Management of indeterminate thyroid nodules: changing the paradigm

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Glossary

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[^{18}F]FDG	[^{18}F]-2-fluoro-2-deoxy-D-glucose, fluorodeoxyglucose
[^{18}F]FDG-PET	[^{18}F]-2-fluoro-2-deoxy-D-glucose positron emission tomography
[^{99m}Tc]Tc-MIBI	hexakis(2-methoxy-2-methylpropylisonitrile)technetium[^{99m}Tc]
^{131}I	radioiodine
^{99m}Tc	technetium-99m
$^{99m}TcO_4^-$	^{99m}Tc-pertechnetate
ACR	American College of Radiology
ADC	apparent diffusion coefficient
AI	artificial intelligence
ATA	American Thyroid Association
AUC	area under the curve
AUS	atypia of undetermined significance
AUS/FLUS	AUS or follicular lesion of undetermined significance
B-mode	bright mode
BCR	benign call rate
BRAF	B-type RAF kinase
BTA	British Thyroid Association
(c)TT	completing total thyroidectomy
CA	carcinoma
CA-IX	carbonic anhydrase IX
CEAC	cost-effectiveness acceptability curve
CI	confidence interval
CK-19	cytokeratin 19
CNA	copy number alterations
CNA-LOH	CNA and loss of heterozygosity
CNN	convolutional neural networks
CT	computed tomography
Df	degrees of freedom
DLR	diagnostic likelihood ratio
DPO-PCR	dual priming oligonucleotide PCR
DTC	differentiated thyroid carcinoma
DW-MRI	diffusion-weighted magnetic resonance imaging
e.g.	exempli gratia, for example
EANM	European Association of Nuclear Medicine
EfFECTS	Efficacy of [^{18}F]FDG-PET in Evaluation of Cytological indeterminate Thyroid nodules prior to Surgery
EQ-5D-5L	EuroQol 5-dimension 5-level
eFVPTC	(encapsulated) follicular variant of papillary thyroid carcinoma
FA	follicular adenoma
FA-OV	oncocytic variant of follicular adenoma, currently known as OA
[^{18}F]FDG-PET/CT	[^{18}F]FDG positron emission tomography / computed tomography

FFPE	formalin-fixed paraffin-embedded
FISH	fluorescence in-situ hybridization
FN	follicular neoplasm
FN/SFN	FN or suspicious for FN
FNAC	fine needle aspiration cytology
FN	false negative
FP	false positive
FTC	follicular thyroid carcinoma
FTC-OV	oncocytic variant of follicular thyroid carcinoma, currently known as OCA
FT-UMP	follicular tumour of unknown malignant potential
FVPTV	follicular variant of papillary thyroid carcinoma
GEC	gene expression classifier
GH	genome haploidization
GLCM	grey level co-occurrence matrix
GLM	generalized linear model
GLUT	glucose transporter
GMP	gene mutation panel
GWLOH	genome-wide loss of heterozygosity
H&E	hematoxylin and eosin
HBME-1	Hector Battifora mesothelial-1
HCA	Hürthle cell adenoma, currently known as OA
HCC	Hürthle cell carcinoma, currently known as OCA
HCN	Hürthle cell neoplasm, currently known as OCN
HCN/SHCN	HCN or suspicious for HCN, currently known as O-FN
HIF1a	hypoxia-inducible factor-1 alpha
HK	hexokinase
HMGA	high mobility group AT-hook
HRM	high-resolution melting (analysis)
HRQoL	health-related quality of life
hTERT	human telomerase reverse transcription
HT	hemithyroidectomy
HU	Houndsfield units
IBSI	Image Biomarker Standardisation Initiative
ICC	immunocytochemistry
ICCRTC	Italian consensus for the classification and reporting of thyroid cytology
i.e.	id est, that is
IHC	immunohistochemistry
iMCQ	iMTA Medical Consumption Questionnaire
iPCQ	iMTA Productivity Costs Questionnaire
IQR	interquartile range
ITN	indeterminate thyroid nodules
kPa	kilopascals
LAIR	lesser-allele intensity-ratio
ldCT	low-dose CT

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LOH	loss of heterozygosity
LR	likelihood ratio
MALDI-MSI	matrix-assisted laser desorption ionization / mass spectrometry imaging
MAPK	mitogen-activated protein kinase
mAs	milliamperage × seconds
MCS	mental component score
MCT4	monocarboxylate transporter 4
MD	molecular diagnostics
MeSH	Medical Subject Headings
mi-OCA	minimally invasive OCA
MIC	minimally important change
MIP	maximum intensity projection
miRNA	microRNA
mPTC	papillary microcarcinoma
MRI	magnetic resonance imaging
MRS	magnetic resonance spectroscopy
MTC	medullary thyroid carcinoma
NBIA	National Biomedical Imaging Archive
NCI	National Cancer Institute
NGS	next generation sequencing
NHGRI	National Human Genome Research Institute
NH-H	nodular hyperplasia with oncocytic cell metaplasia
NIFTP	non-invasive follicular thyroid neoplasm with papillary-like nuclear features
NIS	sodium-iodide symporter
NPV	negative predictive value
OA	oncocytic (thyroid) adenoma, formerly HCA
OCA	oncocytic (thyroid) carcinoma, formerly HCC
OCN	oncocytic cell (thyroid) neoplasm, formerly HCN
O-FN	oncocytic follicular neoplasm
OR	odds ratio
PCR	polymerase chain reaction
PCS	physical component score
PET	positron emission tomography
PET/CT	positron emission tomography/computed tomography
PPARγ	peroxisome proliferator-activated receptor γ
PPV	positive predictive value
PRISMA	preferred reporting items for systematic reviews and meta-analyses
PTC	papillary thyroid carcinoma
QALY	quality-adjusted life year
QUADAS	quality assessment of diagnostic accuracy studies
RAF	rapidly accelerated fibrosarcoma
RAI	radioactive iodine
RAS	rat sarcoma virus
RCI	reciprocal chromosomal imbalance

RCT	randomized controlled trial
READ	real-time exonuclease-mediated allelic discrimination
rhTSH	recombinant human thyrotropin
RI	retention index
RNA	ribonucleic acid
ROC	receiver operating characteristic
ROI	range of interest, region of interest
ROM	risk of malignancy
r_s	Spearman's rank correlation coefficient
SHCN	suspicious for Hürthle cell neoplasm, currently known as O-FN
SPECT	single-photon emission computed tomography
SROC	summary receiver operating characteristic
SUV	standardized uptake value
SUV_{max}	maximum standardized uptake value
SUV_{peak}	peak standardized uptake value
TBSRTC	the Bethesda System for Reporting Thyroid Cytopathology
TCGA	the cancer genome atlas
ThyPRO	thyroid patient-reported outcome
TIRADS	thyroid imaging reporting and data system
TLG	total lesion glycolysis
TN	true negative
TP	true positive
TPO	thyroid peroxidase
TRK	tyrosine receptor kinase
TROP-2	trophoblast cell surface antigen-2
TT	total thyroidectomy
TUMP	tumour of unknown malignant potential
US	ultrasound
USE	ultrasound elastosonography
VAF	variant allele frequency
VAS	visual analogue scale
VE1	$BRAF^{V600E}$ specific antibody
VEGF	vascular endothelial growth factor
VOI	volume of interest
wi-OCA	widely invasive OCA
WO_{Ind}	wash-out index
WTP	willingness to pay
XAI	explainable artificial intelligence

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Curriculum Vitae

Curriculum Vitae

Elizabeth Janna (Lisanne) de Koster was born on the 25th of July 1988 and grew up in Hoedekenskerke, Zeeland, the Netherlands. After graduating cum laude from the Gymnasium at the Buys Ballot College, Goes, in 2006, she studied taal- en cultuurstudies at the University of Utrecht for one year before starting her medical education at the University of Utrecht in 2007. During her bachelor studies, she became actively involved in the medical student association MSFU "Sams" and during her master studies, she fulfilled a fulltime board position in 2011-2012 as treasurer. Subsequently, during the medicine master's program, she started an extracurricular research project on the factors influencing the nondiagnostic rate of thyroid fine needle aspiration cytology at the departments of surgical oncology and radiology at the University Medical Center Utrecht, Utrecht. She also visited the Tygerberg hospital at the University of Stellenbosch, Cape Town, South Africa, for a clinical internship in general surgery.

In 2015, Lisanne obtained her medical degree and started her PhD research at the Radboud University Medical Center, Nijmegen. Under the supervision of prof. dr. Lioe-Fee de Geus-Oei, prof. dr. Wim Oyen, and dr. Dennis Vriens, she coordinated the EfFECTS trial, the Dutch multicenter randomized controlled trial on the efficacy of [^{18}F]FDG-PET/CT in the diagnosis of cytologically indeterminate thyroid nodules that is the basis of this thesis. During her PhD research, she held a parttime position as board member for the LUMC Association for PhD Candidates as treasurer.

To bridge the gap to enroll the desired number of trial participants in the EfFECTS trial, she concurrently worked as a surgical resident (not-in-training) at the St. Antonius Hospital, Nieuwegein, from April 2017 to June 2018. Since July 2018, she is working as a surgical resident in training at the Haaglanden Medical Center, the Hague. She aspires to become a trauma surgeon with an additional qualification for pediatric surgery.

Lisanne currently lives in Leiden with her partner Mathijs and their children Boaz and Lauren.

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