



# RADIOLOGIC SAFETY

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## TI-RADS Highlights

Thyroid nodules are very common, present in 68% of the adult population by screening ultrasound. In addition, there has been an increase in the incidence of papillary thyroid cancer resulting from increasing use of screening ultrasound. However, many thyroid malignant nodules are nonaggressive in behavior. Mortality has remained very low despite the increase in incidence of papillary cancer. Hence came the ACR attempt to risk stratify which nodules warrant FNA on the basis of predicting clinically significant malignancy. This may also have the effect of reducing the number of needless biopsies on benign nodules.

TI-RADS was developed. Each thyroid nodule is categorized as TR1 (Benign), TR2 (not suspicious), TR3 (moderately suspicious), or TR5 (highly suspicious for malignancy). 5 characteristics are evaluated for each nodule: composition, echogenicity, shape, margin, and echogenic foci. Points are assigned based on each characteristic. The more points assigned, the more suspicious the nodule. This may seem like a daunting task at first. But there is an online calculator available (<http://tiradscalculator.com>). In addition, use of templates during dictation can be extremely helpful.

Composition is categorized as cystic/almost completely cystic (0 points), spongiform (0 points), mixed cystic and solid (1 point), and solid/almost completely solid (2 points) with solid the most suspicious feature.

Echogenicity is categorized as anechoic (0 points), hyperechoic/isoechoic (1 point), hypoechoic (2 points), and very hypoechoic (3 points). Very hypoechoic is the most suspicious feature. Hypoechoic is in reference to thyroid. Very hypoechoic is in reference to neck muscles.

Shape is categorized as wider than tall (0 points) or taller than wide (3 points). Taller than wide is the suspicious feature and means ratio of  $>1$  in AP diameter to horizontal diameter in transverse plane.

Margin is categorized as smooth (0 points), ill defined (0 points), lobulated/irregular (2 points), or extrathyroid extension (3 points). The last is the most suspicious feature.

Echogenic foci is categorized as none or large comet tail artifacts (0 points), macrocalcifications (1 point), peripheral/rim calcifications (2 points), and punctate echogenic foci (3 points). The latter is the most suspicious feature.

The points from all 5 above categories are added up for each nodule and a TR category is assigned for each nodule:

0 points	TR1
2 points	TR2
3 points	TR3
4-6 points	TR4
7 or more points	TR5

Another very important characteristic evaluated for each nodule is size. No points are assigned with size. The size is not used for TR categorization. But it is used to help determine if follow up or FNA is warranted.

And the size warranting FNA increases with decreasing TR category. If a nodule is TR5, the threshold size for FNA is 1 cm. For TR4 the threshold size increases to 1.5 cm. For TR3, the threshold increases to 2.5 cm. (No FNA indicated for TR1 or TR2 nodules no matter the size.)

Follow up is recommended for TR5 nodules  $\geq 0.5$ cm. TR4 nodules  $\geq 1$  cm, TR3 nodules  $\geq 1.5$  cm.

All nodules should be measured in 3 axes. These include largest dimension on axial, maximum perpendicular measurement on same axial image, and maximal longitudinal dimension. For multinodular thyroid glands, no more than 4 nodules with the highest ACR TI-RADS point scores that fall below size threshold for FNA are to be followed. Mentioning other nodules is unnecessary and these can be reassessed on follow up sonogram.

Growth is defined as increase of 2 nodule dimensions by at least 2 mm or 20% increase in at least 2 nodule dimensions.

No more than 2 thyroid nodules should be biopsied. These nodules for biopsy should be the nodules with the highest point totals that meets criteria for FNA. Size is not the primary criteria in this regard.

With more widespread implementation of the ACR TI-RADS Committee's recommendations, there will be improved standardization, with the aim of reduced unnecessary biopsies as well as lessening the "overdiagnosis" of the incidence of thyroid cancers, many of which are indolent.

#### References:

1. Tessler, F et al. ACR Thyroid Imaging, Reporting and data system (TI-RADS): White paper of the ACR TI-RADS Committee. J Am Coll Radiol 2017
2. Grant, E et al. Thyroid Ultrasound Reporting Lexicon: White paper of the ACR thyroid imaging, reporting and data system (TIRADS) committee. J Am Coll Radiol 2015;12:1272-1279 2015
3. <http://tiradscalculator.com>