



## THYROID NODULES AND CANCER

### Next-generation sequencing molecular marker assay results in accurate diagnosis of cancer in thyroid nodules with indeterminate thyroid biopsy results

#### BACKGROUND

Thyroid nodules are common and may be seen in up to 50% of the population. The concern about any thyroid nodule is whether it is cancerous. Thyroid biopsy is often performed to determine whether nodules are cancerous or benign. While a benign vs cancer diagnosis is the usual result, ~10–15% of biopsy results are indeterminate with a diagnosis of a follicular neoplasm or suspicious for follicular neoplasm. These thyroid nodules have a cancer risk of approximately 15% to 30%. Current practice guidelines recommend thyroid surgery for patients in this category. However, testing for cancer gene mutations (molecular markers) in indeterminate thyroid biopsy specimens has become more common and may help determine which patients are more likely to have a non-cancerous nodule that does not require surgery. Next generation molecular marker testing has expanded the number of cancer genes examined and preliminary results suggest that this newer testing may be better able to identify thyroid cancers prior to surgery. This study assessed a next generation molecular marker assay in biopsy samples classified as follicular neoplasm or suspicious for follicular neoplasm.

#### THE FULL ARTICLE TITLE

Nikiforov YE et al. Highly accurate diagnosis of cancer in thyroid nodules with follicular neoplasm/suspicious for a follicular neoplasm cytology by ThyroSeq v2 next-generation sequencing assay. *Cancer*. September 10, 2014 [Epub ahead of print].

#### SUMMARY OF THE STUDY

Thyroid biopsy samples from 143 thyroid nodules with a diagnosis of follicular neoplasm or suspicious for follicular neoplasm were divided into two groups. The first group consisted of 91 samples (December 2012 to September 2013) and molecular testing was done after surgery was

already completed. The second group consisted of 52 samples (October 2013 to May 2014) and tested prior to surgery. Next generation molecular marker testing was performed.

In the first group, out of the 64 samples that were negative on molecular testing, 62 were identified as benign and 2 as cancer. Out of the 27 samples that were positive for cancer gene mutations, 23 were cancer and 6 were benign. In the second group, among 37 samples that were negative on molecular testing, 35 were identified as benign and 2 as cancer. Out of the 15 samples that were positive for cancer gene mutations, 12 were cancer and 3 were benign. Adding all the results together, next generation molecular marker testing correctly identified 92% of biopsy samples as cancer or benign.

#### WHAT ARE THE IMPLICATIONS OF THIS STUDY?

The results of this study indicate that a next-generation molecular marker significantly improves the diagnosis of cancer in thyroid nodules found to be a follicular neoplasm or suspicious for follicular neoplasm on thyroid biopsy. The method appears to be highly accurate (92%) in classifying these thyroid nodules into cancer or benign. These data suggest that this new molecular marker assay will be helpful in managing patients with a thyroid nodule that has an indeterminate biopsy result.

— Maria Papaleontiou, MD

#### ATA THYROID BROCHURE LINKS

Thyroid Nodules: <http://www.thyroid.org/what-are-thyroid-nodules>

Thyroid cancer: <http://www.thyroid.org/cancer-of-the-thyroid-gland>



## THYROID NODULES AND CANCER, continued

### ABBREVIATIONS & DEFINITIONS

**Thyroid fine needle aspiration biopsy (FNAB):** A simple procedure that is done in the doctor's office to determine if a thyroid nodule is benign (non-cancerous) or cancer. The doctor uses a very thin needle to withdraw cells from the thyroid nodule. Patients usually return home or to work after the biopsy without any ill effects.

**Suspicious thyroid biopsy:** This happens when there are atypical cytological features suggestive of, but not diagnostic for malignancy. Surgical removal of the nodule is required for a definitive diagnosis.

**Thyroidectomy:** Surgery to remove the entire thyroid gland. When the entire thyroid is removed it is termed a total thyroidectomy. When less is removed, such as in removal of a lobe, it is termed a partial thyroidectomy.

**Molecular markers:** Genes and microRNAs that are expressed in benign or cancerous cells. Molecular

markers can be used in thyroid biopsy specimens to either to diagnose cancer or to determine that the nodule is benign.

**Genes:** A molecular unit of heredity of a living organism. Living beings depend on genes, as they code for all proteins and RNA chains that have functions in a cell. Genes hold the information to build and maintain an organism's cells and pass genetic traits to offspring.

**Mutation:** A permanent change in one of the genes.

**Oncogenic mutation:** A mutation that leads to the development of cancer.

**Genetic marker:** A gene or DNA sequence with a known location on a chromosome that can be used to identify specific traits.