MEDICINA NUCLEAR: Evaluación y terapia en el cáncer diferenciado de tiroides

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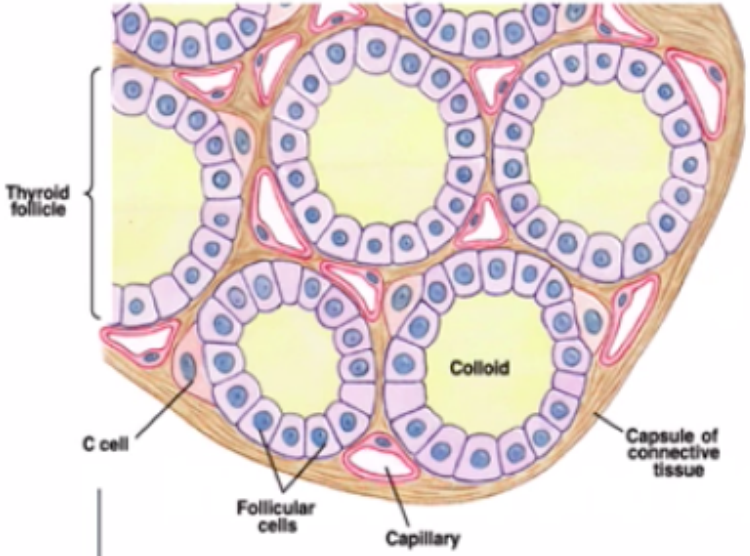
Thyroid malignancy



MTC

DTC

PDTC

APC

Follicular cell-derived	
Differentiated thyroid ca. (DTC)	**80-90%**
▪ Papillary thyroid ca. (PTC)	80-95%
▪ Follicular thyroid ca. (FTC)	5-20%
Poorly-differentiated thyroid ca. (PDTC)	**<5%**
Anaplastic thyroid ca. (ATC)	**<5%**
C cell-derived	
Medullary thyroid ca. (MTC)	**5-10%**
Others	**<1%**
Sarcomas	
Lymphomas	
Metastases (i.e. > renal cancer)	

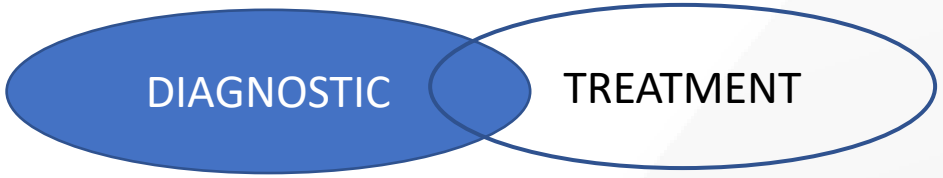
NÚCLEO DE QUITO

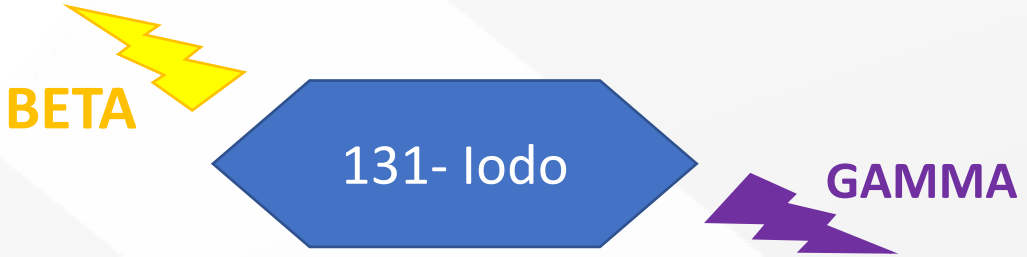
- Sobrevida a 5 años: 99.9% → localizada
  98.3% → enfermedad locoregional
  54.9% → metastásica

- ***BRAF V600E mutation*** reduced expression of all thyroid-specific genes involved in iodine metabolism, resulting in variably decreased responsiveness to 131I.

NÚCLEO DE QUITO

TERAGNOSIS (THERAGNOSTICS)



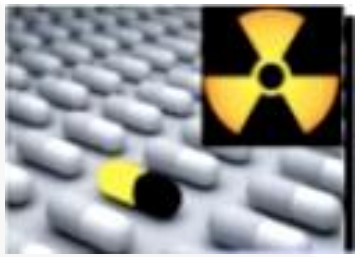


131-Iodo

- Decaimiento: Beta y Gamma
- Radiación Beta: efecto terapéutico (parcialmente imagen)
- Radiación gamma: emisión, imagen.

NÚCLEO DE QUITO

RAI se administra por vía oral, como fluído bebible o cápsulas

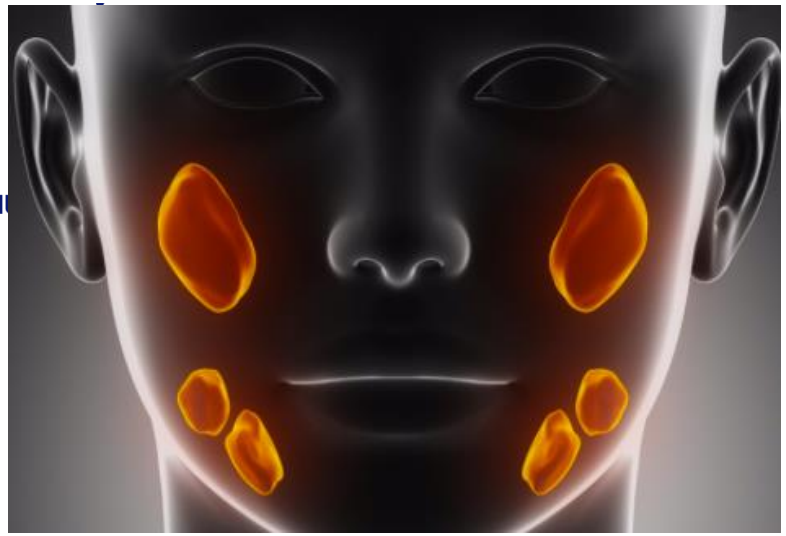


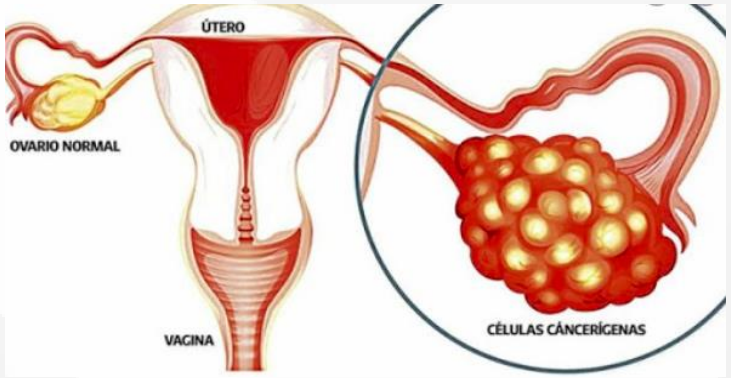
Sin efectos adversos significativos

Tempranos: tiroiditis rádica, dolor, nausea, vómito, fatiga, cefalea (24 horas), ageusia o sabor metálico (transitorios), boca seca sialoadenitis, xeroftalmia

Tardíos: anemia, leucopenia, trombocitopenia, aplasia medular (800-1000mCi, fibrosis pulmonar (extremadamente raro), dosis acumulativa alta por M1 de gran extensión.

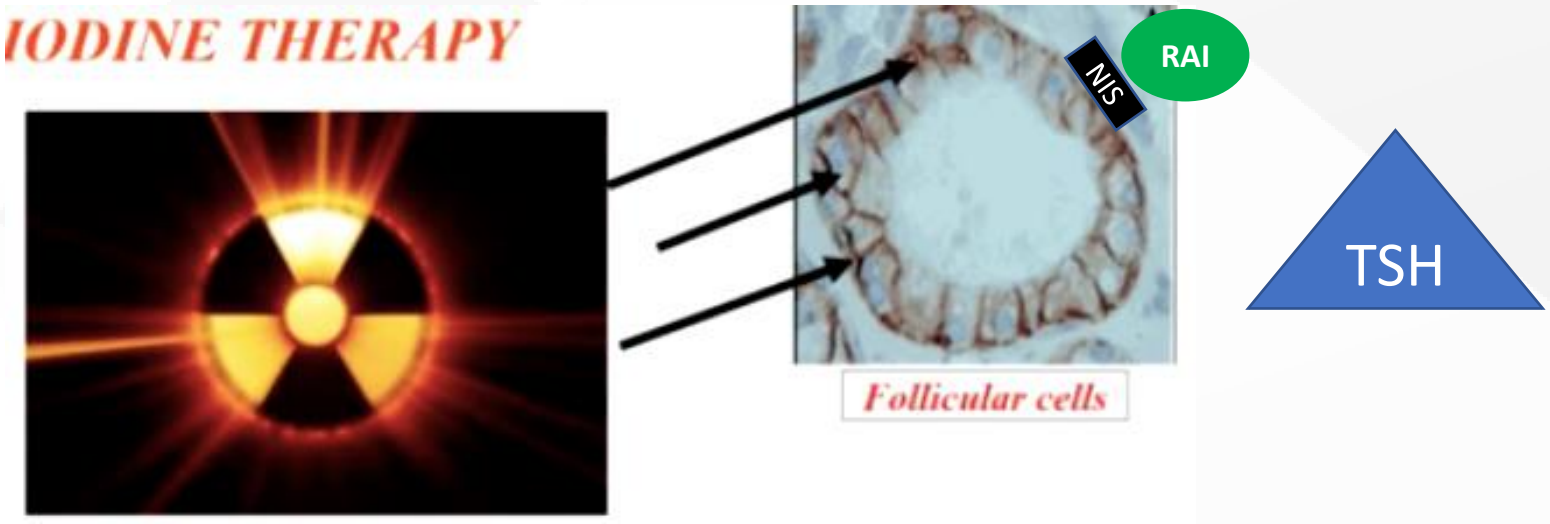
RAI puede ser administrado de forma segura con antecendetes de reacciones alérgicas a pescados y mariscos y a contrastes yodados de examenes de imagen estructural.



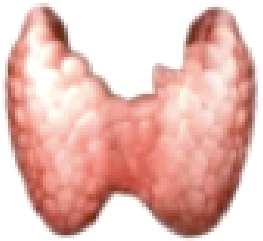

ÚTERO
OVARIO NORMAL
VAGINA
CÉLULAS CÁNCERÍGENAS

NÚCLEO DE QUITO

El efecto terapéutico basado en la acumulación específica en células tiroideas y el daño inducido por la radiación



Debido al decaimiento beta: destrucción de remanente glandular y de las células de Ca diferenciado de tiroides (papilar y folicular)



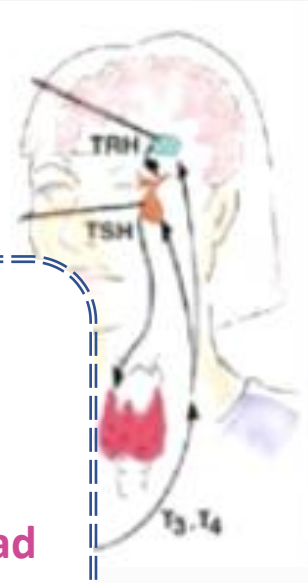
NÚCLEO DE QUITO

Two doses of 0.9 mg thyrotropin alfa (rhTSH) intramuscular, 2 consecutive days,
- 3.rd day patient recieved I-131,
- 5-th day blood is drawn for measurement of serum Tg, TgAt and TSH
- 5-6.day postablative scan

ENDOGENA

Lower TSH levels may be sufficient for remnant ablation without influencing remnant ablation success rates (low risk)

La administración exitosa requiere un *estado de hipotiroidismo TSH > 30 mIU/L,* estimula NIS



SUBOPTIMO:
- Gran remanente
- Insuficiencia hipofisaria
- M1 funcionantes

RCT Dg 131I

- Igual del eficaz que estimulación hormonal.
- **Calidad de Vida**
- **Ca metastásico (pobre densidad y funcionalidad NIS**

Vrachimis A, Riemann B, Mader U, Reiners C, Verburg FA. Endogenous TSH levels at the time of 131I ablation do not influence ablation success, recurrence-free survival or differentiated thyroid cancer-related mortality. Eur J Nucl Med Mol Imaging. 2016;43(2):224–231.

TABLE 1
Differentiated Thyroid Cancer: Clinical and Pathologic Characteristics (*5*)

Histological subtypes	Morphology	Molecular markers	Pattern of spread	RAI avidity
Papillary thyroid cancer (PTC)	Classical papillae Clear nuclei	BRAF V600E, RET/PTC fus	Lymph nodes	++++
PTC–follicular variant	Follicular structures Clear nuclei	BRAF K601E, RAS, PAX8/PPARγ	Lymph nodes	+++++
PTC–aggressive variants*	Specific cell features and structural changes	BRAF V600E, 1q amp, TERT promoter	Lymph nodes Lung	+++
Follicular thyroid cancer	Capsular invasion (MI) Vascular invasion (WI) Extrathyroidal invasion (WI)	RAS, PAX8/PPARγ, PTEN, TSHR, TERT promoter	Lung Bone	+++++
Hürthle cell thyroid carcinoma	Hürthle cells	RAS, PAX8/PPARγ, PTEN, TSHR, chromosomal loss, mitochondrial DNA mutations, TERT promoter	Lung Bone	++
Poorly differentiated thyroid cancer	Invasion Mitoses >3 Necrosis Convoluted nuclei	RAS, TERT promoter, TP53, PIK3CA, PTEN, CTNNB1, AKT1, EIF1AX, ALK fus	Lymph nodes Lung Bone	+/–
Anaplastic thyroid cancer	Undifferentiated cells with immunohistochemical or ultrastructural features of epithelial origin but of morphological and immunophenotypic markers of thyroid origin	TP53, TERT promoter, PI3K/AKT/mTOR, SWI/SNF subunts, RAS, EIF1AX, BRAF	Local invasion Lung Bone Lymph nodes	–

*Tall, columnar, solid, and hobnail variants.
RAI = radioiodine; MI = minimally invasive; WI = widely invasive; fus = fusion.

- Anca M. Avram, Luca Giovanella, Alexis Vrachimis. SNMMI Procedure Standard/EANM Practice Guideline for Nuclear Medicine Evaluation and Therapy of Differentiated Thyroid Cancer. The journal of nuclear medicine. June 2022. Vol 63. No 6

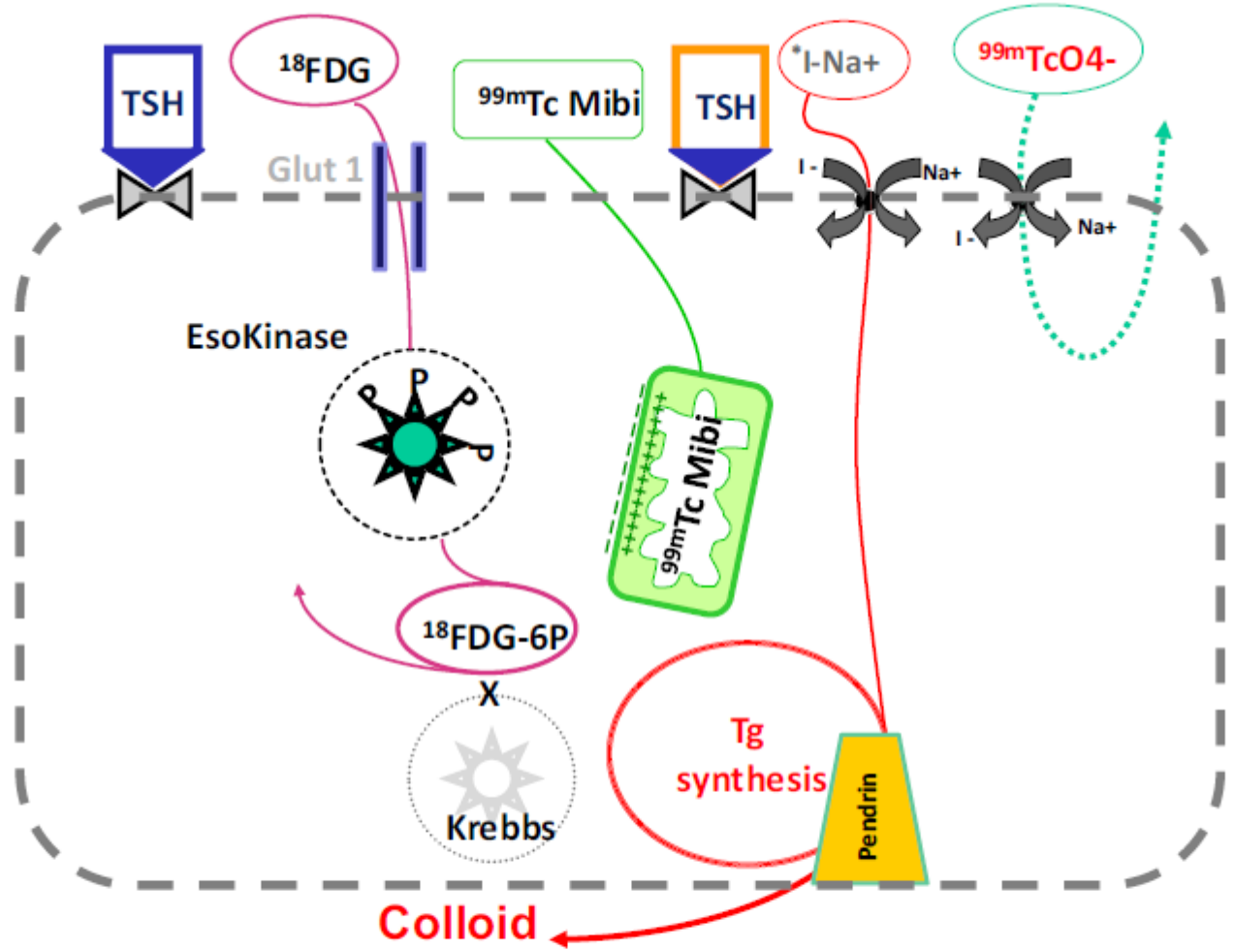


Fig. 1. Nuclear imaging of follicular thyroid cell: molecular basis. ^{18}F-FDG, ^{18}F-fluorodeoxyglucose; ^{18}FDG-6P, ^{18}FDG 6-phosphatase; ^{99m}Tc-MIBI, 99mTc-2-methoxyisobutylisonitrile; $^{99m}TcO_4$-, ^{99m}Tc-pertechnetate; TSH, thyroid-stimulating hormone.

Follicular neoplasm, noninvasivefollicular thyroid neoplasm with papillary-like nuclear features, follicular thyroid neoplasm with papillary-like nuclear features. FNA can be complemented by assessment of specific molecular alterations (e.g., BRAF or TERT mutations, RET fusions), as well as molecular imaging with 99mTc-MIBI or 18F-FDG.

Please cite this article in press as: Giovanella L, et al., Role of isotope scan, including positron emission tomography/computed tomography, in nodular goitre, Best Practice & Research Clinical Endocrinology & Metabolism (2014), http://dx.doi.org/10.1016/j.beem.2014.01.008

NÚCLEO DE QUITO

INTERFERENCIAS

DIETA BAJA EN IODO (LID)

- <50 ug/d
- LID preparation decreased 24-h urinary iodine excretion by 83% and increased radioiodine uptake in thyroid remnants by 65% (P <0.001) as compared with controls.
- The efficacy of 131I treatment (assessed at 6 mo and defined by absent neck activity and Tg <2 ng/mL) was also improved by LID: successful ablation was achieved in 65% of LID patients compared with 48% of patients in the control group (P <0.001).
- Patients comparing 2- and 4-wk LIDs showed no significant difference in urinary iodine levels, both periods resulting in optimal I/Cr for 131I therapeutic administration (i.e., <50mg/g).

CONTRASTES YODADOS (4-6 semanas)

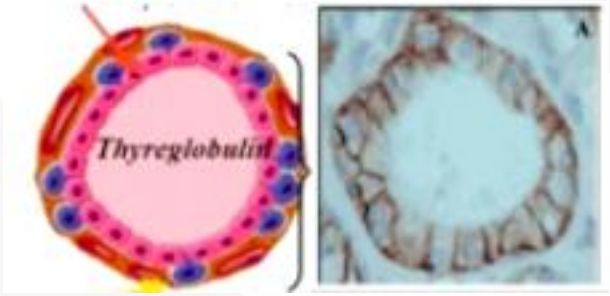
AMIODARONA (6 m)

- Pluijmen MJ, Eustatia-Rutten C, Goslings BM, et al. Effects of low-iodide diet on postsurgical radioiodide ablation therapy in patients with differentiated thyroid carcinoma. Clin Endocrinol (Oxf). 2018;58(4):428–435.

NÚCLEO DE QUITO

TIROGLOBULINA

(Tg t1/2) of 65.2 h. Correct timing of serum sampling for Tg measurement not be performed sooner than 25 d after total thyroidectomy to allow for clearance of the postsurgical Tg peak

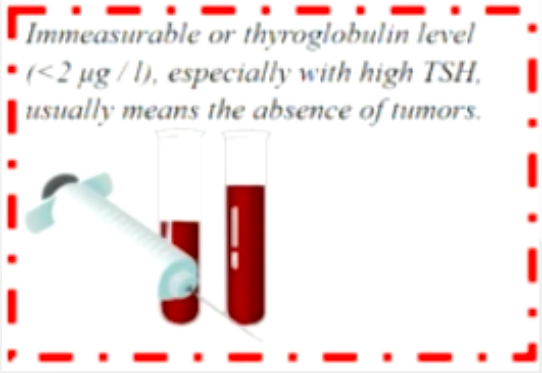


131I?? Dosis mayores 131I

Marcador tumoral:

- TT+ RAI
- Despues de remover restos tiroideos, recurrencia o M1
- Valores elevados de TSH ↑ S Trg
- Anticuerpos
- Puede estar elevada en situaciones de benignidad pero en CDT ↑↑↑

Likelihood of achieving remission or having persistent or recurrent disease in response to an initial therapy



- Matrone A, Gambale C, Piaggi P, et al. Postoperative thyroglobulin and neck ultrasound in the risk restratification and decision to perform 131I ablation. J Clin Endocrinol Metab. 2017;102(3):893–902
- Schlumberger M, Leboulleux S, Catargi B, et al. Outcome after ablation in patients with low-risk thyroid cancer (ESTIMABL1): 5-year follow-up results of a randomised, phase 3, equivalence trial. Lancet Diabetes Endocrinol. 2018;6(8): 618–626.
- Hindie E, Taieb D, Avram AM, Giovanella L. Radioactive iodine ablation in lowrisk thyroid cancer. Lancet Diabetes Endocrinol. 2018;6(9):686.

NÚCLEO DE QUITO

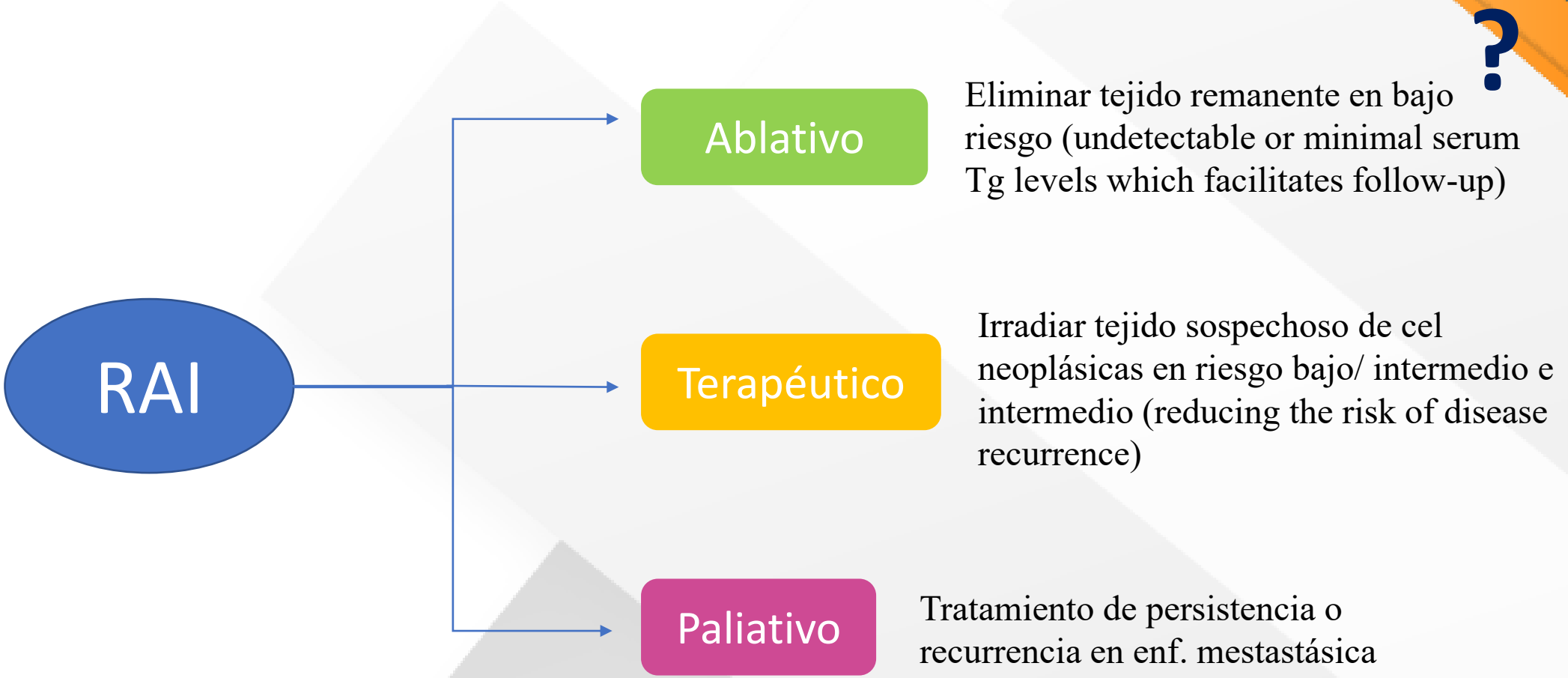
TERAPIA CON YODO RADIOACTIVO (^{131}I)

- Improved overall survival (OS) and disease-specific survival in patients with advanced tumors and regional and/or distant metastatic disease who received postoperative 131I therapy (1).
- A statistically significant effect on improving clinical outcomes at 10 y, with decreased risk for locoregional recurrence (RR, 0.31; CI, 0.2–0.49) and an absolute risk reduction of 3% for distant metastatic disease (3).
- Intermediate risk patients (mean follow-up, 6 y; longest follow-up, 14 y), demonstrated that adjuvant 131I treatment improved OS, both for younger (,45 y) and older (65 y) subsets of patients.
- Adjuvant 131I therapy was associated with a 29% reduction in risk of death for all patients (4).
- The beneficial effects of postoperative 131I therapy are most evident in patients with locoregionally advanced and distant metastatic disease (stages IVA, IVB, and IVC).
- Administration of 131I therapy was associated with significantly improved 5- and 10-y survival for both PTC and follicular thyroid cancer (FTC) patients, regardless of pathologic substage (stages IVA, IVB, or IVC), as follows: mortality rates in the PTC cohort (n 5 10,796) at 5 and 10 y were 11% and 14%, respectively, in patients who received 131I therapy, compared to 22.7% and 25.5%, respectively, in patients who received none; mortality rates in the FTC cohort (n 5 1,036) at 5 and 10 y were 29.2% and 36.8%, respectively, in patients who received 131I therapy, compared to 45.5% and 51%, respectively, in patients who received none (5).
- For patients with distant metastases, a delay of 6 mo in administration of 131I therapy is associated with decreased survival, demonstrated after a follow-up period of only 5–6 y (6).

1. Jonklaas J, Sarlis NJ, Litofsky D, et al. Outcomes of patients with differentiated thyroid carcinoma following initial therapy. Thyroid. 2006;16(12):1229–1242.
2. Sawka AM, Thephamongkhol K, Brouwers M, Thabane L, Browman G, Gerstein HC. Clinical review 170: A systematic review and metaanalysis of the effectiveness of radioactive iodine remnant ablation for well-differentiated thyroid cancer. J Clin Endocrinol Metab. 2004;89(8):3668–3676.
3. Ruel E, Thomas S, Dinan M, Perkins JM, Roman SA, Sosa JA. Adjuvant radioactive iodine therapy is associated with improved survival for patients with intermediate-risk papillary thyroid cancer. J Clin Endocrinol Metab. 2015;100(4): 1529–1536.
4. Yang Z, Flores J, Katz S, Nathan CA, Mehta V. Comparison of survival outcomes following postsurgical radioactive iodine versus external beam radiation in stage IV differentiated thyroid carcinoma. Thyroid. 2017;27(7):944–952.
5. Higashi T, Nishii R, Yamada S, et al. Delayed initial radioactive iodine therapy resulted in poor survival in patients with metastatic differentiated thyroid carcinoma: a retrospective statistical analysis of 198 cases. J Nucl Med. 2011;52(5): 683–689.

NÚCLEO DE QUITO

TERAPIA CON RADIOYODO



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NÚCLEO DE

Objetivos de la terapia con radioyodo

Goal	I-131 Therapy		
	Remnant Ablation	Adjuvant Treatment	Treatment of Known Disease
Initial staging	√	√	√
Facilitate follow-up	√	√	√
Improve DSS	-	√	√
Decrease recurrence	-	√ *Enf. microscópica*	-
Improve PFS	-	√	√
Curative intent	-	√	√
Palliative intent	-	-	√

Tuttle thyroid Tha Martinique principles 2019

NÚCLEO DE QUITO

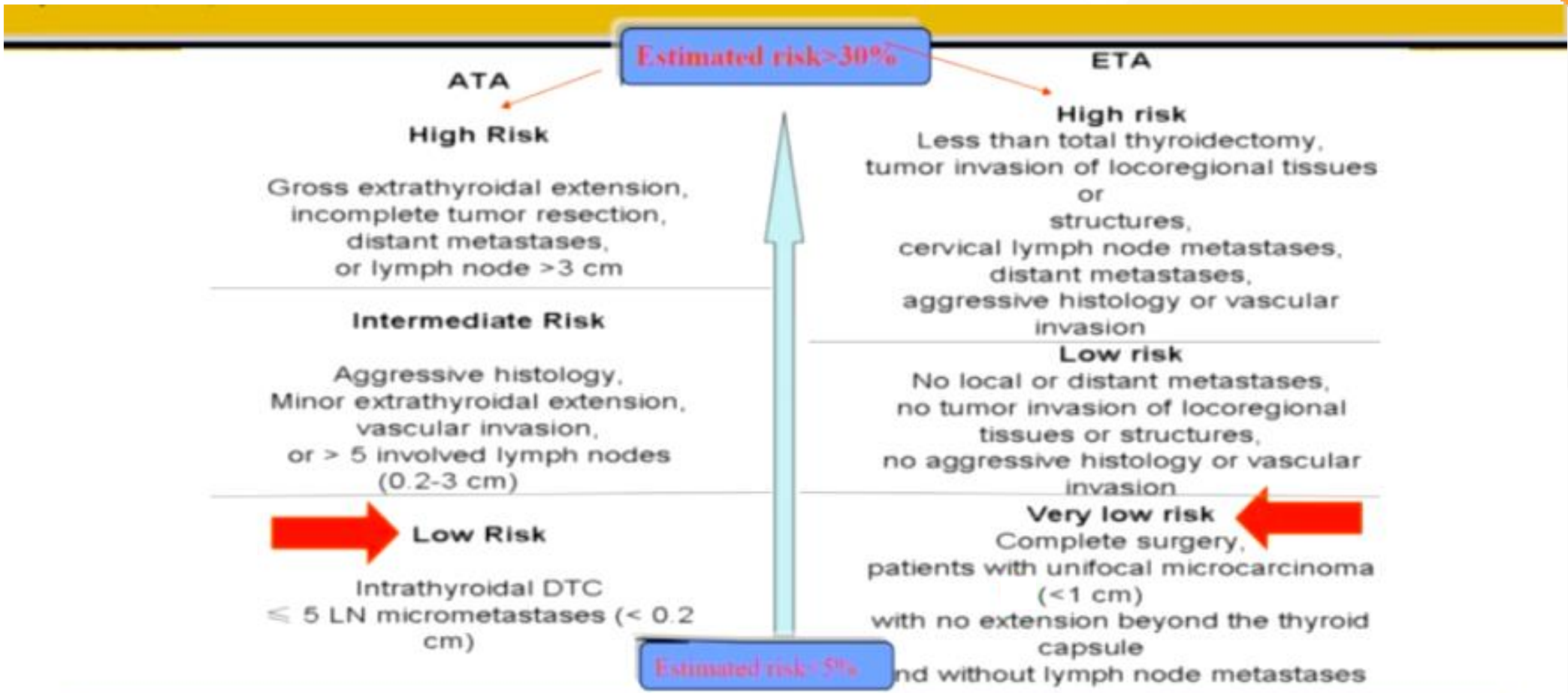

***Figure:** Risk stratifications of differentiated thyroid cancer (DTC) patients by the American Thyroid Association (ATA) (2015) and the European Thyroid Association (ETA) guidelines (2006).*

TABLE 3
Suggested Framework for ^{131}I Therapy

Strategy	Prescribed ^{131}I activity	Clinical/pathologic context
Risk-adapted ^{131}I therapy	1.11–1.85 GBq (30–50 mCi) ^{131}I*	Remnant ablation
Risk-adapted ^{131}I therapy	1.85–3.7 GBq (50–100 mCi) ^{131}I**	Adjuvant treatment
Risk-adapted ^{131}I therapy	3.7–5.6 GBq (100–150 mCi) ^{131}I	Treatment of small volume locoregional disease
Risk-adapted ^{131}I therapy	5.6–7.4 GBq (150–200 mCi) ^{131}I	Treatment of advanced locoregional disease and/or small volume distant metastatic disease
Whole-body/-blood dosimetry	≥7.4 GBq (≥200 mCi) ^{131}I, maximum tolerable safe ^{131}I activity	Treatment of diffuse distant metastatic disease

Riesgo bajo

Riesgo moderado

≤100 mCi

Not recommended

Riesgo alto

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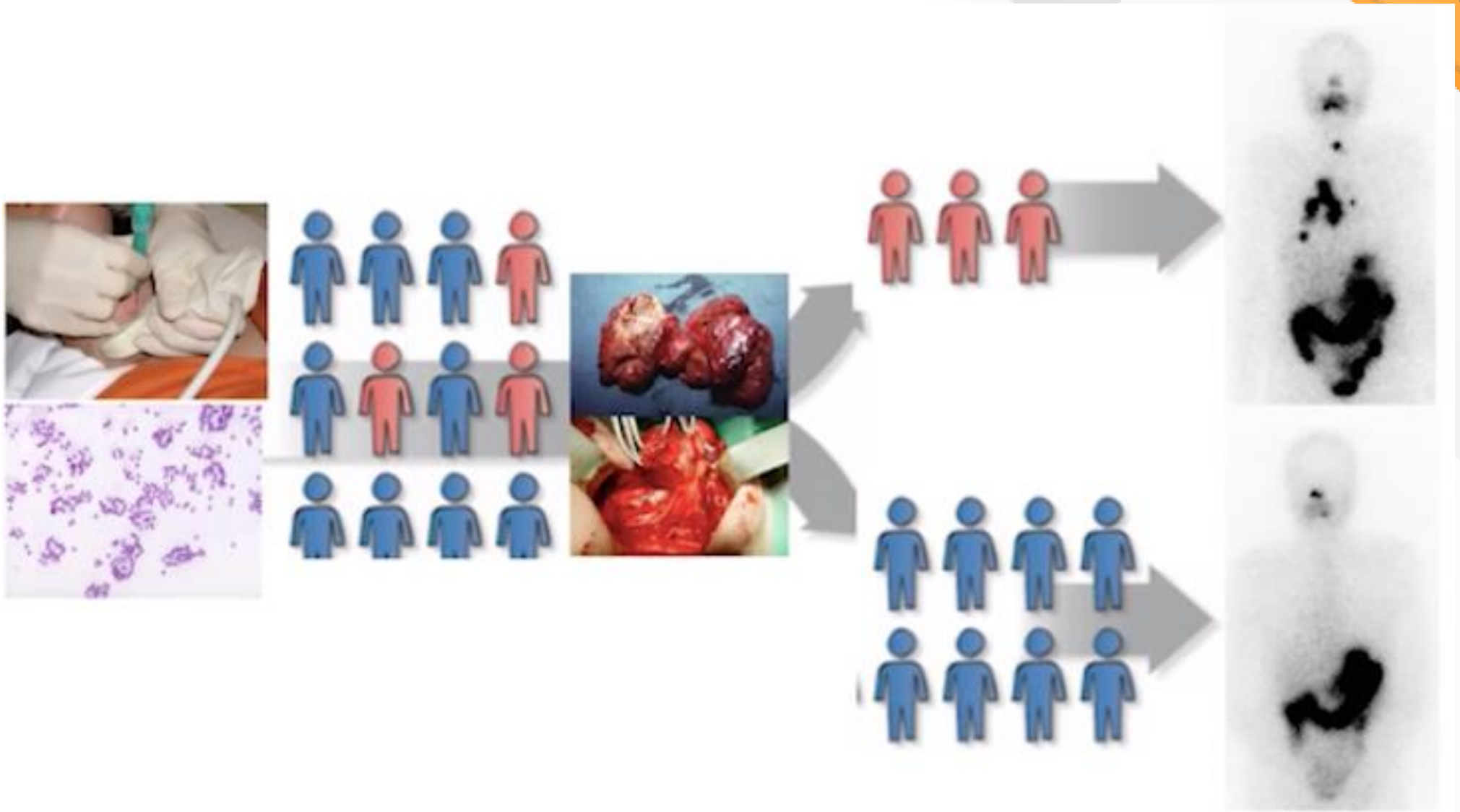
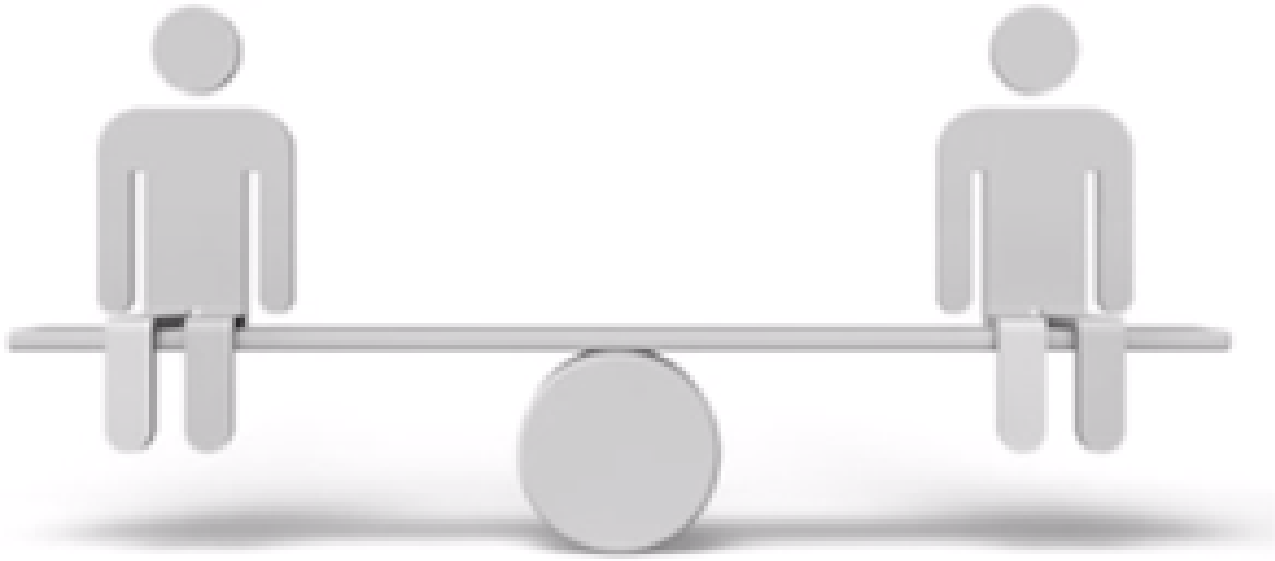


NÚCLEO DE QUITO

Subterapéutico o sobretratamiento?



NÚCLEO DE QUITO

- Edad
- Estratificación de riesgo de recidiva
- Comorbilidades
- Función renal
- Factores que condicionan radioresistencia.
- Controversias (Ablación, dosis).
- Dosis óptima de ^{131}I para ablación existosa
- Marcadores tumorales
- Estudios de imagen estructural y molecular (si procede).
- Dosis acumulativa
- Dosimetría

Mejorar resultados y sobrevida

a) *side effects if 150–200mCi ^{131}I therapeutic activity is administered*
b) *administer the highest safe ^{131}I therapeutic activity (MTA) for maximizing tumor radiation absorbed dose.*

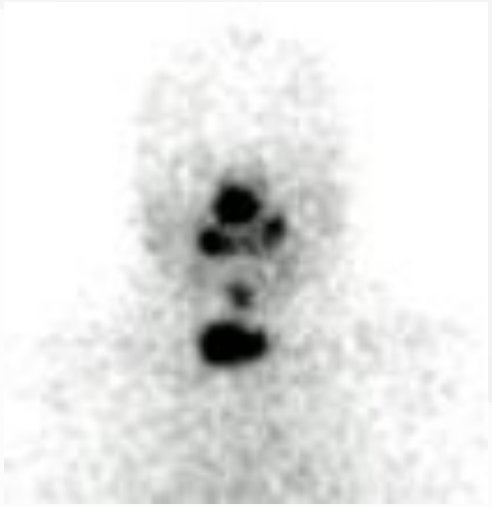
- Jentzen W, Nahum AE, Bockisch A, Binse I, Tulchinsky M. Fixed 3.7-GBq 131I activity for metastatic thyroid cancer therapy ignores science and history. J Nucl Med. 2017;58(9):1530.
- Verburg FA, Luster M, Giovanella L, et al. The “reset button” revisited: Why high activity 131I therapy of advanced differentiated thyroid cancer after dosimetry is advantageous for patients. Eur J Nucl Med Mol Imaging. 2017;44(6):915–917.

NÚCLEO DE QUITO

RASTREO CORPORAL TOTAL CON ^{131}I

DIAGNOSTICO
RCTDX

POSTTRATAMIENTO



NÚCLEO DE QUITO

RCT con ^{131}I

DIAGNOSTICO:

- 1-5 mCi
- Identificar enfermedad, local, locoregional o a distancia (Qx complementaria, no terapia innecesaria, ausencia de evidencia de tejido remanente tiroideo y enfermedad metastásica Tg estimulada <1 ng/mL.
- ***SPECT/CT*** (ganglios no US, micromestastasis pulmonares, lesiones óseas sin daño cortical).
- Evidenciando áreas de captación no visualizadas que condicionan administración de dosis más altas de terapia metabólica y detección de remanentes de gran tamaño.
- 49-58% cambio en relación a dosis ^{131}I basadas solamente en clínica/HP (25-30%).
- **^{131}I** vs ^{123}I (mayor detección de M1)
- **THW** vs rhTSH (fallo en detección de M1)
- RCT y Trg (modificación 29%)
- Riesgo intermedio y alto, follow up 3 años, CR 88% locoregional, 42% a distancia

NÚCLEO DE QUITO

RCT con ^{131}I

- 1-5 mCi 1-2 TWH, 2-4 rhTsH (T4 50 ug vs 5 ug ^{131}I, sustitución con T3
  Efectividad

POSTTRATAMIENTO:

- Estadificación
- 2-10d??, discordancia 7,5% early y 12% delayed
- 28% of nodal metastases,17% lung metastases and 16% of bone metastases in early scans.

Ruptura tisular → "stunning"

TABLE 4
Response to Therapy in DTC Patients: Dynamic Risk Stratification Criteria (Modified from [6])

Excellent response: No clinical, biochemical, or structural evidence of disease: negative imaging and either suppressed Tg <0.2 ng/mL or stimulated Tg <1 ng/mL
Biochemical incomplete response: Abnormal Tg (i.e., suppressed Tg >1 ng/mL or stimulated Tg >10 ng/mL) or rising anti-Tg antibody levels in the absence of localizable disease (i.e., negative imaging)
Structural incomplete response: Persistent or newly identified locoregional or distant metastases (any Tg value)
Indeterminate response: Nonspecific biochemical (i.e., suppressed Tg 0.2–1 ng/mL or stimulated Tg 1–10 ng/mL or stable/declining anti-Tg antibody levels) or structural findings that cannot be confidently classified as either benign or malignant

Tg = thyroglobulin.

SPECT/CT

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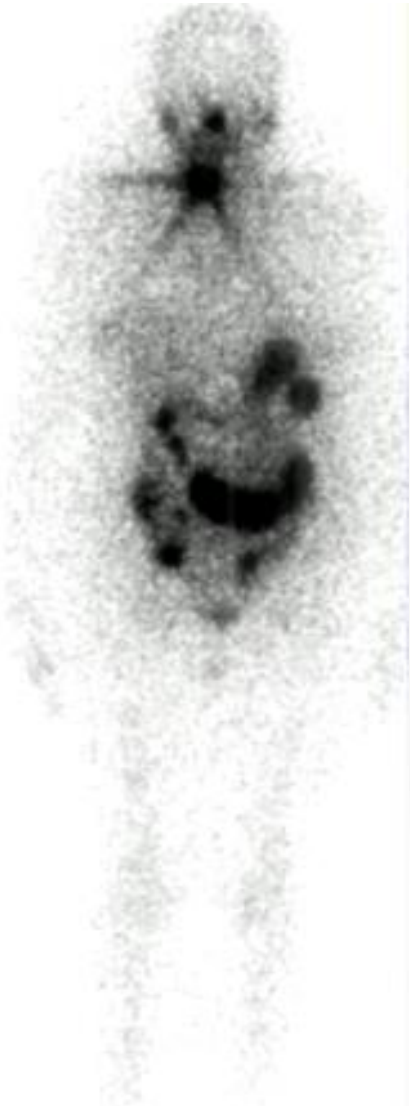
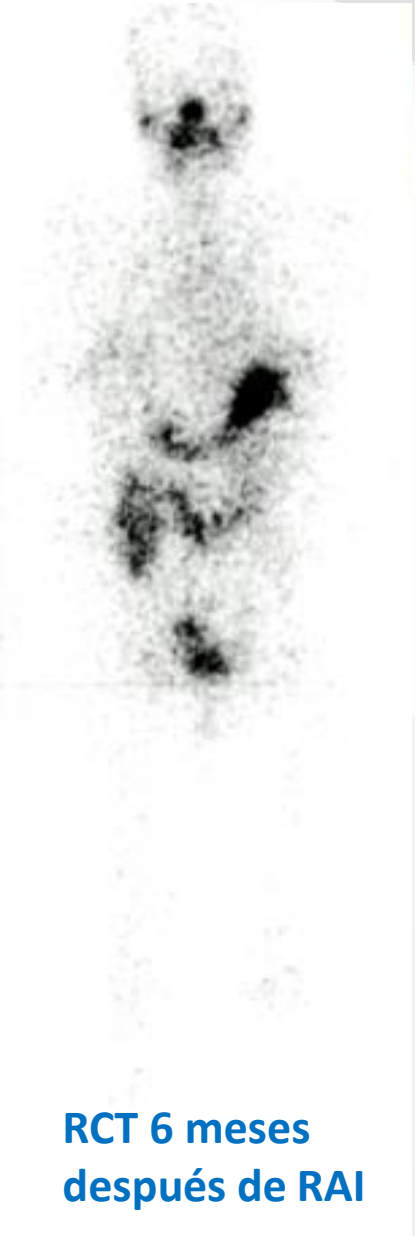
NÚCLEO DE QUITO

TSH: 84 mUI/L
TRG: 8 ng/ml



RCT 72 horas
después de RAI



RCT 6 meses
después de RAI

CR:

TSH: 79 mUI/L
TRG: 0.9 ng/ml

NÚCLEO DE QUITO

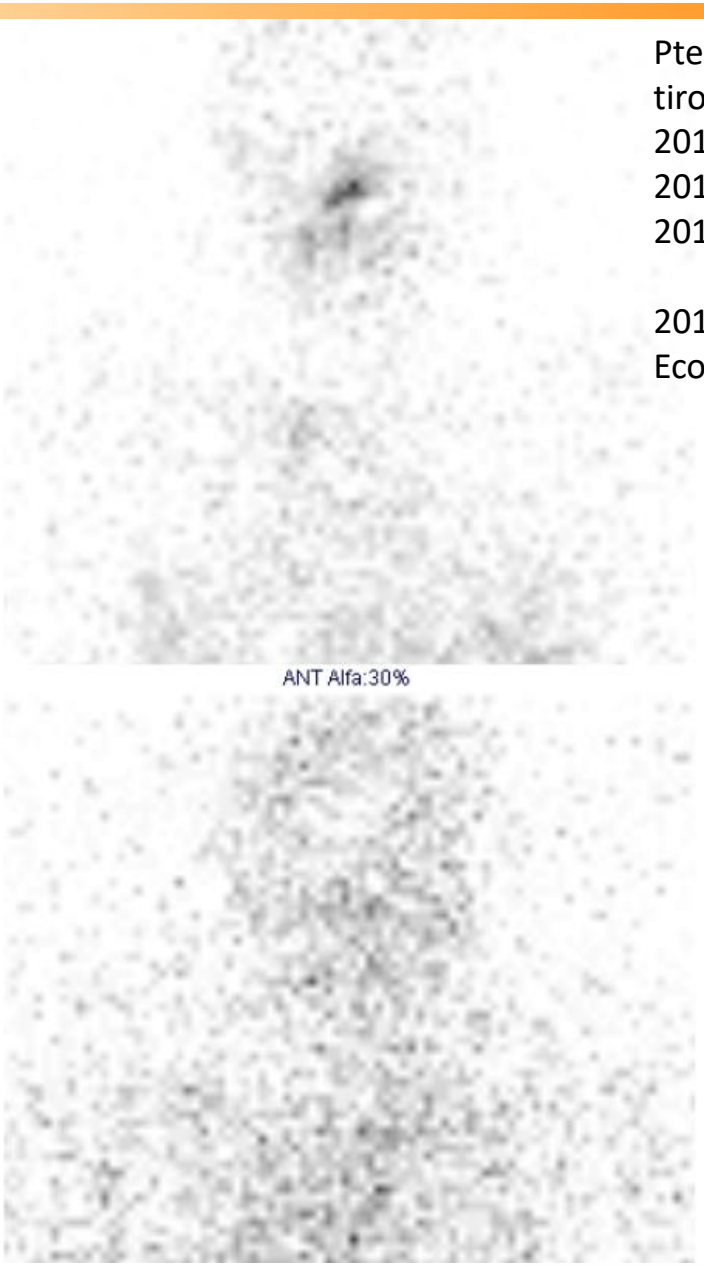
SPECT/CT

VENTAJAS

- Caracterización morfológica, hallazgos inespecíficos (información de TC)
- Remanente, adenopatías o fisiológico
- Reduce pitfalls RCT
- Hallazgos erroneos. Modifica la estadificación, cambios de terapéutica.
- D/C futuro estudios (TC, RM)

DESVENTAJAS

- Avidez, falsos negativos

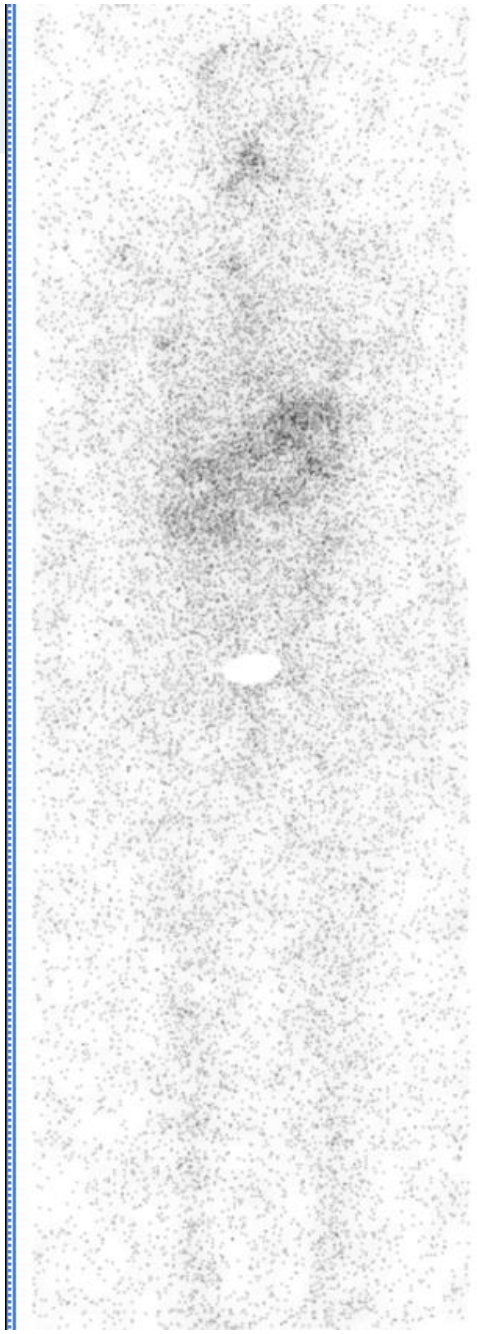


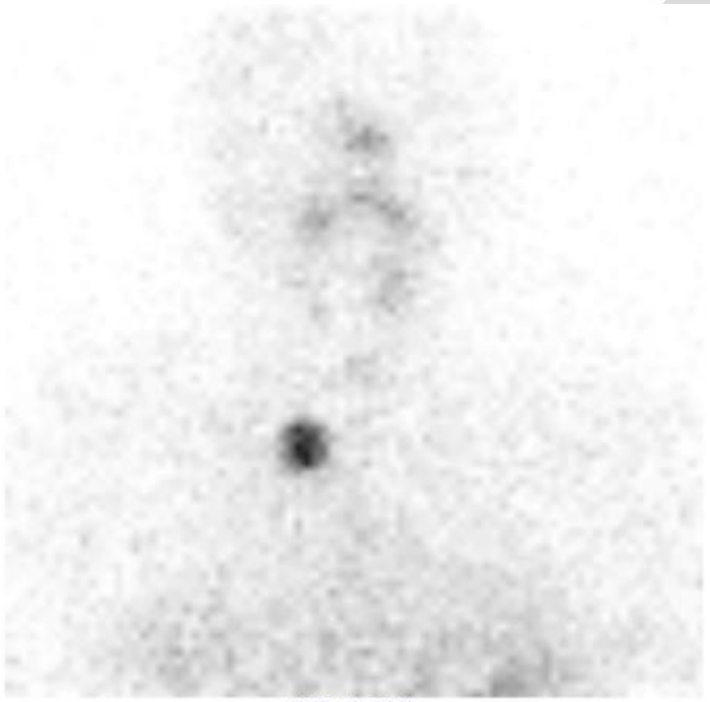
Pte femenina 41 años. Dg: Carcinoma papilar de tiroides + TT+VGC, VG derecho e izquierdo (abril 2013) + 1 dosis de I-131 (150 mci - septiembre 2013) + recaída ganglionar izquierda (febrero 2014) sin 131I por lactancia.

2019: TSH 0.1 Tgr 0.1 anticuerpos negativos.
Eco de cuello junio 23: negativo

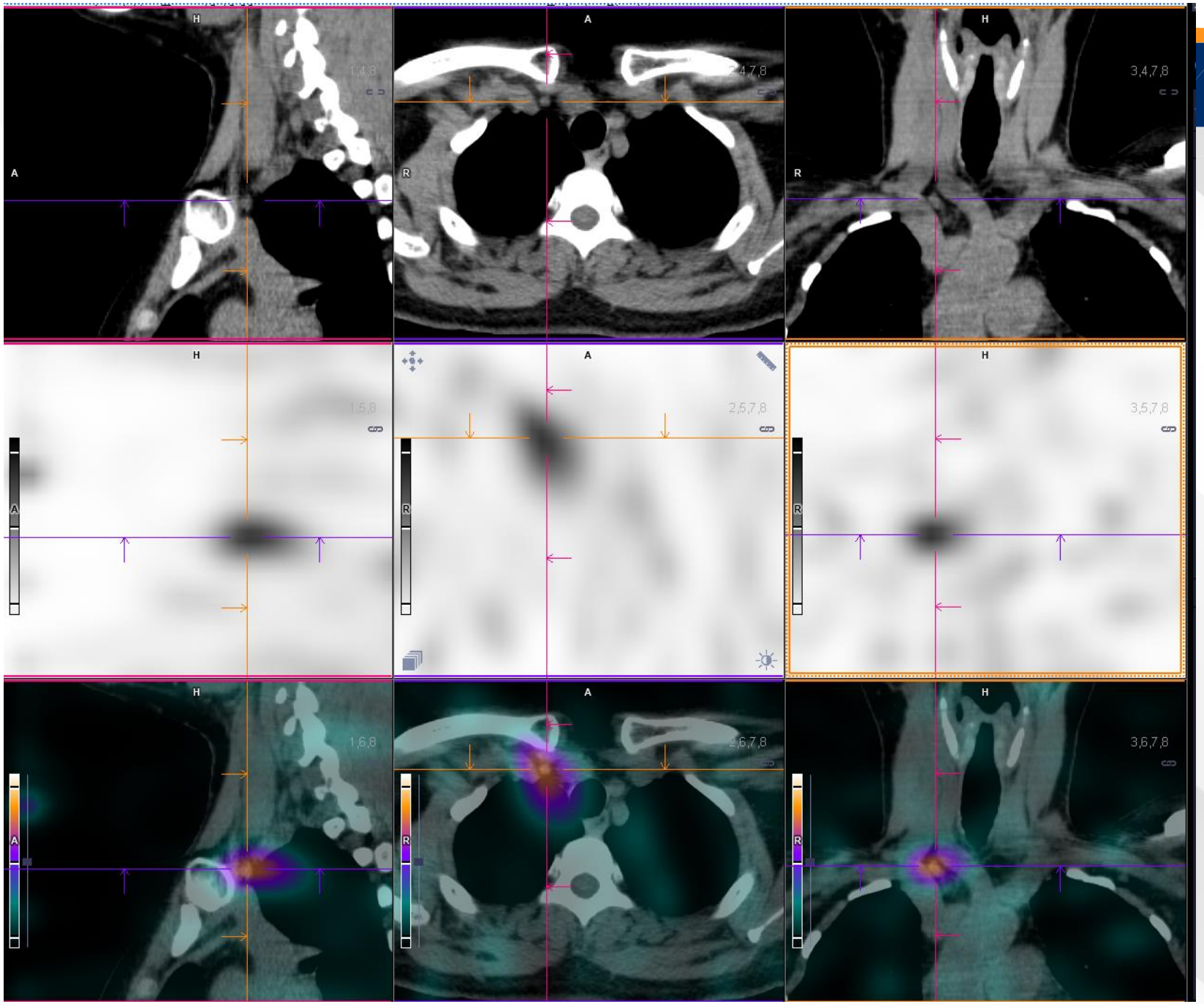
06/2023 RCT
TSH: 0,1 mUI/L
TRG: 5 ng/ml
ANTI-TG: NEG

TRATAMIENTO 150 MCI
TSH: 188,70 mUI/L
TRG: 25 ng/ml
ANTI-TG: 15.98 UI/ml

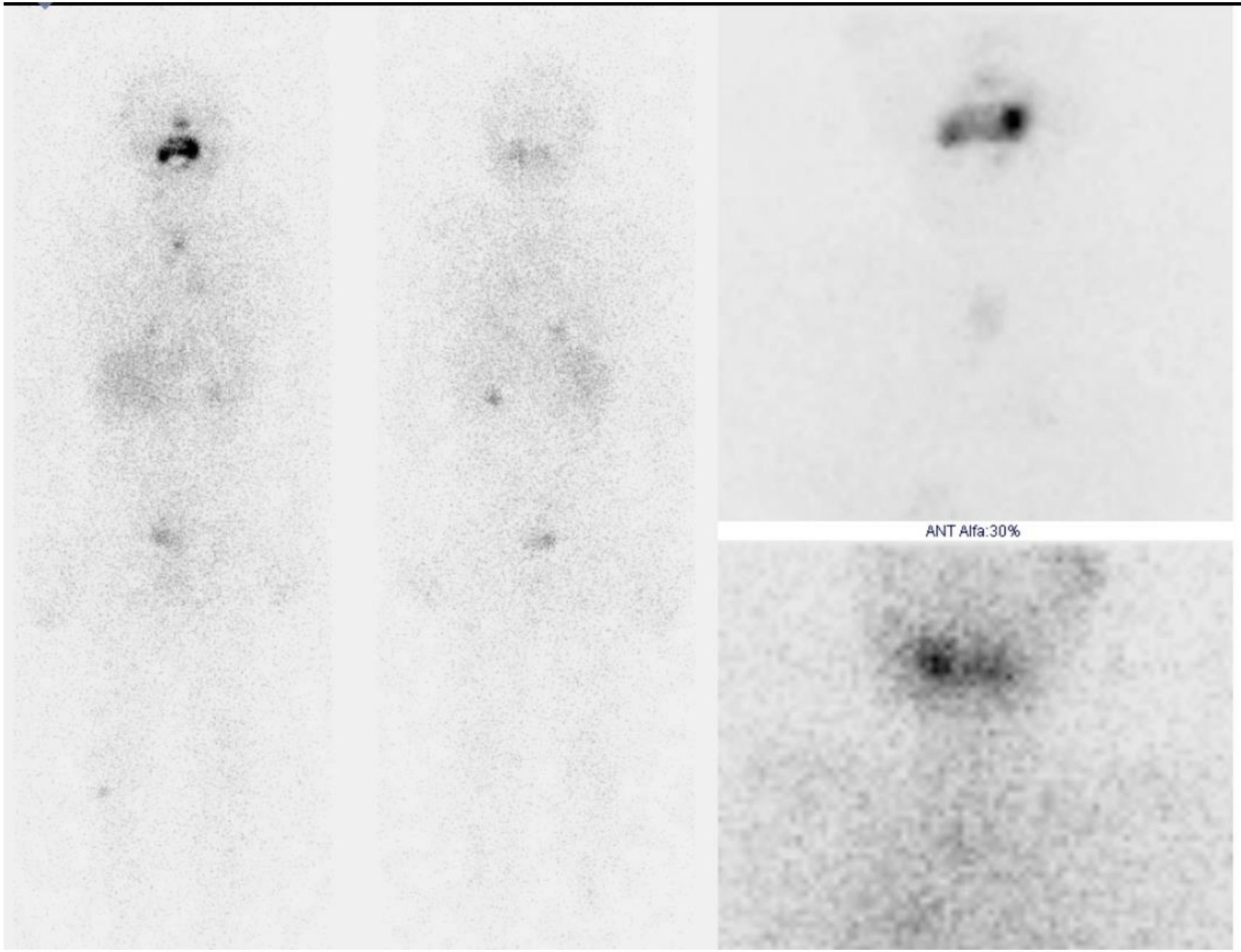




ANT Alfa:30%

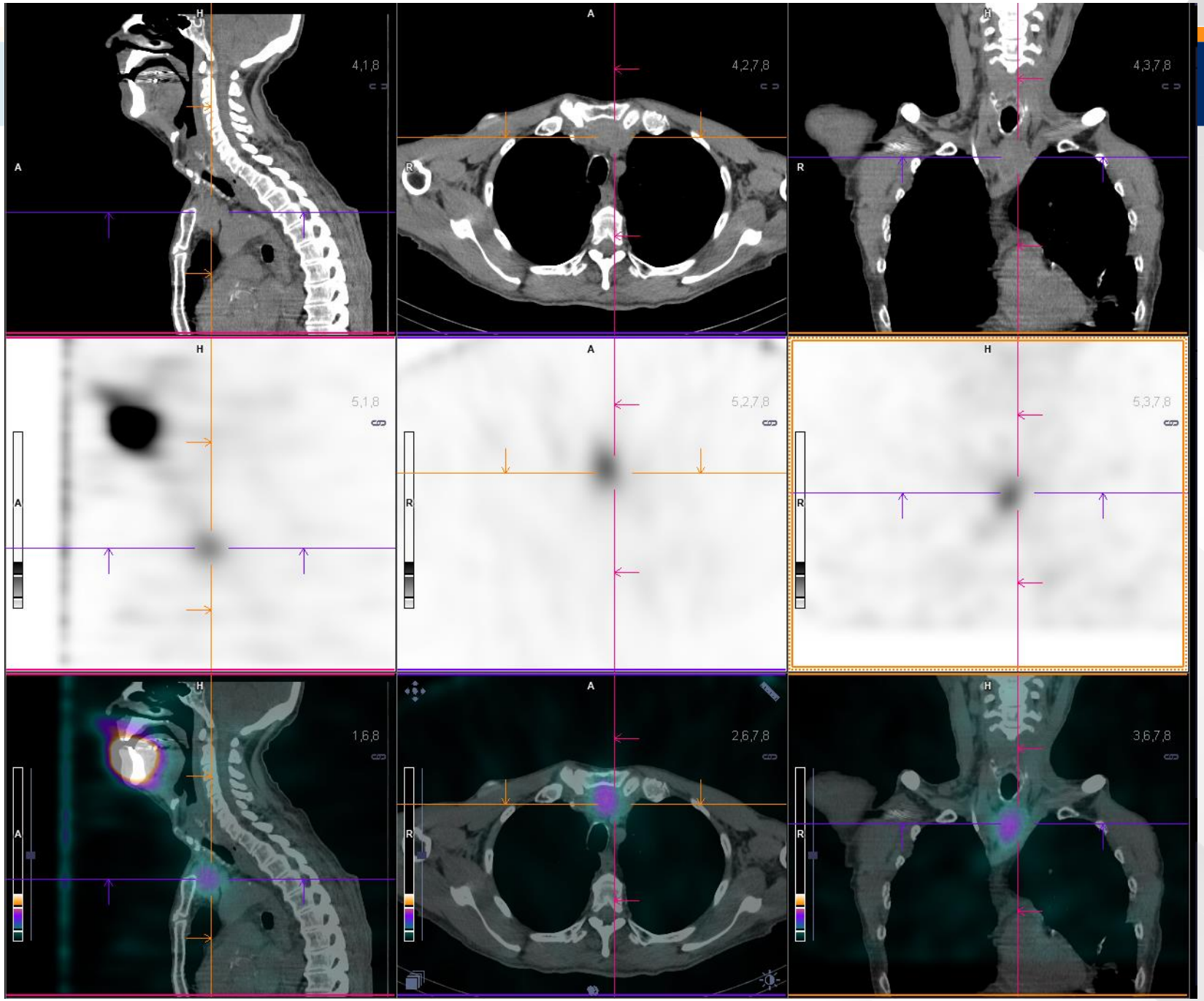


Adenopatía metastásica 5mm



Dg: Ca papilar de tiroides + tiroidectomía mas vaciamiento izq (13/09/2021) + ca de amígdala izquierda tratado con quimioterapia y radioterapia + amigdalectomía izquierda + complemento de tiroidectomía izquierda + vaciamiento cervical izquierdo (06/06/2022). Tratamiento yodo agosto 22 200mci (RCT remanente).

19/06/2023
TSH: 188,70 mUI/L
TRG: 585,30 ng/ml
ANTI-TPO: 14,30 Ui/ml
ANTI-TG: 15.98 UI/ml


H
4,1,8
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4,2,7,8
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H
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R
H
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A
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R
H
5,3,7,8
R
H
1,6,8
A
A
2,6,7,8
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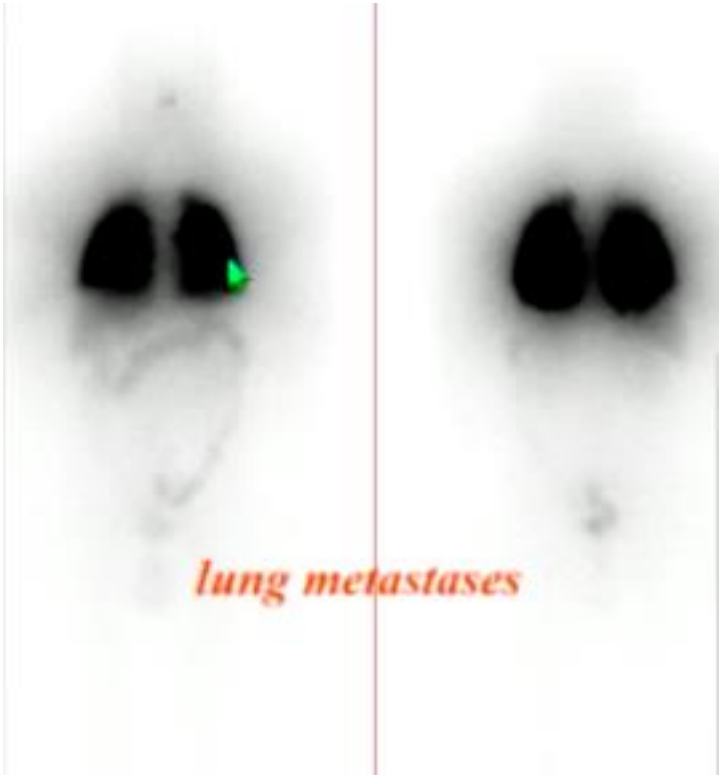
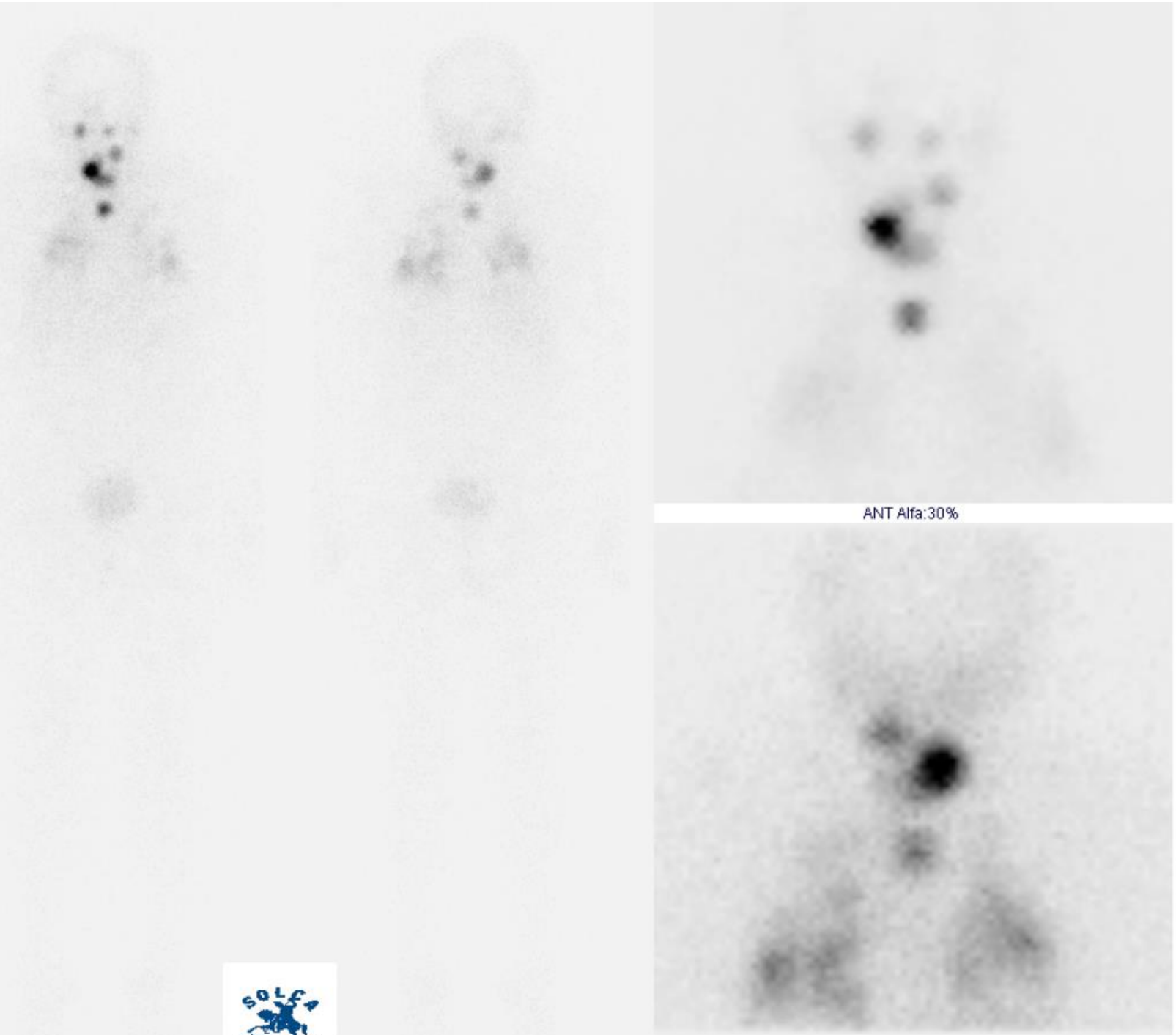
H
3,6,7,8
R

NÚCLEO DE QUITO

TRATAMIENTO DE METASTASIS A DISTANCIA



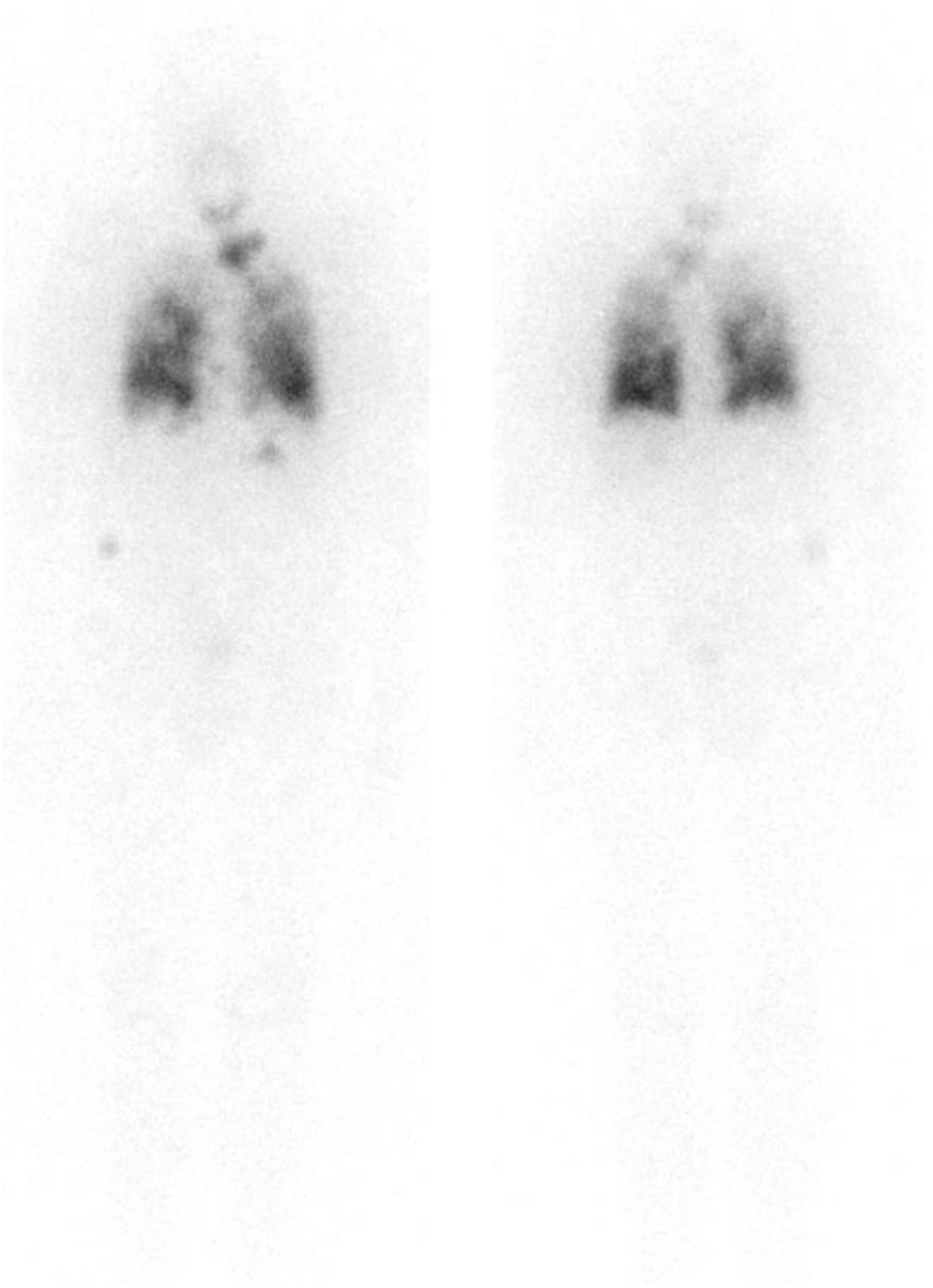
- Lesiones con avidez por 131 I
- Dosis 150-300 mCi
- Pulmonares: que no se visualizan en TC
- Oseas: resección o RAI+ RT



Paciente femenina de 36. Dg: Carcinoma papilar de tiroides + TT+ VGC. HP: carcinoma papilar de tiroides variante folicular y papilar. Angio invasión presente focal. Invasion linfovascular identificada. Extensión extratiroidea presente microscópicamente infiltra a tejido adiposo adyacente sin evidencia macroscópica clínica de invasión. Ganglios linfáticos: ganglios 13/54, deposito ganglionar de mayor tamaño: 1.7cm. Extensión extranodal no identificada. Estadio pt3a, p1b, pmx.

TRATAMIENTO 150 mCi

TSH: 126,9 mUI/L
TRG: 0,45 ng/ml
ANTI-TPO: 100,8 Ui/ml
ANTI-TG: 101 UI/ml



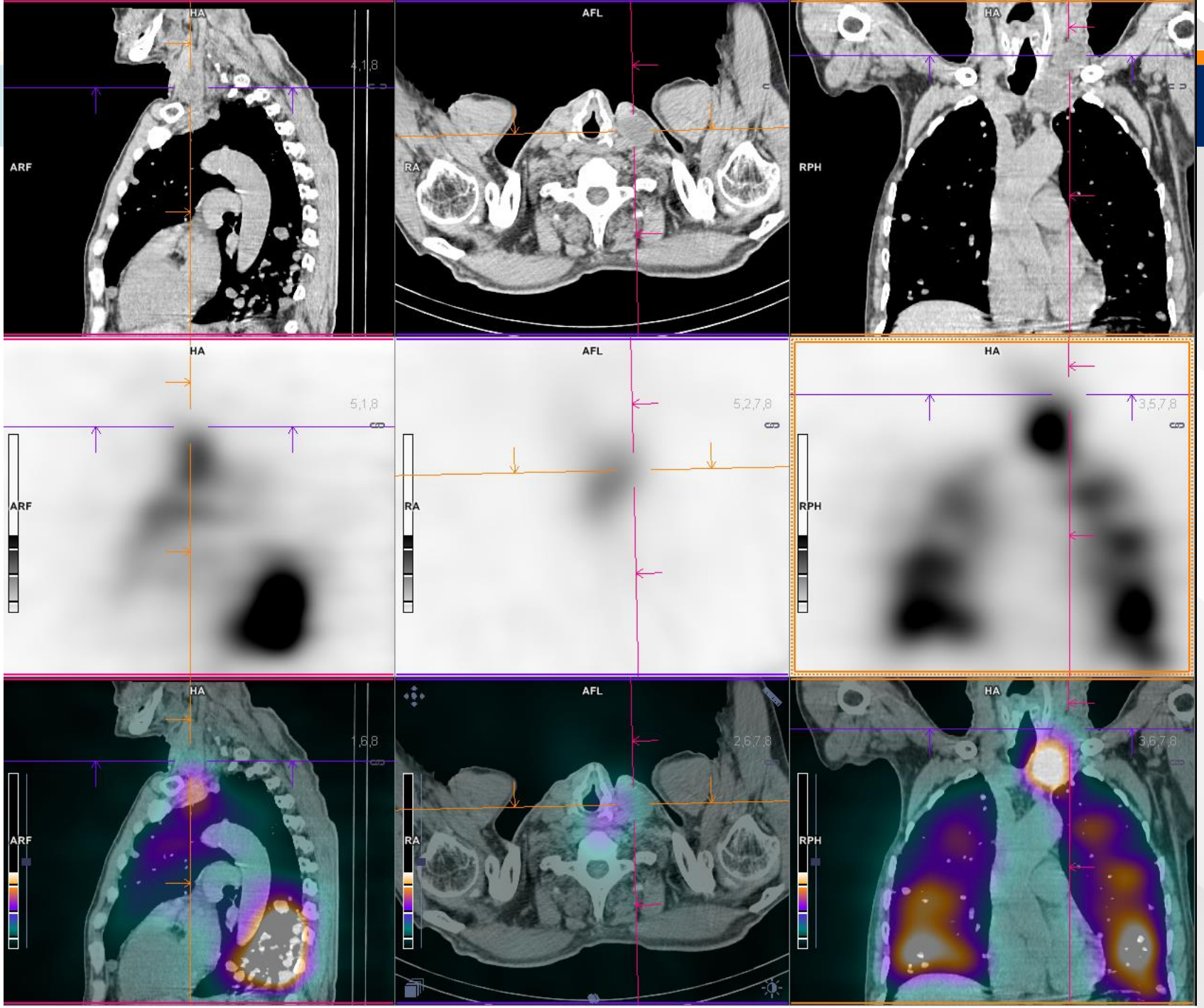
Dg: carcinoma folicular de tiroides estadio IV por metástasis pulmonares + tiroidectomía total (10/2016) + 1°ablación de I-131 dosis 100 mci (06/2017) + (10/2018) 2° ablación I-131 dosis 150 mci por metástasis pulmonares tumor de alto riesgo.+3° ablación (11/2019) I-131 dosis 150 mci.

Dosis acumulada 131I: 400 mCi.
HP: carcinoma papilar variante tiroidea clásica multifocal con extensión extratiroidea mínima (pT3), vaciamiento 9/14 ganglios linfáticos con metástasis de carcinoma papilar.

TC de tórax: Múltiples e incontables imágenes nodulares pulmonares, hallazgos que sugieren depósito secundario de primario conocido.

MC: nódulo cervical izquierdo duro e inmóvil, impresiona adherido a plano muscular. Eco de cuello se evidencia nódulo cervical izquierdo.

05/2022:
TSH: 37.04 mUl/L TRG: 93707 ng/ml
ANTI-TPO: 16.66 Ui/ml ANTI-TG: 902.30 Ul/ml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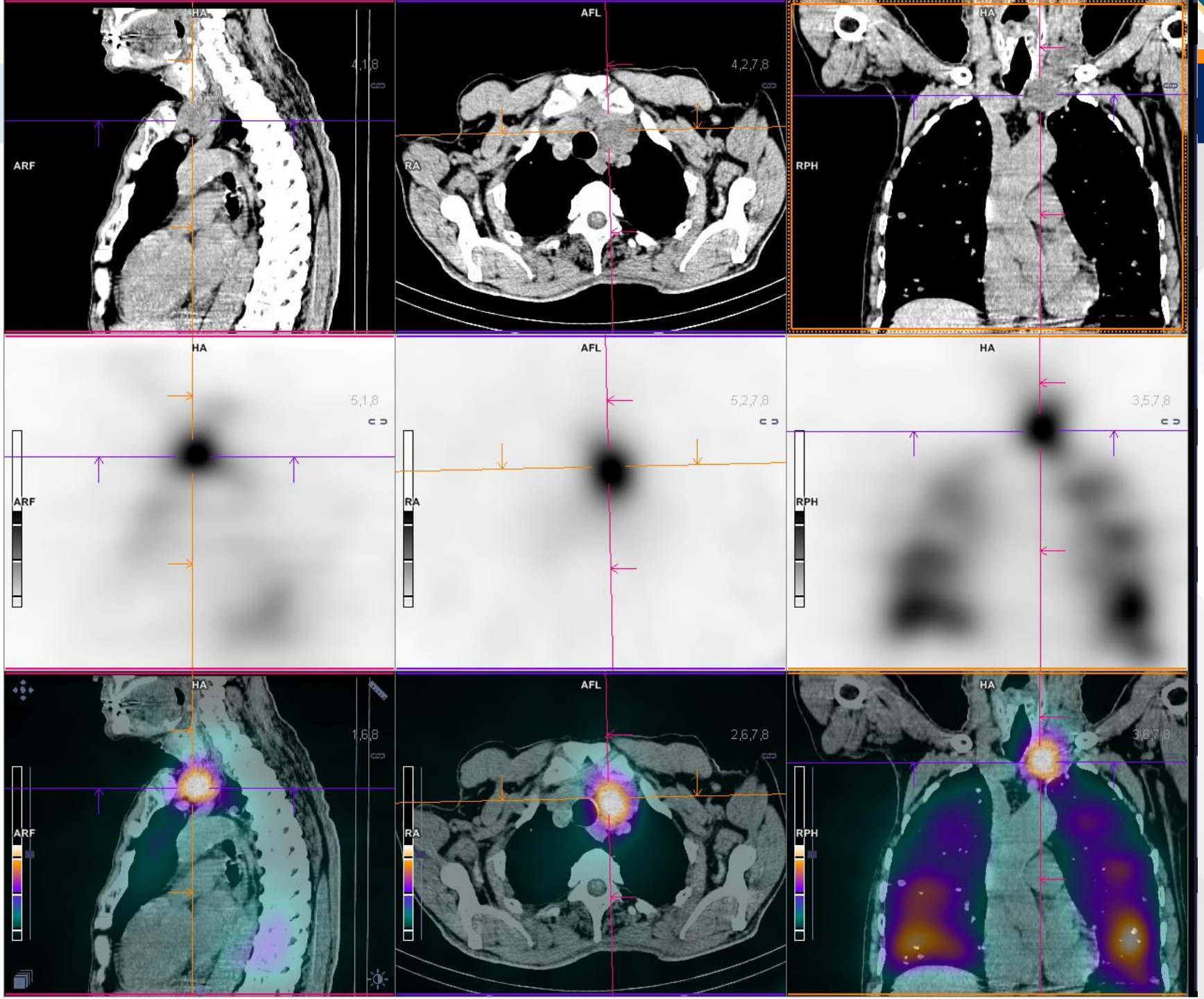
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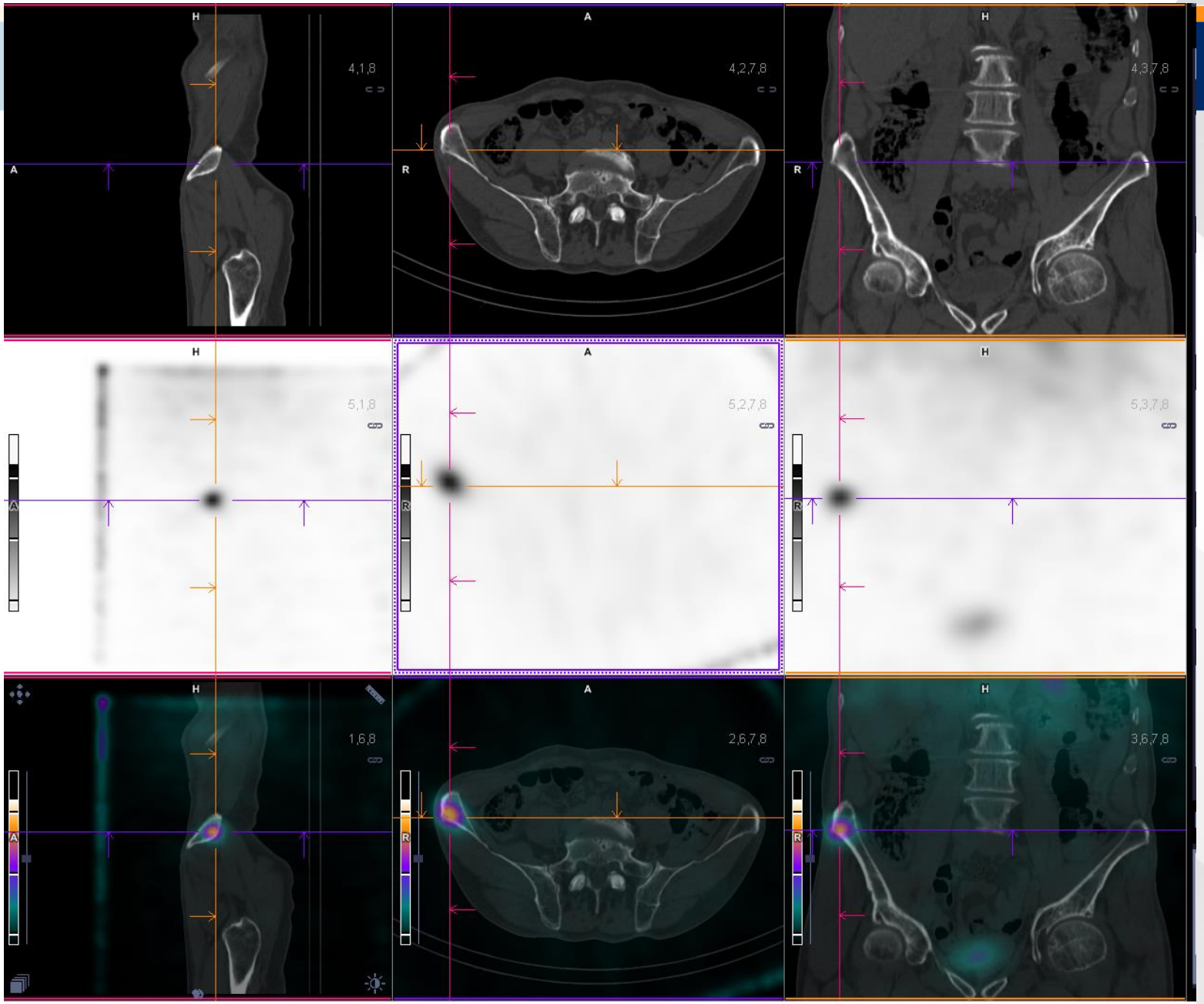
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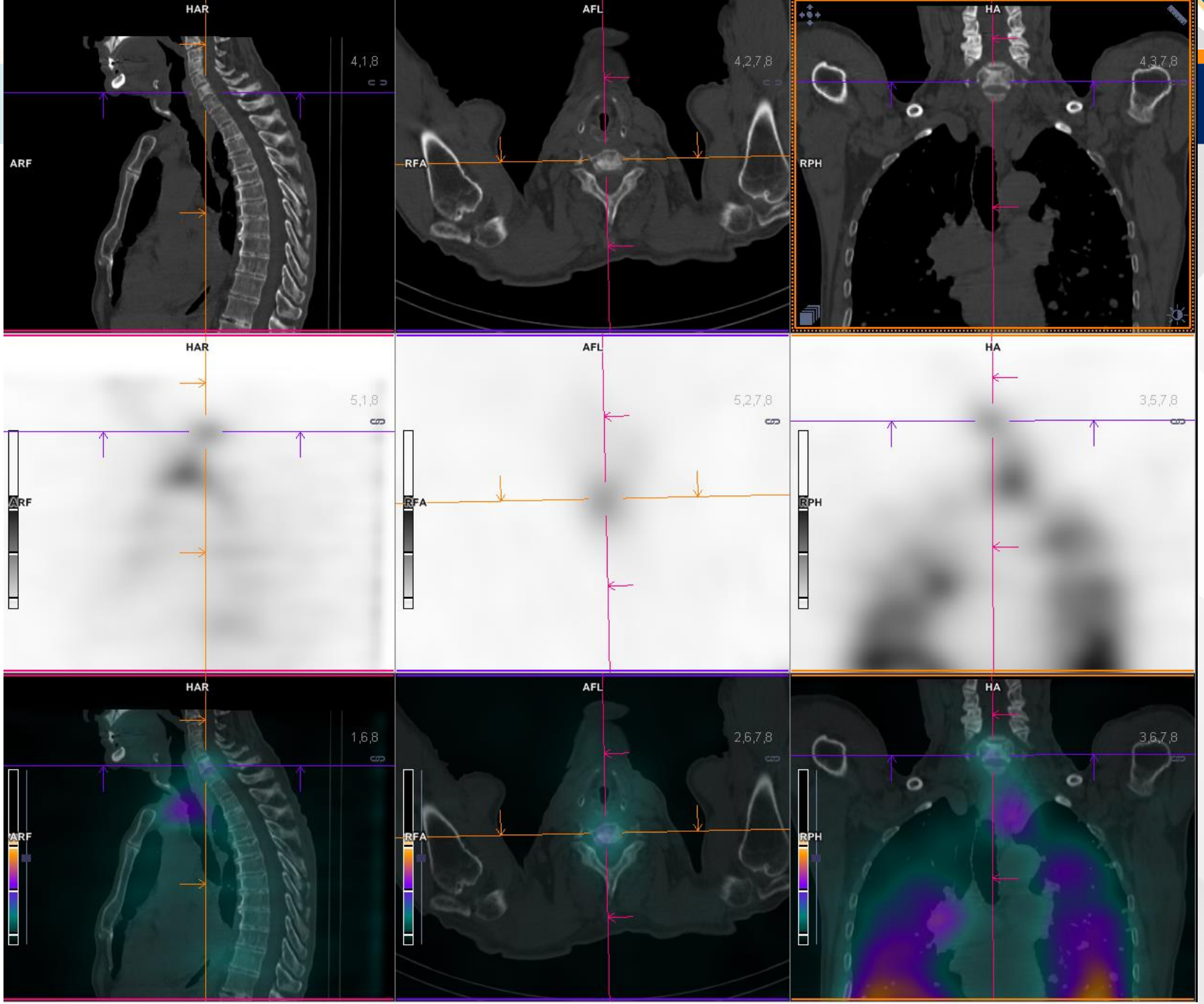
R


HAR
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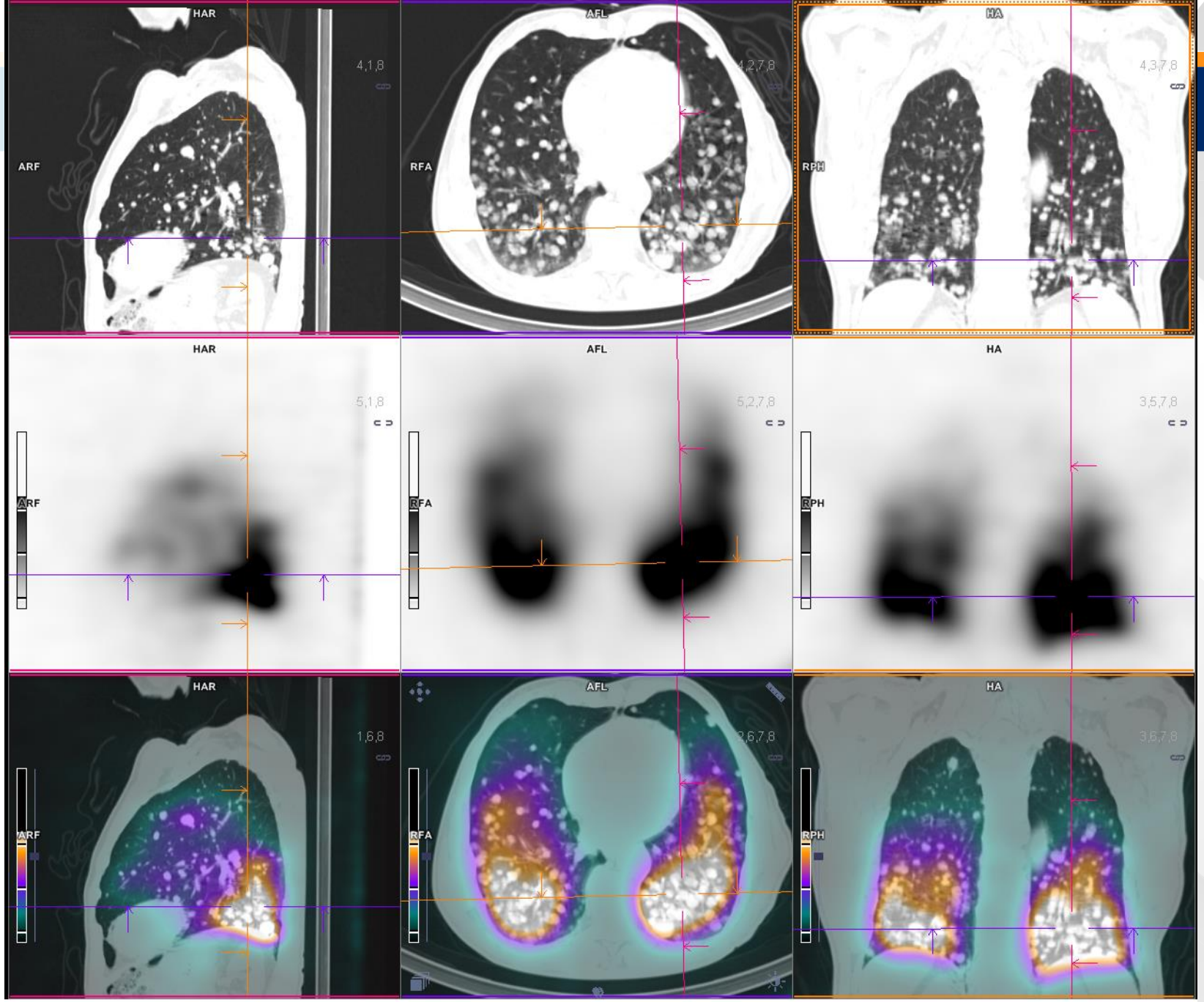

HAR
ARF
AFL
RFA
HA
RPH

Femeneina 47ª. Dg: carcinoma papilar de tiroides+ TT(09/2021).

- ***HP:***

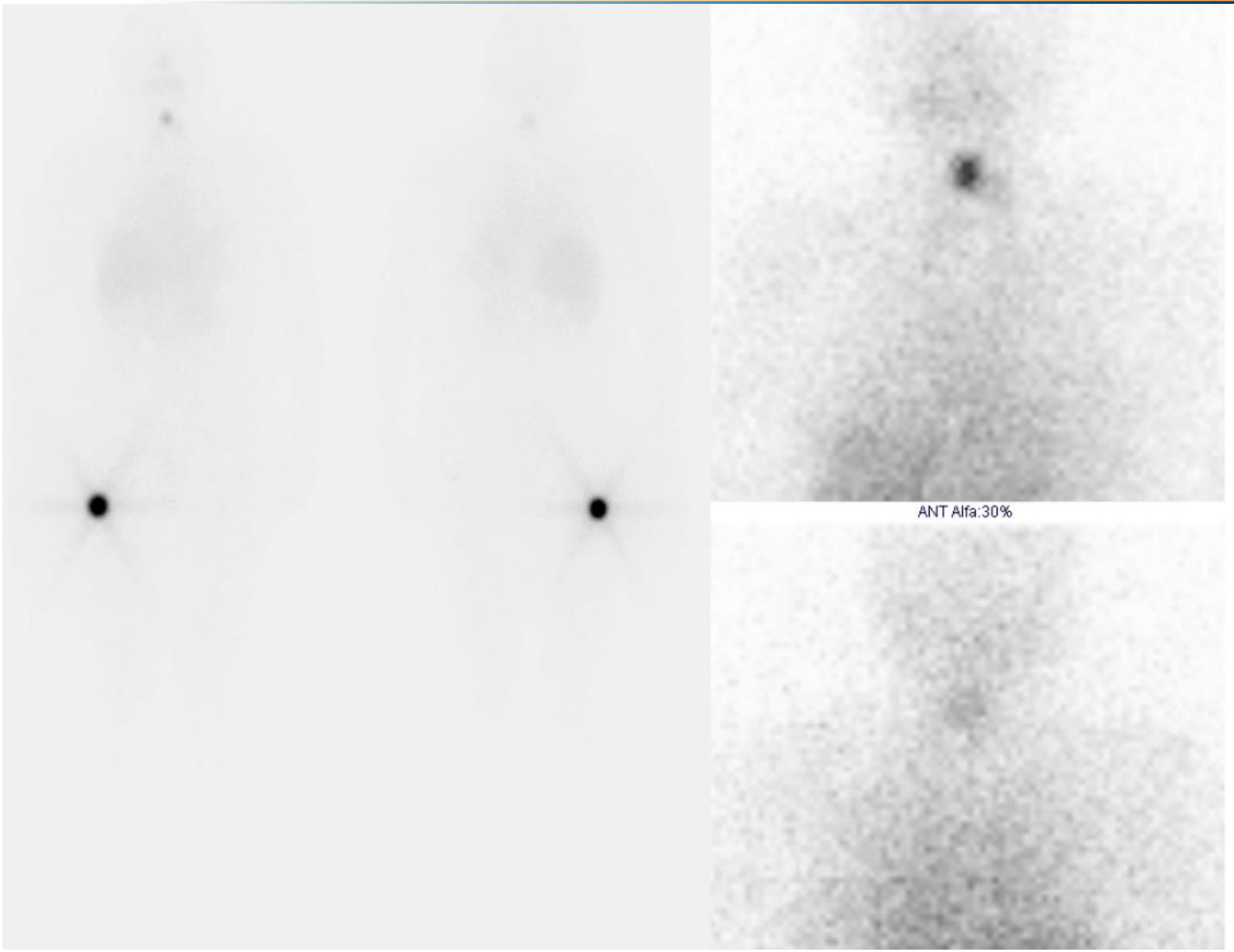
Procedimiento: producto de tiroidectomia total. Focalidad: unifocal. Sitio del tumor: lóbulo derecho, tercio inferior. Tamaño tumoral: 0,9x0,7 cm. Tipo histológico: carcinoma papilar, variante folicular. Mitosis: 2 mitosis/mm2. Necrosis tumoral: no se observa.

Invasión vascular: no se observa. Invasión linfática: no se observa. Invasión perineural: no se observa. Extensión extratiroidea: ausente. Márgenes quirúrgicos: libres dista a 2mm de la cápsula. Ganglios linfáticos: no se recibe.

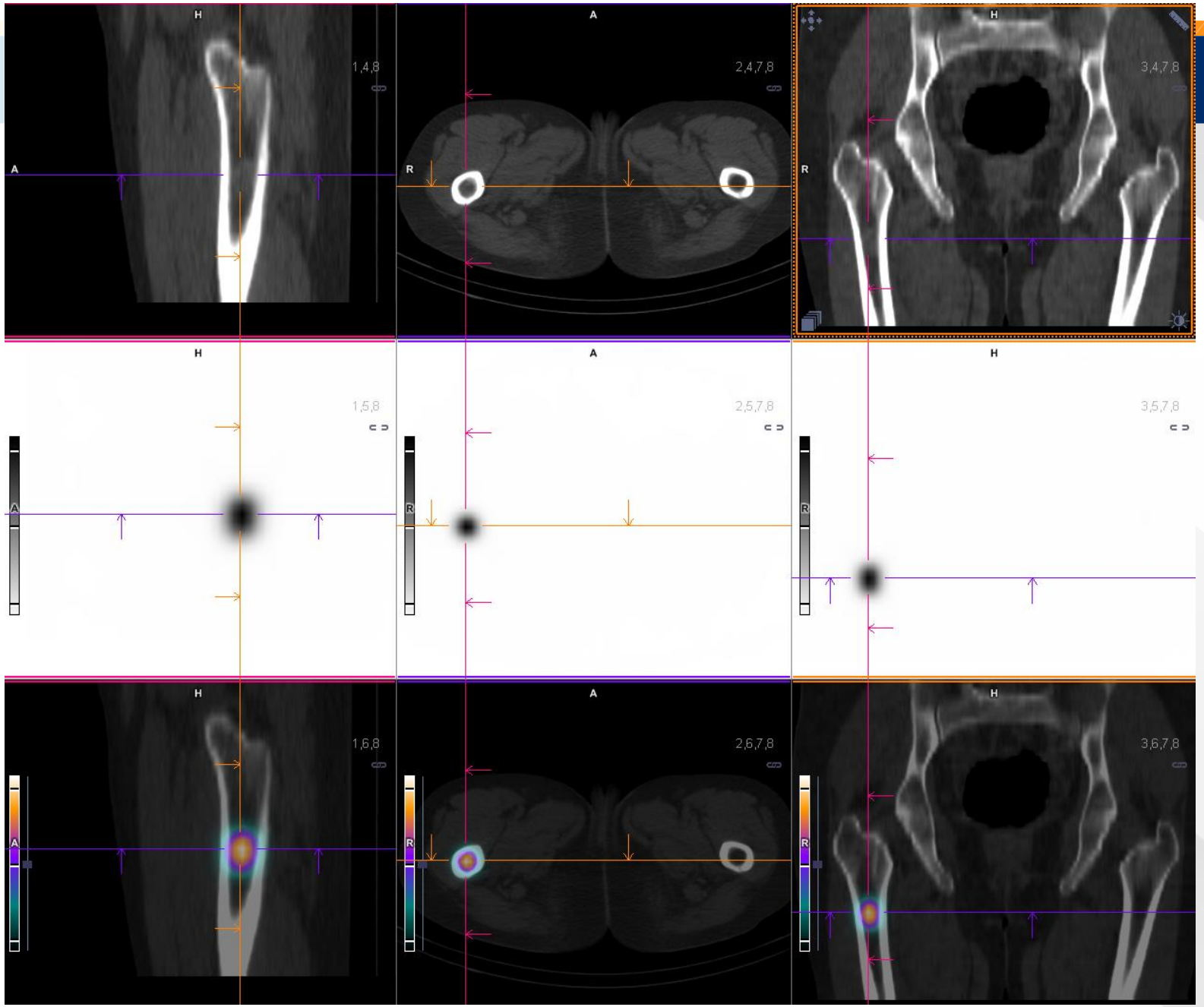
Estadiaje: Pt1a.

- Tiroglobulina (12/2021): 103
- TC cuello: Imagen sugestiva de metástasis a nivel del cuerpo vertebral T1
- RMN: imagen dependiente del cuerpo vertebral de T1 sugestiva de hemangioma
- Eco de cuello 03/2022: imagen pseudonodular ecogénica en el lecho tiroideo derecho, a correlacionar con laboratorio.
- Citología de PAAF (nivel II derecho): hiperplasia linfoide reactiva.
- (03/2022) TSH: 0.18 mUI/L TRG: 8.53 ng/ml Anticuerpos: negativos
- Pte. con diagnóstico de carcinoma papilar de tiroides con estadiaje de T1NxMx.

SOLICITUD: 100 mCi 131I.



TSH: 161,1 mUl/L
TRG: 132,3 ng/ml
ANTI-TPO: 5,40 Ui/ml
ANTI-TG: 11.56 Ul/ml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R

NÚCLEO DE QUITO

TAKE HOME MESSAGES

Ablación con ^{131}I mejora el manejo clínico (facilita el monitoreo de Trg), reduce la tasa de recurrencia y posiblemente incrementa la sobrevida: RCT post ablación permite la detección temprana de M1.

En la mayoría de los casos, la necesidad de RAI, puede ser individualizada, basada en diversos factores (extensión de la enfermedad y riesgo de recurrencia).

Recientemente, ablación puede ser omitida en ***bajo riesgo***.

Dosis bajas de ^{131}I son aceptables en pacientes de ***bajo riesgo*** por su tasa satisfactoria de ablación, menor costo, menor irradiación de los pacientes, así como, del personal de salud.

El uso de dosis altas se sugiere únicamente en pacientes con enfermedad avanzada e histologías desfavorables.

NÚCLEO DE QUITO

TAKE HOME MESSAGES…

SPECT/CT incrementa la sensibilidad de la técnica, caracterización, mayor número de focos CDT, correcto en alto riesgo, respuesta indeterminada.

18F-FDG: Trg, RCT - , HP agresivas, pronóstico

NÚCLEO DE QUITO

Gracias!