Simple Core-Needle Biopsy for Thyroid Nodule, Complicated Tinnitus

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What Is Known about This Topic So Far?

- Although many authors recommend a core-needle biopsy as an alternative modality in cases of inconclusive cytology with fine-needle aspiration for thyroid nodule, it is not in the American Thyroid Association's recommendations and is a complementary tool according to the American Association of Clinical Endocrinologists. Known complications are classically bleeding and hematomas. However, other types of vascular complications may occur, such as incapacitating pulsatile tinnitus.

What Does This Case Report Add?

- In cases of iatrogenic arteriovenous fistulas caused by a core-needle biopsy, angiography is recommended both as a diagnostic and treatment modality. Stenting the fistula with an endoprosthesis can correct the problem immediately.

Key Words

Arteriovenous fistula · Thyroid · Core needle biopsy · Tinnitus · Stent

Abstract

Background: Fine-needle aspiration is the procedure of choice for evaluating thyroid nodules. Core-needle biopsy (CNB) is not included in the American Thyroid Association recommendations for evaluating such nodules. CNB complications are classically bleeding and hematomas. To our knowledge, no case of arteriovenous fistula (AVF) second-

ary to a CNB has been reported, nor has any case of tinnitus secondary to a post-CNB AVF. **Objectives:** To make the clinician aware of possible vascular complications caused by CNB and the possibility of difficult pathology reading caused by previous CNB. **Methods:** A 44-year-old female is described who was referred to our tertiary care center for left-sided pulsatile tinnitus. She did report having had a CNB right before the tinnitus appeared. Conventional angiography demonstrated a focal AVF originating from the left vertebral artery, with reflux to the left vertebral venous plexus. A 6-mm stent was placed over the site of the fistula via an endovascular approach, which solved both the radiological

and clinical documented problems. Moreover, CNB greatly complicated pathology reading once total thyroidectomy was later performed. The suspected area of invasion was an artifact due to the previous biopsies. **Conclusion:** Although many authors recommend a CNB as an alternative modality in cases of inconclusive cytology with fine-needle aspiration, it is not in the American Thyroid Association recommendations. In cases of iatrogenic AVFs caused by a CNB, angiography is recommended both as a diagnostic and therapeutic modality. Stenting the fistula with an endoprosthesis can correct the problem immediately.

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Introduction

Thyroid nodules are a common clinical problem in the head and neck surgeon's daily practice. Globally, the prevalence of thyroid nodules is reported to be as high as 5% in women and 1% in men [1]. The baseline workup includes a history, a physical examination, a TSH determination and imaging such as ultrasound (US). To better characterize the lesion, the American Thyroid Association (ATA) recommends fine-needle aspiration (FNA) as the procedure of choice for evaluating thyroid nodules [1]. The authors add that US guidance is recommended for nonpalpable nodules, which are predominantly cystic or located posteriorly in the thyroid lobe [1]. Core-needle biopsy (CNB) is not among their recommendations for the initial evaluation of thyroid nodules. According to American Association of Clinical Endocrinologists (AACE), it may be used as a complementary investigational tool accordingly, but should not replace FNA [2]. Although the incidence of CNB complications is reportedly low, they do occur. Classically, the main complications feared are bleeding and tumor-cell seeding. Novoa et al. [3] report a rate of complications of 1% with CNB, with minor hematomas accounting for almost 90% of them. Importantly, in traversing the basement membrane, CNB can greatly complicate the histologic analysis of subsequent biopsies. To our knowledge, no case of arteriovenous fistula (AVF) secondary to CNB has been reported in the literature until now, nor has any case of tinnitus secondary to such an AVF been reported. We therefore describe the unusual case of pulsatile tinnitus secondary to an AVF caused by a CNB of the thyroid successfully treated by endovascular stenting. This case indicates that an AVF causing tinnitus is another type of potential vascular complication after a sometimes overly trivialized procedure such as a CNB.

The Patient

A 44-year-old female was referred to our tertiary care center for left-sided tinnitus of unknown origin. She described the tinnitus as pulsatile, constant, and stronger in the dorsal decubitus position. The patient had no history of earaches, otorrhea, hearing loss or vertigo, nor did she complain about any neurological symptoms or report any trauma. This was her first episode of this kind. Her past surgical history was nonsignificant, but she did report having had a core thyroid biopsy shortly before the tinnitus appeared. She also reported that she had been followed by her family physician for a stable thyroid nodule for the previous 2 years. A previous US revealed a $4.3 \times 3.8 \times 2.7$ cm left hyper-echoic heterogeneous nodule with cystic components. When the nodule was initially discovered, she had an inconclusive FNA, since no thyroid cells were seen on cytological examination. Her physician therefore ordered an US-guided core-needle thyroid biopsy, which was performed with an 18G needle though the left side of the patient's neck. Unfortunately, pathology did not find any thyroid cells in the biopsy, which, once again, suggested a missed biopsy. The patient developed left-sided tinnitus shortly after the procedure.

On physical examination, the patient appeared anxious and bothered by her tinnitus. An otoscopic examination did not show any pulsatile mass or any tympanic membrane abnormalities. In addition, the tinnitus could not be objectified. The rest of the head and neck examination was otherwise unremarkable. An US was ordered. It showed the same stable nodule as described before. No gross aneurysm, pseudoaneurysm or arteriovenous malformation was noted. Computed tomography (CT)-angiography was ordered to better characterize this vascularization pattern, but it was normal. Nevertheless, an AVF between the previously biopsied thyroid nodule and a neck vessel was still clinically suspected.

The patient underwent an uneventful total thyroidectomy. The final pathology reported a follicular adenoma with suspicion of an area of capsular invasion. After a review of the pathology, it was concluded that this suspected area of invasion was an artifact due to the previous biopsies. The final diagnosis from the removed thyroid was follicular adenoma with focal capsular irregularity and associated inflammation consistent with the history of previous FNA and CNB.

Even though the thyroid was removed, her tinnitus was still present. Conventional angiography demonstrated a focal AVF originating from the left vertebral artery, with reflux to the left vertebral venous plexus (fig. 1).

The patient was put on clopidogrel, and an arterial prosthesis was planned for a month later. The patient underwent therapeutic angiography (fig. 1). Contrast injection demonstrated a focal arteriovenous malformation on the V2 segment of the left vertebral artery close to the C7 vertebra and draining into the perivertebral venous plexus on the same side. An endoprosthesis 6 mm in diameter was placed over the fistula. Angioplasty was then performed inside the prosthesis to completely eliminate the small, persistent flow through the fistula. The final angiography demonstrated complete occlusion (fig. 1).

The patient's tinnitus had resolved by the time she awoke, and 2 years after her angiographic intervention, she is still tinnitus-free. Her postoperative CT-angiography showed no fistula (fig. 2).

Fig. 1. Therapeutic angiography with endoprosthesis over the fistula. **a, b** Focal AVF on the left side, where core thyroid biopsy occurred. **c** Endoprosthesis in the left vertebral artery. **d** Final result after endoprosthesis placement and balloon dilatation. No fistula is present.

Fig. 2. CT-angiography of the head and neck demonstrating **(a)** coronal view of the left vertebral artery and **(b)** sagittal view of the left vertebral artery without any AVF remaining.

Why So Unique?

There have been only a few reported cases of AVF in connection with the thyroid, and all of them have been thyroidectomy-related and involved mostly the thyroid arteries [4]. As previously mentioned, FNA is the investigation of choice for thyroid nodules [1]. Many studies agree that a CNB could be performed as a complementary tool for assessing nodules for which the results of the initial FNA are indeterminate [3, 5, 6]. However, the ATA has a divergent opinion in that it recommends either surgery or considering a ^{123}I scan, depending on the TSH level after indeterminate cytology [1]. Furthermore, a recent meta-analysis by Novoa et al. [3] of CNB of the head and neck region concluded that this method is not ideal for assessing thyroid lesions, partly because of its low sensitivity in detecting malignancy (68%) as well as its low specificity for identifying true neoplasms (67%). This can be explained to a certain extent by the difficulty in distinguishing follicular adenomas from follicular carcinoma [7].

In our case, the patient had been followed by her family physician before she was referred to us. She had a non-diagnostic FNA prior to undergoing a CNB, which, unfortunately, was nondiagnostic as well. Incapacitating tinnitus resulted from an arteriovenous malformation after a CNB. The biopsy was performed with an 18G needle, which is larger than the 20–21G recommended size by the AACE [2]. In addition, this greatly complicated the final pathology reading because of the false suspicion of invasion resulting from an artifact. On the one hand, the rate

of complications for CNB is usually low, being less than 4%, and these complications are mostly hematomas. Usually, no intervention is needed [3, 5]. On the other hand, this shows that even when US guidance is used, CNB is not complication-free.

Strong suspicion is essential for diagnosing such vascular problems as an arteriovenous malformation. Even newer imaging modalities, such as CT-angiography and US, could not replace conventional angiography. Angiography is still considered the gold standard for both diagnosing and treating such fistulas [8]. Therefore, clinical suspicion should be high enough for one to perform a more invasive procedure, as we did in this case [8]. Our patient had a stent installed that covered the fistula, which solved the problem. As mentioned by Greer et al. [9], lower-profile stenting devices and improved endovascular techniques have been shown to be effective in managing vertebral artery injuries, especially in the vertebral artery area, where they are difficult to access. More than 2 years after the intervention, the patient is still tinnitus-free.

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Disclosure Statement

The authors declare that no financial or other conflict of interest exists in relation to the content of the article.

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