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Thyroid Fine-Needle Aspiration Cytology: Focusing on Adherence to Guidelines and Hospital Organization

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Patient: Female, 39-year-old
Final Diagnosis: Goiter with periprocedural complication
Symptoms: None
Medication: —
Clinical Procedure: Fine-needle aspiration cytology
Specialty: Radiology

Objective: Challenging differential diagnosis





Background: The complications of fine-needle aspiration cytology (FNAC) are rare but can be challenging for performing physicians to diagnose and manage. This type of procedure is perceived as routine and devoid of substantial risks, but uncommon complications can occur and need to be addressed with careful workup.

Case Report: A FNAC procedure for a young female patient with multiple thyroid nodules was requested by her general practitioner. After the FNAC thyroid procedure, a carotid wall hematoma was suspected and could not be excluded with ultrasound (US) alone. Thus, the patient underwent a computed tomography angiogram (CTA) that excluded blood extravasation from the carotid, confirming the suspicion of perivascular blood accumulation. As a precaution, the patient was hospitalized, with US follow-up; she was dismissed the day after her hospital admission with a diagnosis of a benign thyroid nodule in multinodular goiter according to SIAPEC-IAP classification.

Conclusions: This case highlights how a routine-perceived procedure such as FNAC could present a challenge to the performing physicians, pathologist, and radiologist, raising the suspicion of a severe complication that needs to be addressed with a readily available emergency service that may be accessible only within a central hospital-level organization. This case reinforces the point that more careful adherence to clinic-radiological guidelines is needed to avoid potentially inappropriate and harmful procedures. A review of the literature concerning guidelines for FNAC procedure, diagnostic classifications, and reported complications is provided as part of this case report.

MeSH Keywords: **Biopsy, Fine-Needle • Carotid Artery Injuries • Cytological Techniques • Thyroid Gland • Ultrasonography**

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Background

Incidental findings of thyroid nodules have increased exponentially in recent years, mostly due to the widespread application of high-resolution ultrasound (US) to the thyroid [1]. Several international scientific societies have established clinic-radiological guidelines for the diagnosis and the management of thyroid nodules [2,3]. The American College of Radiology identifies 5 radiological risk levels and recommends US-guided fine-needle aspiration cytology (US-FNAC) of high-suspicion nodules if 10 mm or larger, and of nodules with a low risk for malignancy only if larger than 25 mm [2]. According to the European Thyroid Association Guidelines (EU-TIRADS), nodules with no high-risk features (oval-shaped, isoechoic/hyperechoic with smooth margins) should be considered at low risk and FNA performed only if greater than 20 mm, while high-risk nodules greater than 10 mm should undergo FNAC, with possible FNAC also in 5–10 mm nodules if highly suspicious [3]. US-FNAC is considered the gold standard for the diagnostic evaluation of thyroid nodules because of safety, reliability, and cost-effectiveness [4–7]. At the same time, several diagnostic classification systems are used for thyroid nodules with slight differences among each other [8–10]. However, FNAC is still an invasive procedure, not exempt from complications [11–19]. Post-procedure adverse events can be either clinically irrelevant and self-limiting, such as pain in the biopsy site [12], or life-threatening adverse events causing airways obstruction [13] and major bleeding [12,14]. Death after FNAC has also been reported [17].

Herein we report the case of a 39-year-old female who underwent US-FNAC at our institution for incidental thyroid nodules that proved benign, but the procedure was complicated by an accumulation of blood around the carotid artery. The echographic finding was suspicious for carotid hematoma, and it was managed with urgent computed tomography angiography (CTA) scan with contrast and hospitalization follow-up.

Case Report

A 39-year-old female was referred to our University Hospital for the incidental finding of bilateral thyroid nodules on a previous US examination, which was prescribed for recurrent neck pain. No symptoms or signs suggestive of thyroid dysfunction were reported. US detected a 18×12 mm, mixed echo-structure nodule in the right lobe and a 15×7 mm, peripherally vascularized nodule in the left lobe. Despite not being suspicious, an indication for FNAC was given by the general practitioner for the larger nodule (Figure 1A). The procedure was performed by an expert pathologist under US-guidance with a 25G needle. Two maneuvers were made; after the first pass, consisting of predominant colloid material, the second one showed frankly

hemorrhagic material. Post-procedure US control showed a half-moon-shaped blood accumulation in the peri-carotid region, with a 20 mm craniocaudal extension and 7 mm thickness, between the inferior pole of the right lobe and emergence of the common carotid artery (Figure 1B), even with no signs of carotid dissection. Although unlikely, incidental puncture of the carotid artery with consequent hematoma could not be excluded, so the patient was referred to the Emergency Department and an urgent CTA with contrast was performed, approximately 1 hour after the FNAC. CTA excluded the presence of intramural hematoma of the carotid wall and signs of active bleeding (Figure 1C), confirming the presence of a hyperdense blood accumulation surrounding the medial portion of the carotid wall, with a maximum thickness of 4.5 mm. The patient was admitted to the Endocrine Surgical Department for observation and did not complain about breathing difficulties, nor other symptoms during the entire workup. After 24-hour observation, US control displayed a marked reduction in thickness of the peri-carotid blood accumulation (from 7 to 2 mm, Figure 1D). Meanwhile, cytologic smears were evaluated and a diagnosis of a TIR2 benign nodule (Figure 2), according to the 2014 Italian Thyroid Cytology Classification System, was provided [10]. At discharge, the diagnosis was of multinodular goiter with FNAC procedure complicated by self-limited perivascular thyroid bleeding. After 3 months, the patient was well and did not complain about any related symptoms.

Discussion

The widespread use of US has led to an increase in the detection of thyroid nodules [1]. However, most nodules are benign in nature and even the malignant ones with a diagnosis of papillary thyroid carcinoma (PTC), if smaller than 1 cm, are thought to behave in a somehow indolent fashion [20,21]. It is broadly accepted that US-guided FNAC is safe and cost-effective for the diagnosis of thyroid nodules if performed by trained physicians and in suitable locations [4,5,7]. However, an emerging issue is the possibility of overdiagnosis/over-treatment, with approximately 228 000 cases in women in the United States considered to be cases of overdiagnosis according to a large series study of cases occurring between 1988–2007 [22]. Moreover, an increasing number of invasive procedures have been ordered by physicians to investigate the incidence of complications and their severity spectrum. Literature is often discordant regarding the frequency of FNAC complications. An Italian retrospective case series that included almost 8000 FNAs, reported 0.15% of complications [16] which comprised the overall adverse events, without distinction of type or clinical relevance. Another case series showed a complication incidence rate ranging from 1.9% to 6.4% when reporting the incidence of blood extravasation-related complications [11]. Small hemorrhages/hematomas appear to be

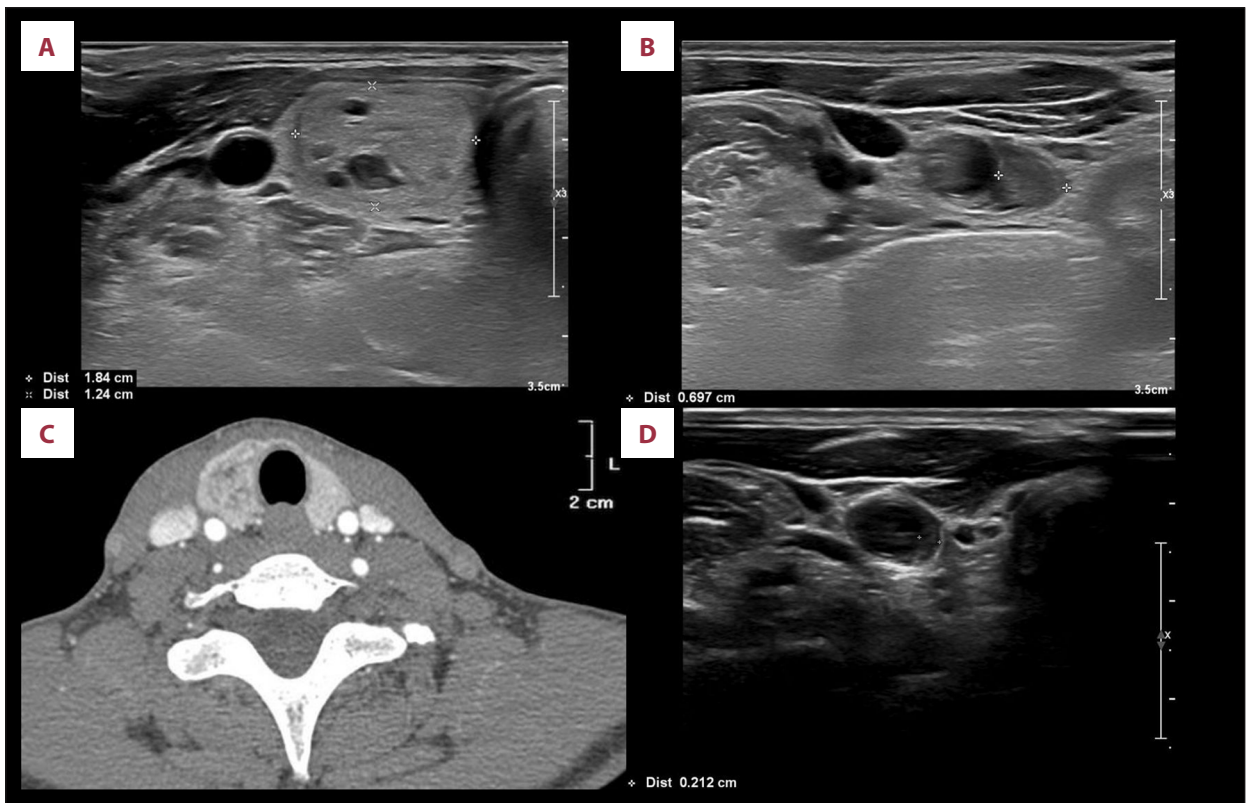


Figure 1. Ultrasound (US) appearance of the thyroid right lobe nodule before fine needle aspiration (FNA) (A). Immediately after the procedure, US detects peri-carotid blood accumulation surrounding approximately half of the carotid wall (B). Detail of computed tomography angiography scan with contrast. The contrast dye clearly highlights the carotid vessel and there are no visible breakages of the carotid wall, demonstrating its integrity and excluding active bleeding (C). After 24 hours, US shows a significant reduction of the peri-carotid hematoma (D).

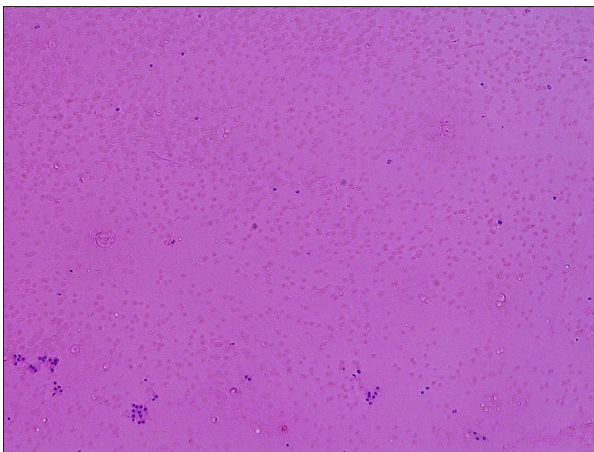


Figure 2. The cytopathological findings are clearly benign, with abundant colloid and sparse aggregates of thyrocytes with no atypia. Original magnification, 10 \times ; hematoxylin and eosin stain.

relatively common, and intra-nodular hemorrhages have been found to be even more frequent than blood extravasation in peri-thyroid soft tissues [11,19]. However, epidemiological data

are limited, probably due to the general avoidance of reporting this type of adverse event, often because of its clinical irrelevance [12]. This information, however, may be of value when considering FNA in other clinical and diagnostic settings, where more invasive diagnostic procedures could be more harmful, as has been recently suggested [23]. The tendency to develop hemorrhage or hematomas after FNAC is mostly attributable to the rich thyroid vascularization and fragility of veins, therefore, special attention is needed for patients with bleeding diathesis or patients under anticoagulant/antiaggregant therapy [24]. Less common complications reported are infectious/inflammatory conditions [25], thyroid swelling of unknown etiology [26], subendothelial carotid hematoma [27], and transient vocal cord paralysis [28].

Our didactic case highlights the importance of adherence to diagnostic guidelines, clinicians being ready to recognize potential complications, and multidisciplinary management together with an adequate central hospital-level organization. Our case report highlights some of the considerations of the procedure itself. Firstly, the frankly hemorrhagic material after the second maneuver prompted the pathologist to ask the

radiologist for a further check, thus revealing the blood accumulation around the carotid wall. Even if there was no demonstration of a carotid puncture during the US-FNAC record and the patient was asymptomatic, this potentially serious complication had to be excluded. This point is particularly important, because in our patient's case, it was thanks to the attention and collaboration of the performing pathologist with the radiologist that the blood accumulation was discovered, raising suspicion for serious complications; while if the radiologist had been alone or checking only the video recording, the potential complication would have been missed. The suspicious situation urged further workup for the patient who received urgently high doses of radiation and contrast dye to exclude the carotid wall rupture. The hematoma was confirmed with the relevant hypothesis that the blood accumulation could have been caused by the puncture of a thyroid capsular vessel, leading to the descent of a relevant quota of blood along the lower part of the thyroid, surrounding the carotid external wall. Not least of all, this situation created a state of stress for the patient with the need for precautionary 24-hour hospitalization. The diagnosis was rendered the same day of the procedure by the performing pathologist with a high degree of confidence and showed a clearly benign nodule with abundant colloid, "naked" nuclei and sparse aggregates of thyrocytes with no atypia.

It is important to note that such a complete and fast workup was possible only because the procedure was performed at a central hospital, where imaging studies with contrast utilization and emergency service were easily accessible. This is important to keep in mind given that more and more FNACs are

nowadays performed in private practice settings [29] where emergency services are not as readily available or performed in peripheral hospitals with a possibly lesser degree of expertise in managing such unusual cases [30]. Moreover, the expected cytological diagnosis of benign nodule draws attention to the indications to perform FNAC. More careful adherence to radiological guidelines and indications [2,3] could reduce the number of unnecessary procedures and thus, undesired procedural complications.

Conclusions

Our case highlights how a routine-perceived procedure such as FNAC could challenge the performing physicians, raising the suspicion of a severe complication and reinforcing the need for an adequate hospital-level organization to be available to correctly ensure quality of management, diagnosis, and patient safety in such cases.

Department and Institution where work was done

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Conflicts of interest

None.

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