Thyroid Nodules – 3. Needle Aspiration Biopsy.

This post will focus on the thyroid nodule needle biopsy, usually the final step in the analysis of a thyroid nodule. The needle biopsy is of central importance in estimating the risk of cancer associated with a thyroid nodule and deciding whether or not to proceed with surgical treatment.

Thyroid nodule fine needle aspiration (FNA) biopsy is a surprisingly safe and straightforward procedure. The needles used are very small – too small to do any damage to structures in the neck. If desired, an anesthetic medication can be applied to numb the skin prior to needle insertion. A very small needle is attached to a syringe, the tip of the needle is carefully placed into the nodule, suction is applied, and a sample of cells from the nodule is collected. If the nodule is large, needle placement can be guided by palpation only, without the use of any imaging equipment. However, if the nodule is small, a sonogram machine is used to create an image of the nodule, guide needle placement, and confirm that the needle tip is actually placed inside the nodule. Usually, the needle is passed back and forth within the nodule to loosen the cells and increase the number of cells recovered during the procedure. The recovered material is mounted on microscope slides, stained, and analyzed by an experienced cytopathologist.

Complications of thyroid FNA biopsy are very rare and when they occur, they are almost always minor. If swelling occurs during the first few hours after the biopsy, cold compresses will help. The neck can be a little sore for a few days after the biopsy. A brief course of acetaminophen, ibuprofen, or aspirin will take care of this problem. Rarely, minor bruising can occur.

The estimation of thyroid cancer risk hinges on obtaining an adequate number of thyroid cells during the biopsy procedure, and on the expert microscopic analysis of the recovered cells. An inadequate number of cells is recovered in 15 – 20 % of biopsy procedures, necessitating repetition of the procedure. Nodules that are partially cystic (fluid-filled) often do not yield material adequate for diagnosis. If a biopsy attempt done without the benefit of sonographic imaging produces an unsatisfactory specimen, repeating the procedure with sonographic guidance of needle placement will increase the chance of recovering diagnostic material. If two or more FNA biopsy procedures have failed to provide diagnostic material, other procedures are available, including the cutting (core) needle biopsy and the large needle aspiration (LNA) biopsy. These procedures may improve diagnostic yield, but may be associated with more pain and bleeding.

The interpretation of the cellular material recovered from the biopsy will guide subsequent treatment recommendations. Following biopsy, the following categories are used to classify thyroid nodules:

1. Nondiagnostic: This occurs in 3-10% of biopsies and results from insufficient recovery of cellular material. No information is obtained, and the biopsy must be repeated. Malignancy is not ruled out, even if no cancer cells are seen.
2. Benign: Thyroid cells look completely normal and no sign of cancer is seen. "Adenomatoid nodules" fall into this category. Also, nodules caused by Hashimoto's Thyroiditis and Subacute Granulomatous Thyroiditis fall into this category.
3. Atypia or Follicular Lesion of Undetermined Significance: This is a problematic borderline category used to describe biopsy material that is not convincingly benign, but is not highly suspicious for malignancy either. The use of this classification varies widely amongst biopsy centers, with some centers using this category in almost 30% of biopsy reports. Consequently, the risk of cancer varies widely within this category, ranging 5-32% amongst

several centers. Molecular analysis of the biopsy material (in addition to microscopic visual inspection) is now being introduced in several centers in an effort to improve diagnostic accuracy.

4. Follicular (or Microfollicular) Neoplasm: This is another troublesome category which includes both benign and malignant nodules that cannot be distinguished on the basis of the biopsy findings. Depending on the treatment center, the risk of cancer in nodules of this category ranges 6-30%. Molecular analysis also holds promise to improve diagnostic accuracy in this category.
5. Hürthle Cell Neoplasm: This category is similar to the Follicular Neoplasm category. However the cells have a different appearance; they are large, polyhedral in shape, and stain with a distinctive red hue. The risk of cancer in nodules of this category is thought to be about twice that of the Follicular Neoplasm category.
6. Suspicious for Malignancy: Nodules in this category have some, but not all, characteristics of malignancy. Cancer risk for nodules in this category ranges 50-75%.
7. Malignant: Nodules in this category are very likely malignant. Possibilities include Papillary cancer, Medullary cancer, Lymphoma, Anaplastic cancer, and distant cancer metastatic to the thyroid. Note that the diagnosis of Follicular cancer cannot be made on the basis of FNA biopsy, and can only be made by analysis of a surgical specimen.

In summary, the FNA biopsy procedure is currently the best available technique for estimating thyroid nodule cancer risk and provides useful for information when considering the need for thyroid surgery. Unfortunately, the procedure is far from perfect, and interpreting the results is often not straightforward. Patients with thyroid nodules should work with a highly experienced endocrinologist who can provide guidance through this difficult process and formulate an optimal treatment plan.