a Use of iodinated contrast is required for optimal cervical imaging using CT; potential delay in radioactive iodine (RAI) treatment will not cause harm.
^b Vocal cord mobility should be examined in patients if clinical concern for involvement, including those with abnormal voice, surgical history involving the recurrent laryngeal or vagus nerves, invasive disease, or bulky disease of the central neck. Evaluation is imperative in those with voice changes.

^c Tg washout is useful in diagnosis of lymph node metastases and recommended if cytology is negative.
^d Routine prophylactic central neck dissection is not indicated in most papillary thyroid cancers.
^e Posterior location, abutting the trachea or apparent invasion, etc.
^f [Principles of Active Surveillance for Low-Risk Papillary Thyroid Cancer \(THYR-D\)](#)
^g If otherwise low risk pathology, lobectomy without completion is an appropriate option.

Ecografía



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Detección, estadificación, seguimiento y vigilancia

EET, multifocalidad y morfología GL

20% mas metástasis

Malignidad S 80-86% y E 84.5 - 95%

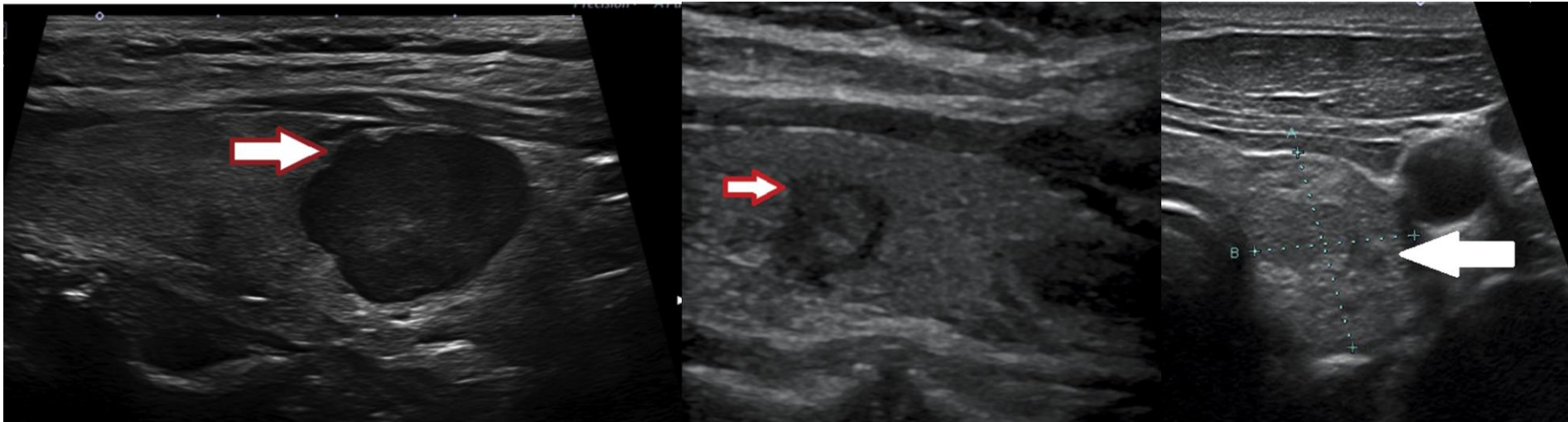
Radiol Clin N Am 55 (2017) 1261–1271

Ecografía



CPT

SG 10 a: 95%



Radiologic Clinics of North America, 2020, Volumen 58, Número 6, Páginas 1059-1070.

Neuroimag Clin N Am 31 (2021) 285–300

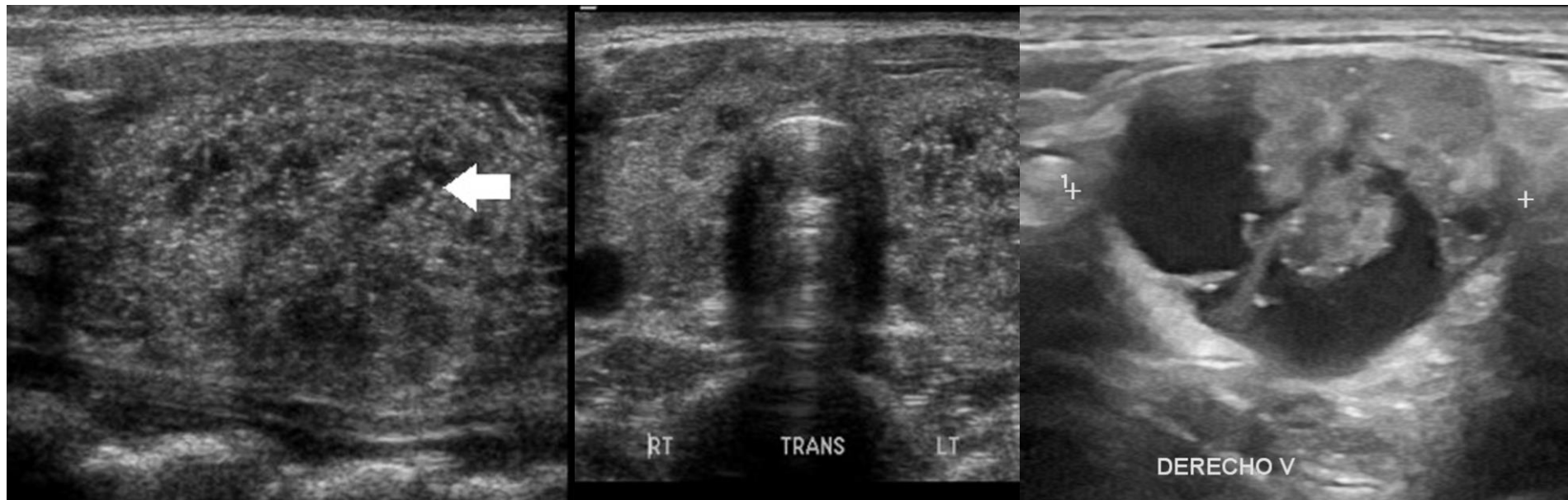
Ecografía



CPT

26-79%

Metástasis ganglionares: 40%



Neuroimag Clin N Am 31 (2021) 285–300

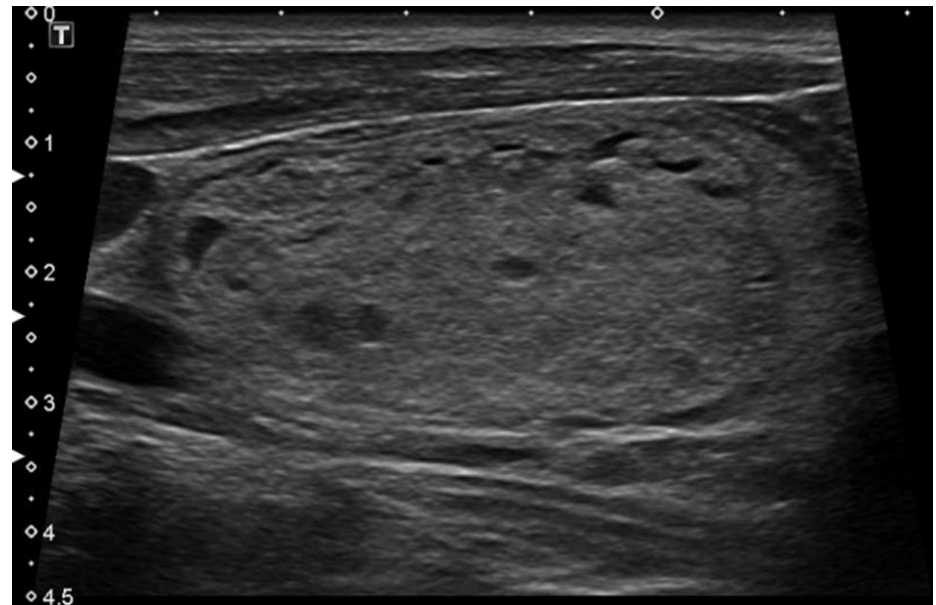
Ecografía



CFT

- **Diseminación hematógica a pulmón y huesos: 1/3 de pacientes al momento del diagnóstico.**
- **Calcificación en cascara de huevo y macrocalcificaciones 15-20%.**
- **Halo hipoecoico: 87% ATA**

SG 10 a: 85%



Radiologic Clinics of North America, 2020, Volumen 58, Número 6, Páginas 1059-1070.

Neuroimag Clin N Am 31 (2021) 285–300

Endocrine Practice 2016;22(Suppl 1):1–60

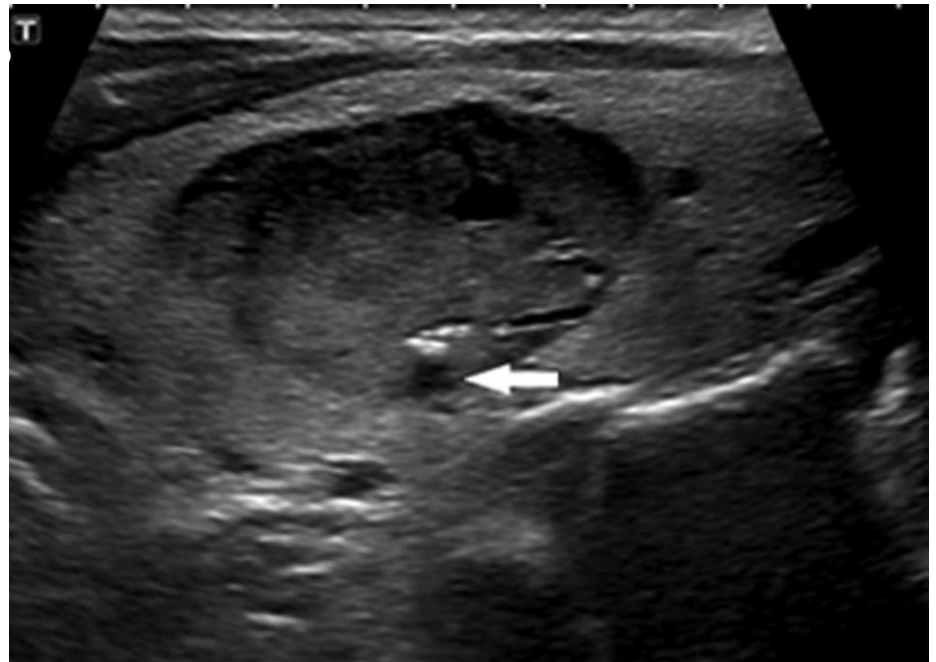
Ecografía



CMT

- Mortalidad 13.4%
- 25% asociados a mutaciones del gen RET
- Calcificaciones gruesas
- Microcalcificaciones + nódulo irregular, asocian metástasis ganglionar.
- Al diagnóstico, 35% de pacientes tienen EET o enfermedad ganglionar
- 13%: metástasis a distancia.
- US, TAC, RM y PET CT

SG 10 a: 75%



Neuroimag Clin N Am 31 (2021) 285–300

Endocrine Practice 2016;22(Suppl 1):1–60

ACR. Criterios apropiados



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Variant 8. Suspected recurrence of medullary thyroid cancers.

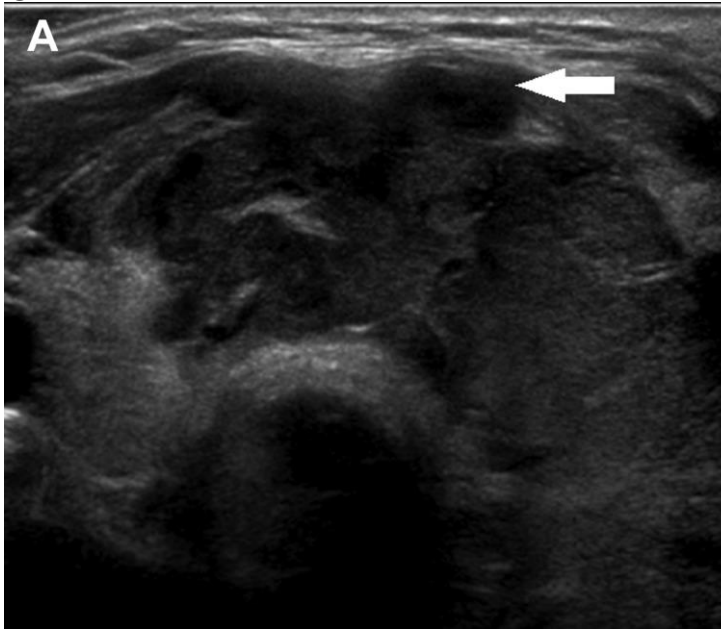
Procedure	Appropriateness Category	Relative Radiation Level
US thyroid	Usually Appropriate	0
CT neck with IV contrast	Usually Appropriate	☼☼☼
CT chest with IV contrast	Usually Appropriate	☼☼☼
MRI neck without and with IV contrast	Usually Appropriate	0
CT abdomen with IV contrast	May Be Appropriate	☼☼☼
CT abdomen without and with IV contrast	May Be Appropriate	☼☼☼☼
MRI abdomen without and with IV contrast	May Be Appropriate	0
MRI complete spine without and with IV contrast	May Be Appropriate	0
Tc-99m bone scan whole body	May Be Appropriate	☼☼☼
CT chest without IV contrast	May Be Appropriate	☼☼☼
CT neck without IV contrast	May Be Appropriate	☼☼☼
FDG-PET/CT whole body	May Be Appropriate	☼☼☼☼
MRI abdomen without IV contrast	May Be Appropriate	0
MRI complete spine without IV contrast	May Be Appropriate	0
MRI neck without IV contrast	May Be Appropriate	0
CT abdomen without IV contrast	Usually Not Appropriate	☼☼☼
CT chest without and with IV contrast	Usually Not Appropriate	☼☼☼
CT neck without and with IV contrast	Usually Not Appropriate	☼☼☼
Ga-68 DOTATATE PET/CT skull base to mid-thigh	Usually Not Appropriate	☼☼☼☼
I-123 scan whole body	Usually Not Appropriate	☼☼☼
I-131 scan whole body	Usually Not Appropriate	☼☼☼☼
In-111 somatostatin receptor scintigraphy whole body	Usually Not Appropriate	☼☼☼☼

Ecografía-TACc



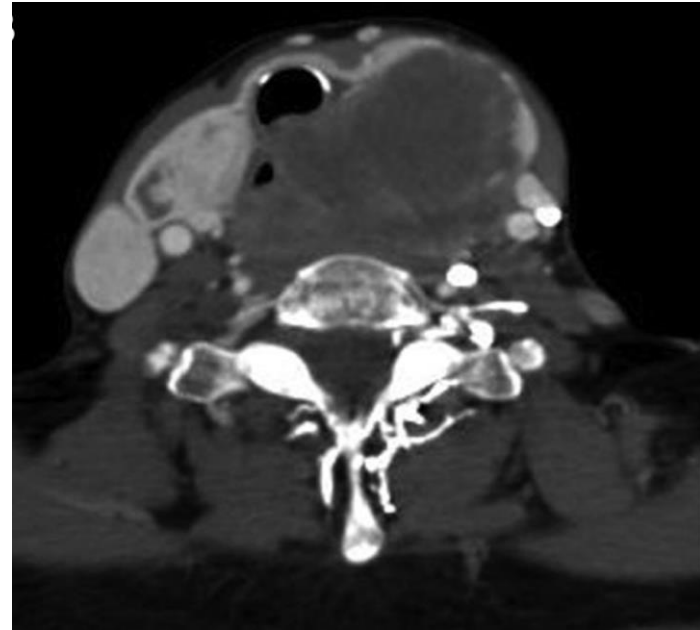
CAT

A



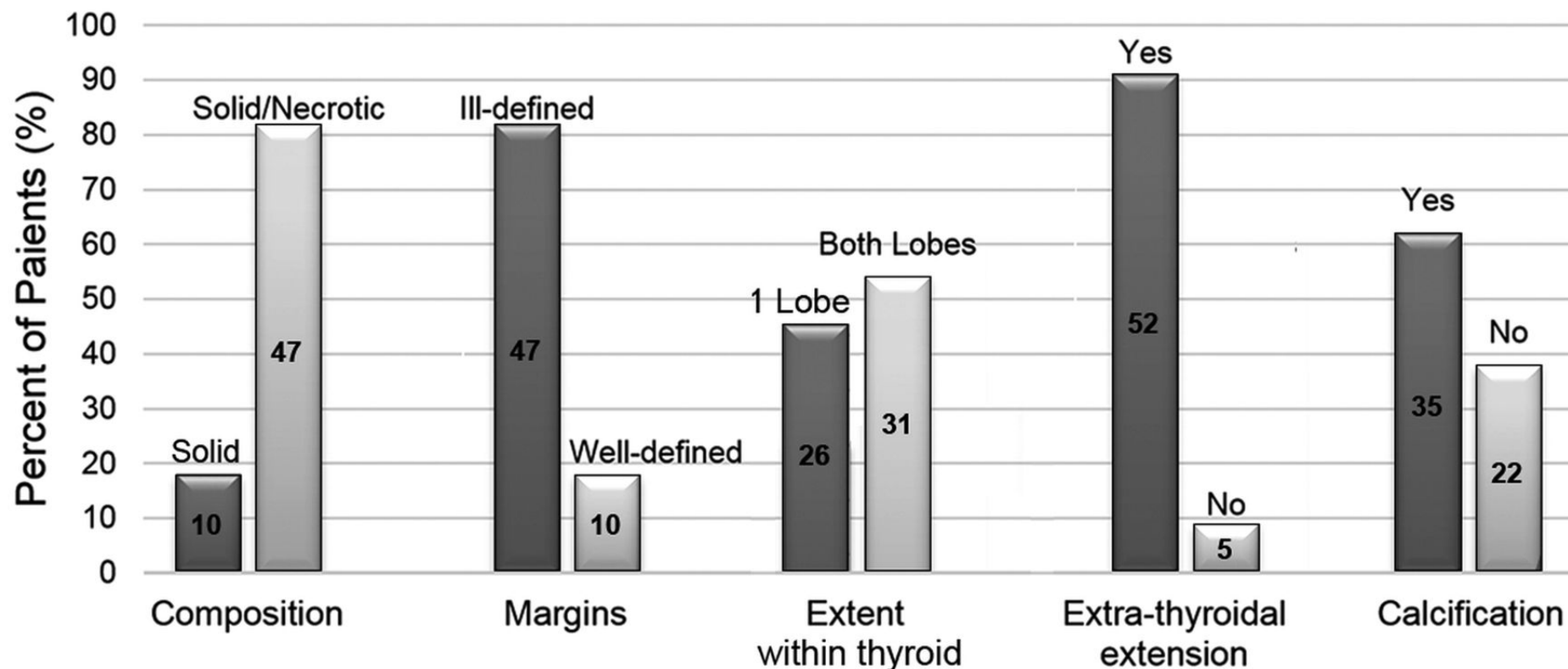
Evaluar resecabilidad

SV MEDIA 5 m. SV 1 a: 20%



Anaplastic Thyroid Cancer Characteristics

n = 57



Tomografía



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Contrastada

Complementaria a la ecografía

VI y VII, retrofaringeo



SOSPECHA CLINICA DE
ENFERMEDAD AVANZADA

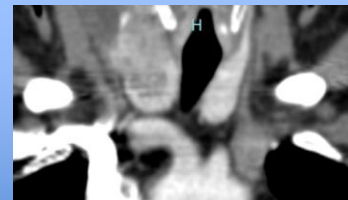


AFECTACION LARINGEA,
TRAQUEA, ESOFAGO Y
VASCULAR



DELIMITA EXTENSION
EXTRAGANGLIONAR

TAC

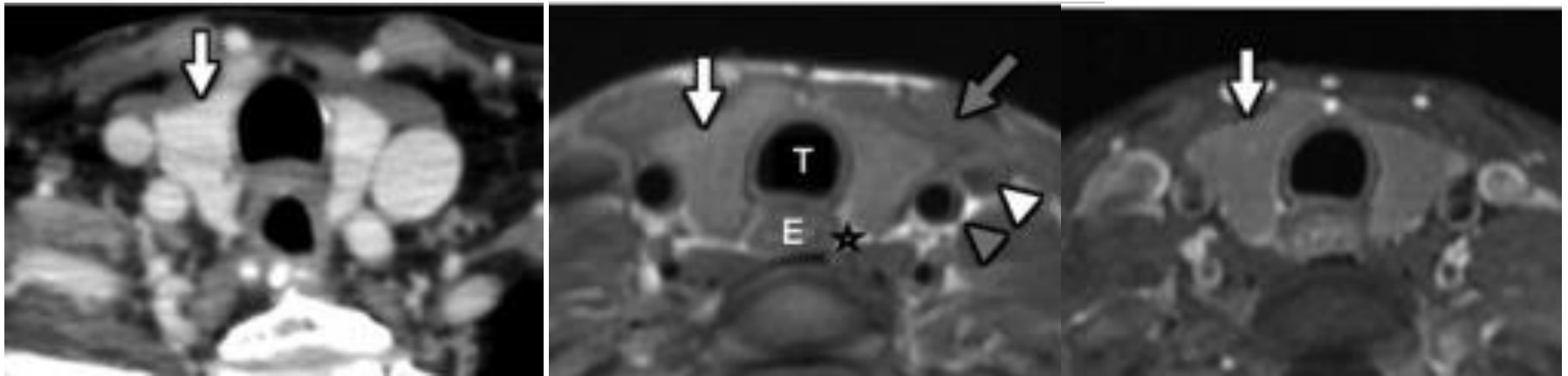


DEFINIR BORDE INFERIOR

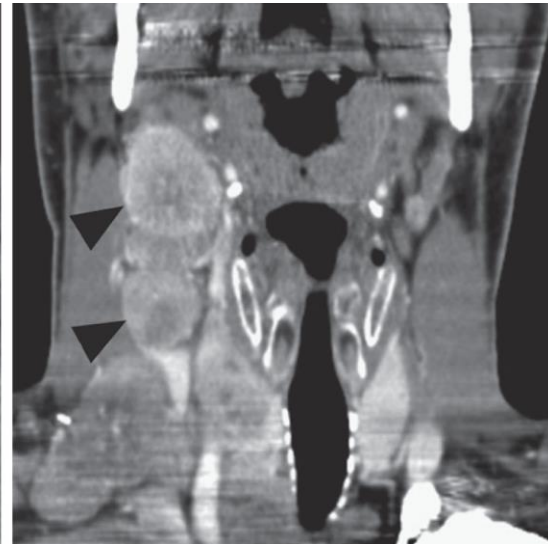
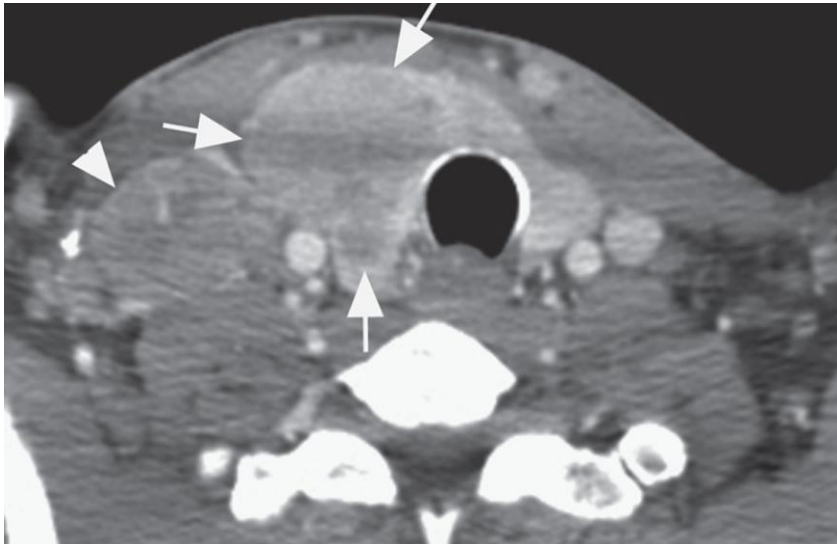
TAC -RM



NÚCLEO DE QUITO



CPT

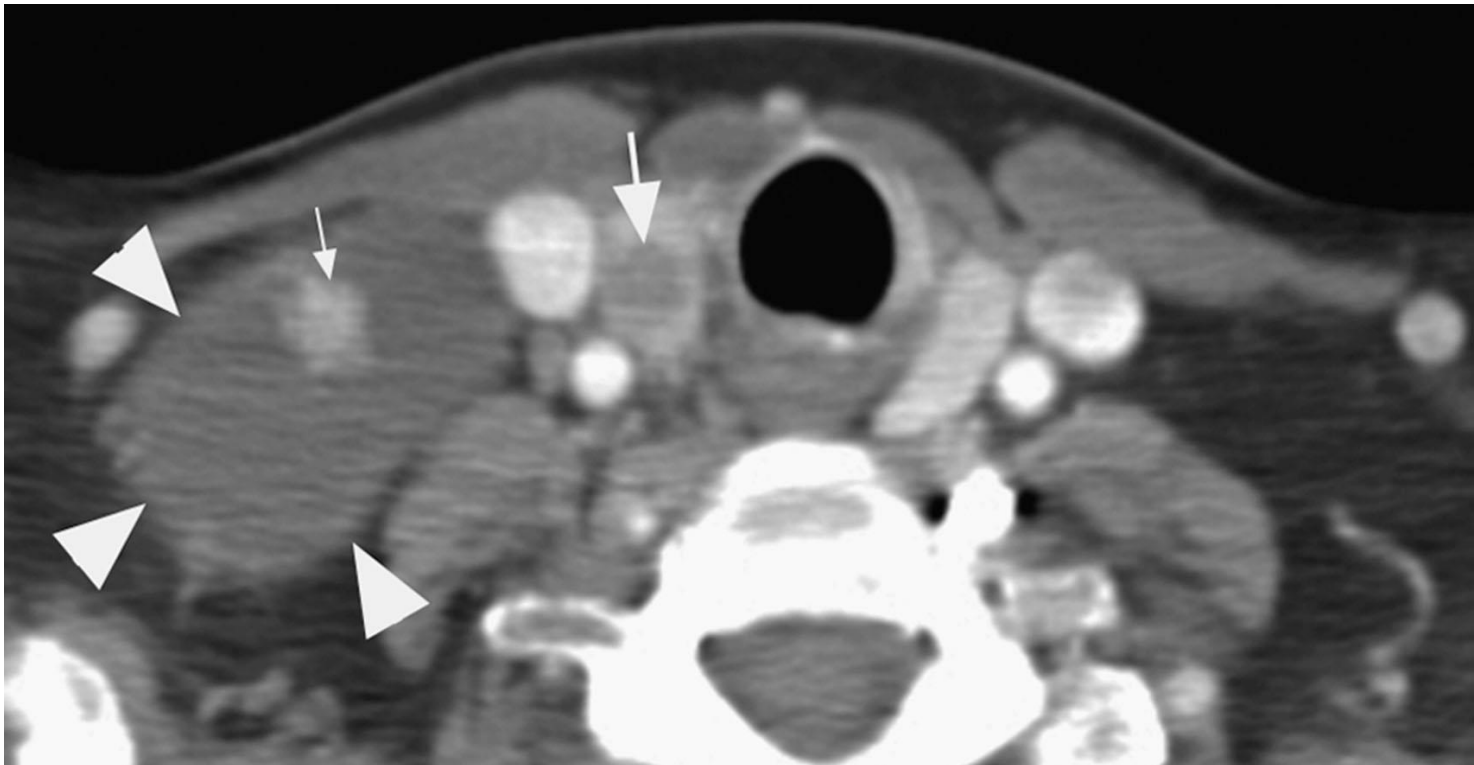


TAC - RM



CPT

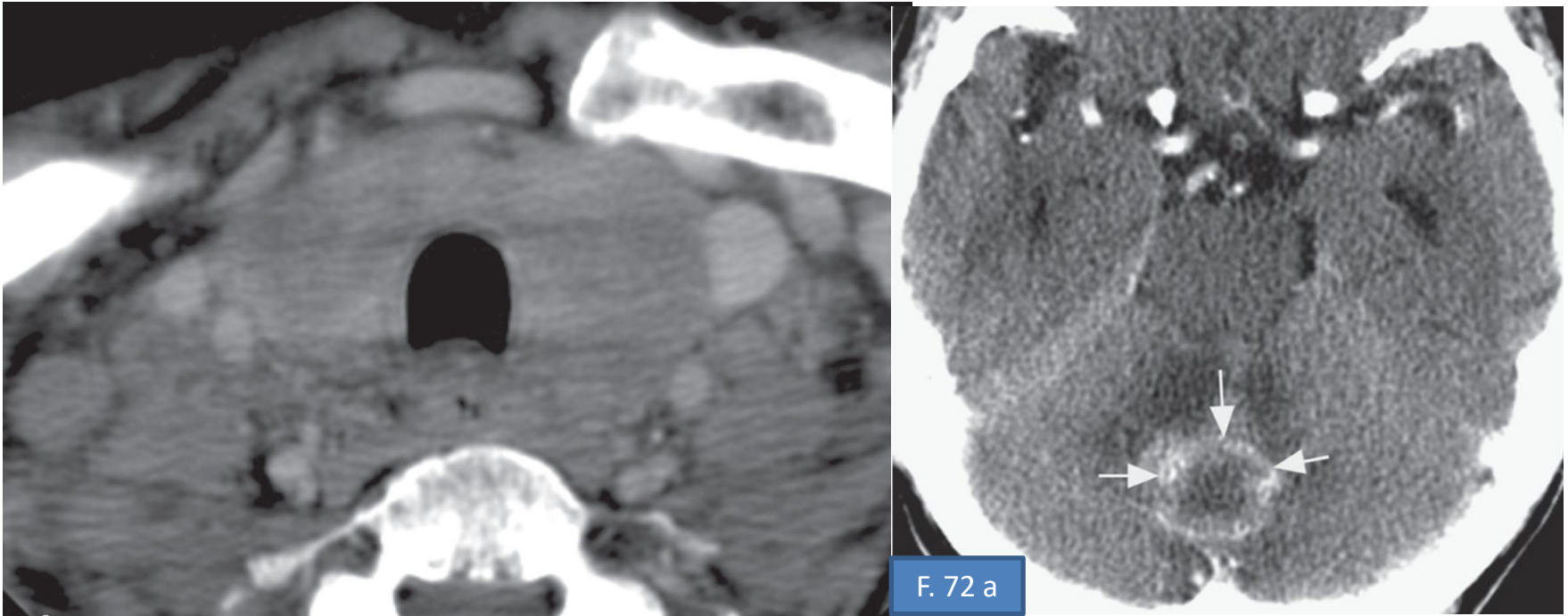
N1 QUISTICAS



TAC - RM



CFT



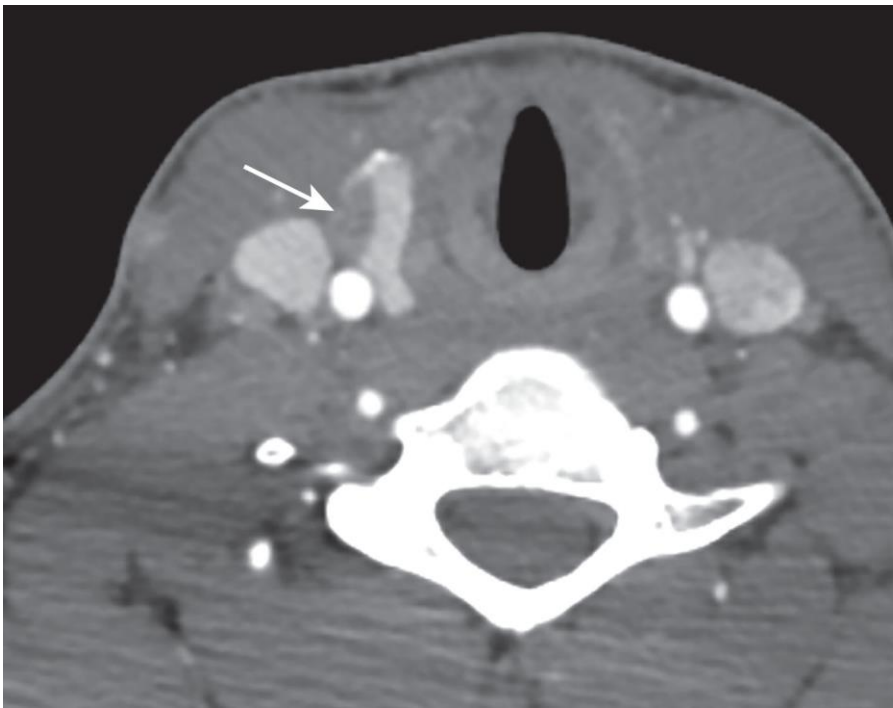
Oncologic Imaging, 2023, Imagens de la tiroides, Cap 36, pag 616-629

TAC - RM



CMT

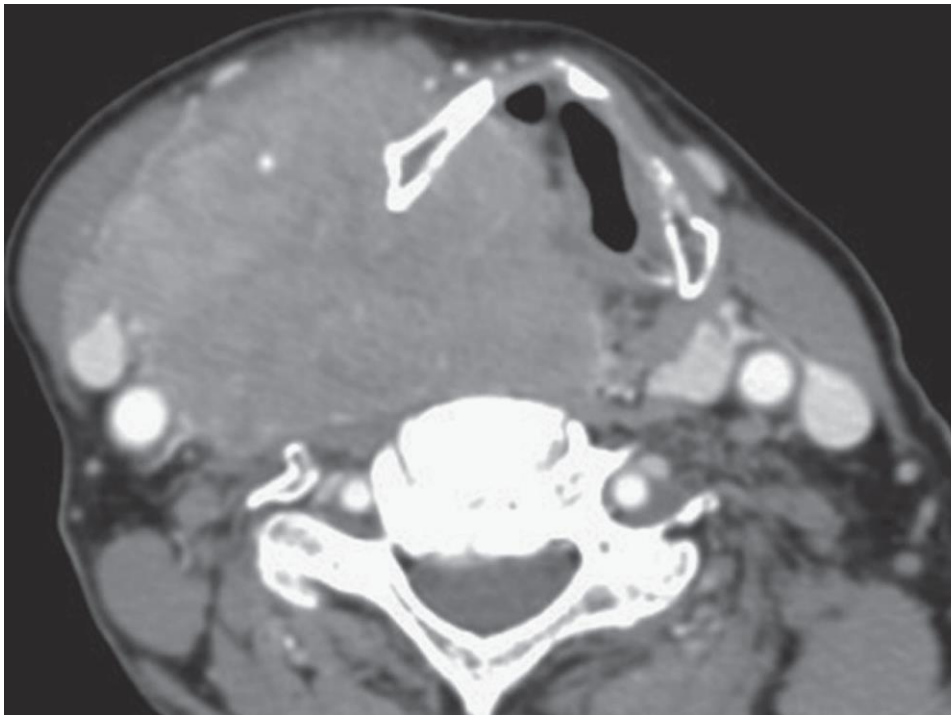
M, 16 a



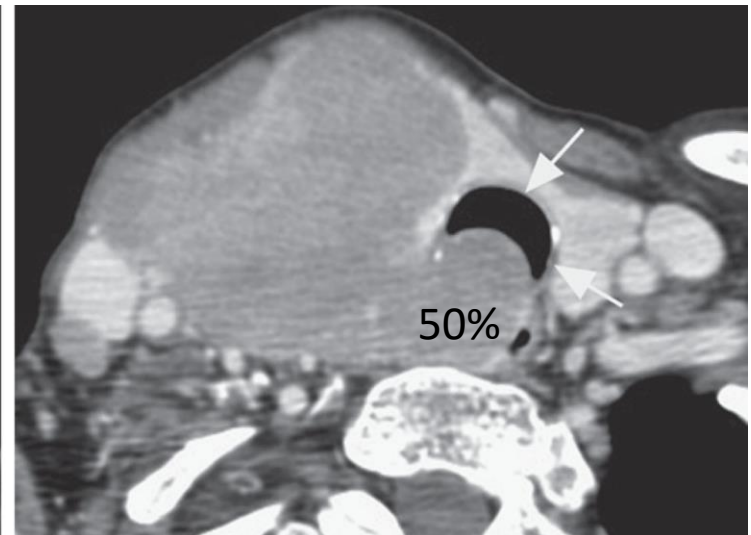
TAC - RM



CAT



M, 76 a



When T is...	And N is...	And M is...	Then the stage group is...
T1-T3a	N0/NX	M0	IVA
T1-T3a	N1	M0	IVB
T3b	Any N	M0	IVB
T4	Any N	M0	IVB
T1-T4	Any N	M1	IVC

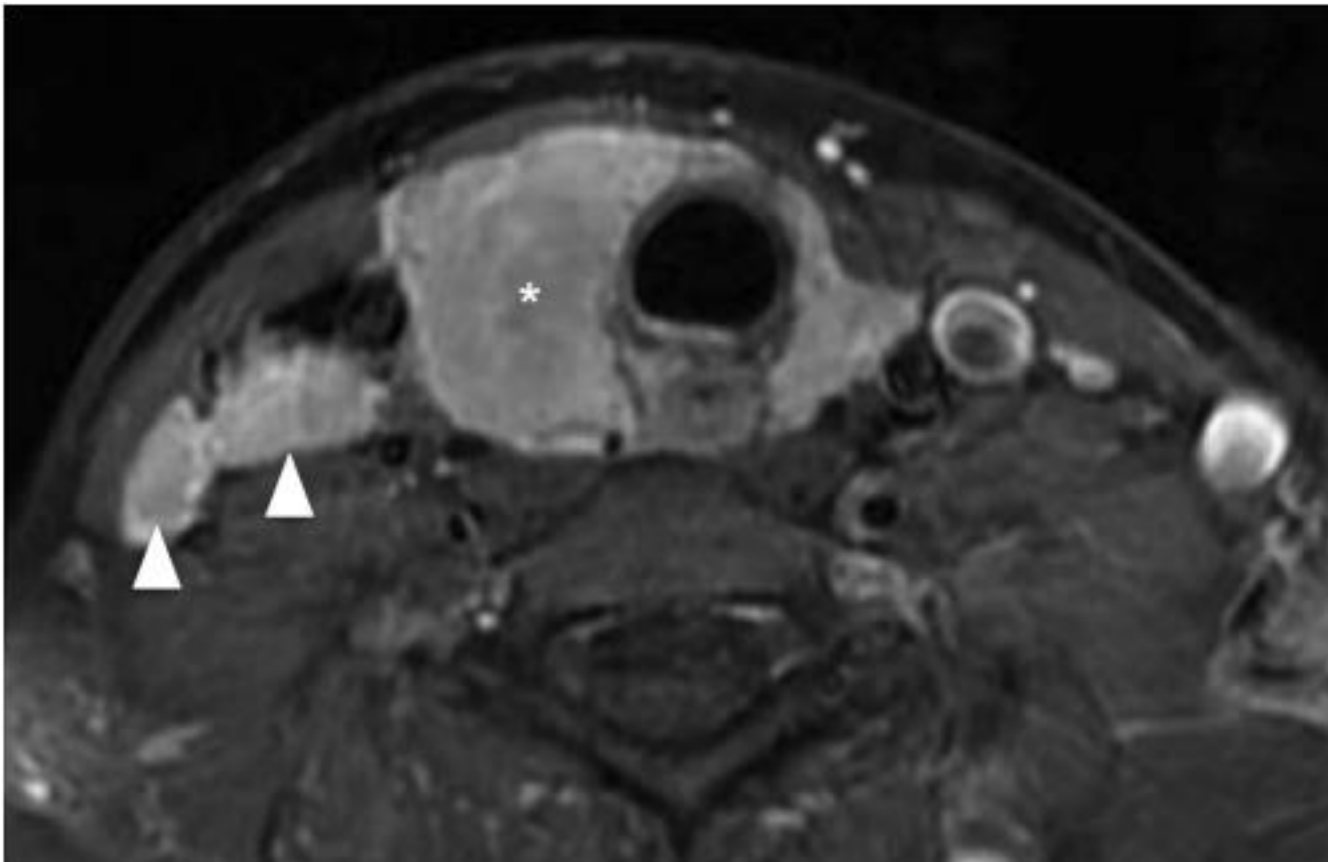
EET 64%, N: 18% y metástasis a distancia 50%: pulmón 90%, hueso 15% y cerebro 15%.

CAT son considerados E IV A, B o C



- US cuello: valorar rápidamente la extensión tumoral y la invasión.
- La TC cabeza, cuello, tórax, abdomen y pelvis pueden determinar con precisión la extensión del tumor tiroideo e identificar la invasión tumoral de los grandes vasos y las estructuras del tracto aerodigestivo superior.
- PET-CT o MRI son recomendados para estadificar con precisión al paciente.
- Las metástasis óseas son usualmente líticas.
- Los CAT clínicamente aparentes son con frecuencia irresecables.
- .Enfermedad confinada al cuello tienen sobrevida de 8 m y enfermedad que se extiende mas allá del cuello 3 m.
- Variables que predicen aún peor pronóstico, mayor edad al diagnóstico, metástasis a distancia, GB >10.000m y disnea . Terapia dirigida e inmunoterapia se asocian a incremento de la sobrevida.
- Factores pronósticos desfavorables: síntomas disfonia, disfagia, disnea y rápido crecimiento tumoral en menos de 1 mes leucocitosis, TT>5 cm y metástasis a distancia.

TAC - RM



Vigilancia

- Ecografía posquirúrgica temprana dentro de 6 a 12 meses.
- Las imágenes adicionales dependen de la extensión de la enfermedad y la cirugía.
- En pacientes con tiroidectomía total, la extensión de la enfermedad residual no se puede determinar en la cirugía o ecografía por lo que la WBS ayuda a determinar si el paciente debe recibir RAI y en que cantidad.

Vigilancia



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- 
- **Imagen + Tiroglobulina sérica + Anticuerpos antitiroglobulina ayudan a clasificar a los pacientes en grupos de riesgo según la respuesta al tratamiento.**

- 
- Excelente respuesta al tratamiento , riesgo de recurrencia bajo (<5%) en pacientes de bajo riesgo o intermedio.
 - Tg baja, no están indicadas las imágenes adicionales.

- 
- Las categorías de riesgo de recurrencia de la ATA ayudan a guiar las imágenes.
 - Excelente respuesta inicial, el riesgo de recurrencia es 1-2% en pacientes de bajo riesgo, de 2-4% en riesgo intermedio y 14% en alto riesgo.

Recurrencia

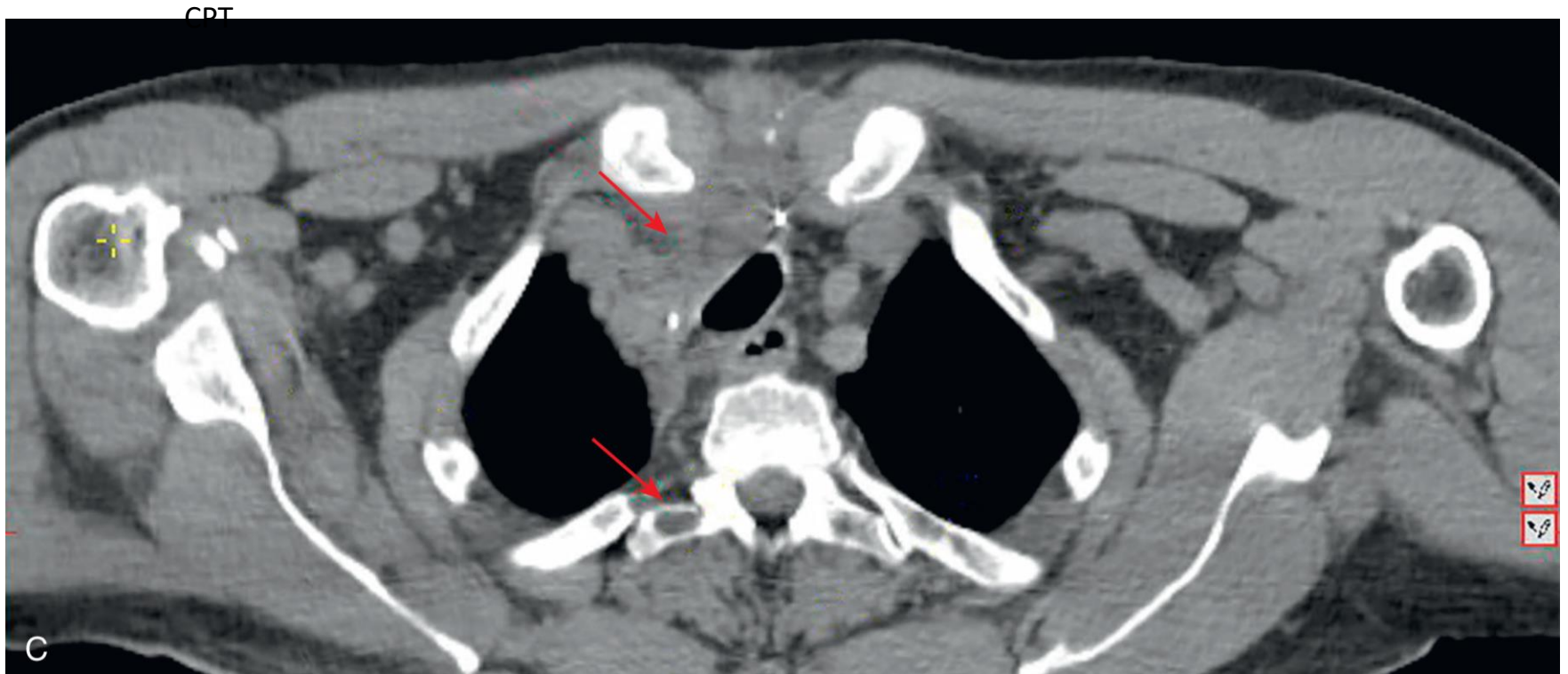
TC tórax: CDT de alto riesgo, TG >10 ng/mL o Ac anti Tg elevados y estudios de cuello (-)

RM cuello para recurrencia en el lecho y evaluar ganglios

CMT: seguimiento calcitonina y ACE.

Calcitonina > 159 pg/ml: metástasis fuera del cuello. TC cuello y tórax. TC trifásica de abdomen o RM columna.

Imágenes de vigilancia



ATA. Sistema de estratificación de riesgo

AR

EET

**Resección tumoral
incompleta**

Metástasis distante

GL > 3 cm

**Tg sérica postquirúrgica
elevada**

CFT con IV extensa

RI

Histología agresiva

EETm

CPT con IV

Metástasis ávidas a I.

1-5 GL <3 cm

**Microcarcinoma
papilar multifocal con
EET o variante BRAF.**

BR

CPT sin metástasis

Resección completa

Intratiroideo

Sin histología agresiva

**No metástasis avida en I a
exploracion**

NO IV

**No afectación GL o 5
micrometatsais <0.2 cm**

**Variante folicular
encapsulada, intratiroidea,
bien diferenciada, con
invasion capsular e IV minima
o nula < 4 focos.**

**Microcarcinoma papilar
intratiroideo, unifocal,
multifocal y secuencia RA**

- El pronóstico está asociado con el tamaño del tumor.
- Los tumores pequeños suelen tener un pronóstico excelente, con baja probabilidad de recurrencia.
- En un estudio, la tasa de mortalidad relacionada con el cáncer a 20 años fue:
 - 6% con diámetro del tumor primario de 2 a 3.9 cm.
 - 16% con tumores de 4 a 6.9 cm.
 - 50% con tumores de 7 o más cm.
- La invasión extratiroidea aumenta en 5 v el riesgo de muerte y puede causar una morbilidad sustancial si hay afectación de la tráquea, esófago, nervio laríngeo recurrente o columna.
- 2 – 10% de los pacientes con cáncer de tiroides tienen metástasis al diagnóstico, 2/3 son pulmonares, 1/4 óseas. Raros: cerebro, riñones, hígado y glándulas adrenales.

T



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<i>T Category</i>	<i>T Criteria</i>
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 into major neck structures
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 carotid artery or mediastinal vessels from a tumor of any size
<i>Note:</i> All categories may be subdivided: (s) solitary tumor and (m) multifocal tumor (the largest tumor determines the classification).	

[Thyroid. 2017 Jun 1; 27\(6\): 751–756.](#)

N - M



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<i>N Category</i>	<i>N Criteria</i>
NX	Regional lymph nodes cannot be assessed
N0	No evidence of regional lymph nodes metastasis
N0a*	One or more cytological or histologically confirmed benign lymph node
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

<i>M Category</i>	<i>M Criteria</i>
M0	No distant metastasis
M1	Distant metastasis

[Thyroid. 2017 Jun 1; 27\(6\): 751–756.](#)

Differentiated thyroid cancer

<i>When age at diagnosis is...</i>	<i>And T is...</i>	<i>And N is...</i>	<i>And M is...</i>	<i>Then the stage group is...</i>
< 55 yrs	Any T	Any N	M0	I
	Any T	Any N	M1	II
≥ 55 yrs	T1	N0/NX	M0	I
	T1	N1	M0	II
	T2	N0/NX	M0	I
	T2	N1	M0	II
	T3a/T3b	Any N	M0	II
	T4a	Any N	M0	III
	T4b	Any N	M0	IVA
	Any T	Any N	M1	IVB

Anaplastic thyroid cancer

<i>T is...</i>	<i>And N is...</i>	<i>And M is...</i>	<i>Then the stage group is...</i>
T1-T3a	N0/NX	M0	IVA
T1-T3a	N1	M0	IVB
T3b	Any N	M0	IVB
T4	Any N	M0	IVB
Any T	Any N	M1	IVC

Estratificación del riesgo perioperatorio

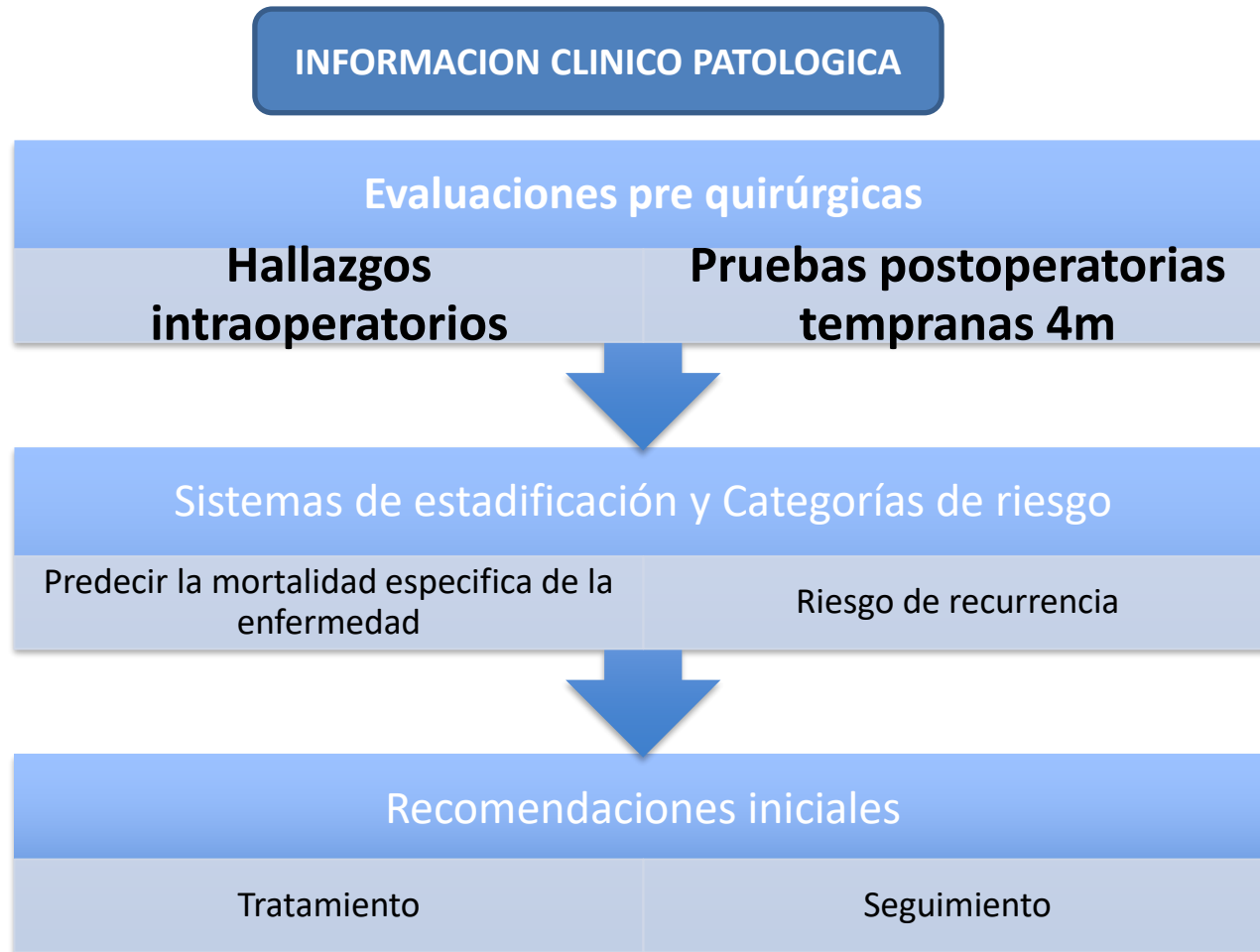


TABLE 1. RISK STRATIFICATION

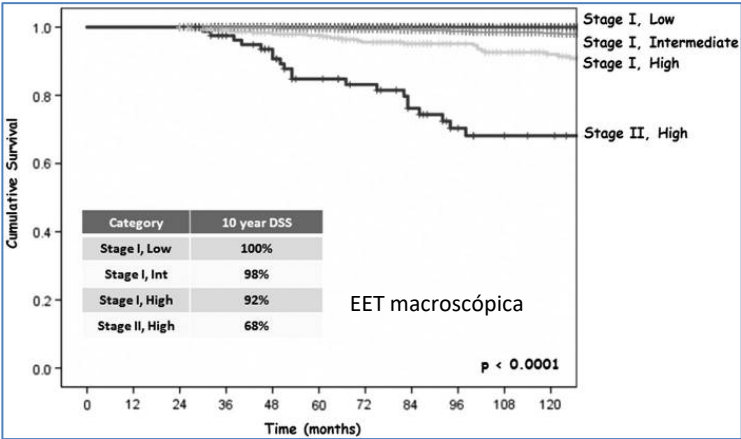
	<i>AJCC eighth edition</i>	<i>ATA 2015</i>	<i>Theranostic</i>
Primary risk factors			
Basic histology (DTC vs. anaplastic vs. MTC)	✓	✓	✓
Age at diagnosis <55 vs. ≥55 years	✓		
Primary tumor size <4 cm vs. ≥4 cm	✓		
Presence or absence of lymph node metastasis	✓	✓	
Presence or absence of gross extrathyroidal extension	✓	✓	
Specific structures grossly invaded by tumor	✓		
Incomplete tumor resection (gross residual disease) ^a		✓	
Presence or absence of distant metastasis	✓	✓	
Postoperative thyroglobulin suggestive of distant metastasis ^a		✓	
RAI uptake outside thyroid bed, if performed		✓	✓

Secondary modifying risk factors

Specific age at diagnosis	✓		
Number of metastatic lymph nodes	✓	✓	
Size of metastatic lymph nodes	✓	✓	
Location of metastatic lymph nodes (N1a vs. N1b)	✓		
Size of metastatic foci within metastatic lymph nodes	✓		
Presence or absence of extranodal extension	✓	✓	
Incomplete tumor resection (gross residual disease) ^a	✓		
Subtypes of DTC	✓	✓	
High mitotic index	✓		
Presence of perineural invasion	✓		
Presence or absence of tumor capsule invasion	✓	✓	
Presence or absence of microscopic vascular invasion	✓	✓	
Extent of microscopic capsular and/or vascular invasion			✓
Unifocal vs. multifocal tumor foci	✓	✓	
Postoperative serum thyroglobulin ^a	✓		
RAI uptake outside thyroid bed, if performed ^a		✓	✓
ATA risk category (low, intermediate, or high)	✓		
Mutational status and molecular profile of the tumor		✓	✓

^aConsidered both primary and secondary risk factors.

4881 pcts, 1980=2016, < 55 a, 2 a de seguimiento, 73% F y 96% CPT



DISTRIBUTION BY AJCC STAGE AND ATA RISK CATEGORY IN 4881 DIFFERENTIATED THYROID CANCER PATIENTS <55 YEARS OLD AT DIAGN

AJCC stage	Percent within AJCC stage	ATA risk of recurrence category		
		Low	Intermediate	High
I	98% (4797/4881)	38% (1799/4797)	56% (2692/4797)	6% ^a (306/4797)
II	2% (84/4881)	—	—	100% ^b (84/84)
Total (all stages)	4881	1799	2692	390

^aClassified as ATA high risk on the basis of the presence of gross extrathyroidal extension (any N, T3b/T4a/T4b, M0).

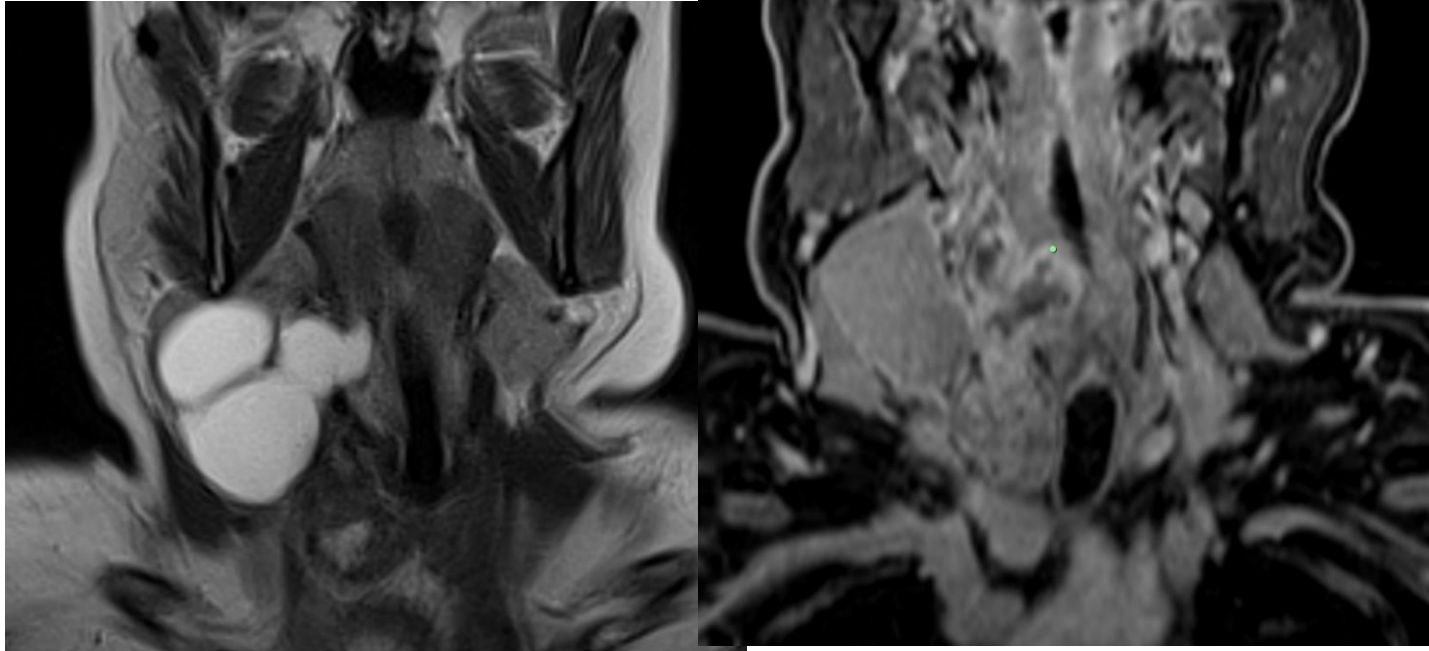
^bClassified as ATA high risk on the basis of M1 disease (any T, any N, M1).

[Thyroid.](#) 2018 Oct 1; 28(10): 1293–1300.

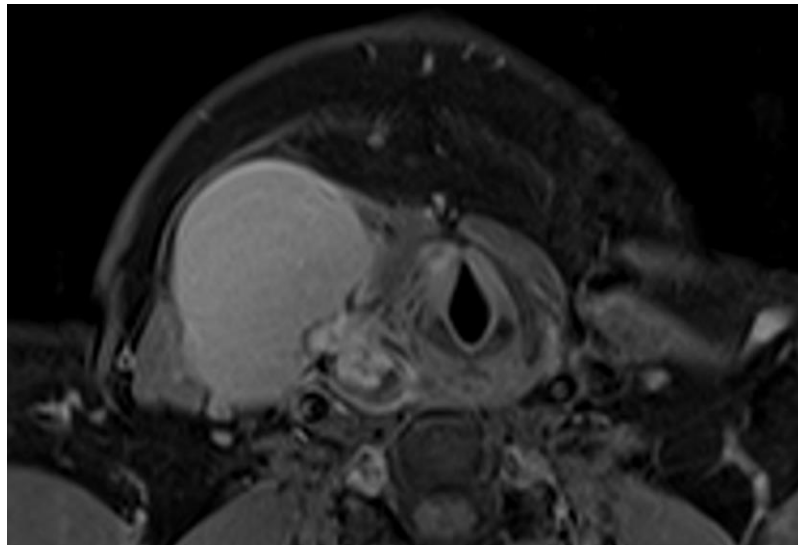
	PTC	FVPTC	FTC	OCA	DHGTC	PDTC
Oncogenic drivers	-BRAFV600E mutation -RET fusion -NTRK fusion	-Encapsulated variant: RAS gene family mutations (NRAS > HRAS > KRAS) -Infiltrative variant: BRAF V600E mutation	-RAS gene family mutations (most prevalent NRAS > HRAS > KRAS) -AKT pathway (PTEN, PIK3CA) -PAX8-PPARG fusion	Mitochondrial DNA (mtDNA) mutations, Chromosome 7-12-17 amplification, RAS, EIF1AX, TERT, TP53, NF1, and CDKN1A mutations	The majority develop from PTC: BRAF V600E mutation + additional genetic changes (TP53, TERT promoter mutations)	The majority develop from FTC: RAS mutations + additional genetic changes (TP53, TERT promoter mutations)
Differentiation	Good	Good	Good	Good	Good	Poor
Grade	Low	Low	Low	Low	High	High
Prevalence	80-90%	25% of PTCs*	10%	4%	-	5%
% with single-organ metastases at presentation [Ref. (12)]	53.9%	ND	11.9%	2.8%	ND	1.6%
% with multi-organ metastases at presentation [Ref. (12)]	38.3%	ND	14.9%	3.1%	ND	1.7%
Prevalent pathway of metastasization	Lymph nodes	Blood Lymph nodes	Blood	Blood	Lymph nodes	Blood
Prevalent metastatic patterns [Ref. (12)]	Distal nodes (30.5%) Lung (53.4%) Bone (28.1%) Liver (8.3%) Brain (4.7%) [Ref. (6)]	Distal nodes 7% encapsulated 65% infiltrative	Bone (> 60%) Lung (> 40%) Liver (< 5%) Brain (> 5%)	Lung (> 60%) Bone (>40%) Liver (10%) Brain (< 5%)	ND	Lung (70%) Bone (40%) Brain (10%)

	SURGERY	RADIATION THERAPY	INTERVENTIONAL RADIOLOGY
Lung	Metastasectomy if slow-progressing lesion (doubling time < 3 years) and good PS	SBRT (e.g. 20-75 Gy in 5-15 fractions) If slow-moderate progressing lesion	RFA If solitary, small (< 3 cm) and/or symptomatic lesions not amenable to surgery, without soft tissue/mediastinum invasion and without contact with large vessels
Bones	Metastasectomy young patients having solitary spinal lesion without non-spinal BMs or other organ metastases Spinal stabilization + SBRT If pathological or impending fracture risk and spinal cord compression with or without vertebral fracture	SABR/SBRT Inoperable bone lesions associated with pain or high fracture risk	Embolization Prior to surgical resection of bone metastases to reduce the intraoperative bleeding risk; it can be combined with SBRT Cementoplasty/vertebroplasty If symptomatic osteolytic spinal metastases at risk of SRE. Vertebroplasty can be combined with RFA RFA/CA to achieve rapid (1 – 7 days) and long-lasting pain control. CA can treat larger lesions than RFA and can be associated with cementoplasty
Liver	Metastasectomy can be considered for solitary and slow-progressing lesions (few data available)	SBRT if RFA/TACE not feasible	RFA* If lesion < 30 mm, distant at least 3 mm from surrounding vessels, well visible on ultrasonography (avoid RFA if lesion at the hilum) TACE* if multiple liver metastases with bilobar liver involvement and adequate arterial vascularization *Techniques can be repeated and combined in case of large and highly vascularized lesions
CNS	Neurosurgery + SRS/SRT If solitary lesion suitable to surgery	SRS (e.g. Gamma Knife) If solitary lesion SRS/SBRT +/- systemic therapy if multiple lesions (n < 10) and good prognostic profile (favorable PS, controlled extra-CNS disease and expected survival > 3 months) WBRT If multiple lesions (n > 10) and uncontrolled extra-CNS disease	ND

Curr Opin Oncol 2023, 35:15–21



M, 65^a
 CPT
 36 mm
 N1
 EC II



F, 51 a, CPT

3 cm :T2



N1b



N1a



EC I

Para tener en cuenta...



NÚCLEO DE QUITO

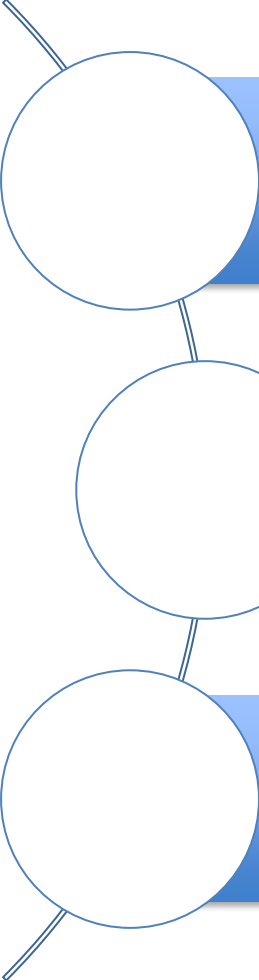


Imagen diagnóstica es fundamental para el estadiaje

La información contenida es decisiva en el manejo.

Atender a la localización y tamaño del tumor primario y a su relación con las estructuras en vecindad y describirlas.



GRACIAS