REVIEW

CURRENT EVIDENCE ON CORE-NEEDLE BIOPSY (CNB) VERSUS FINE-NEEDLE ASPIRATION (FNA) FOR EVALUATING THYROID NODULES

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ABSTRACT

Objectives. This publication is a narrative review of published scientific articles on the diagnostic role of CNB (core-needle biopsy) compared with a repeated use of the FNA (fine-needle aspiration) method after the initial fine-needle aspiration, or using CNB as a first line tool. **Methods.** We have searched in order to find all relevant articles which debated both types of investigations and were published in the last 5 years. In the end we have managed to include a total of 19 articles in our review. **Results.** Most of the studies report the use of CNB after the initial use of the FNA method where CNB has demonstrated a smaller rate of non-diagnostic results, alongside lower AUS/FLUS and higher rates of FN/SFN. One of the benefits of CNB is that it can prevent unnecessary surgery and repeated biopsy. As a first-line option for assessing thyroid nodules, CNB has accrued a higher rate of conclusive results with low inconclusive and non-diagnostic rates compared to conventional FNA. A better use of CNB is when it is combined with FNA or following uncertain results after FNA. No difference has been found either in sensitivity or accuracy for malignancy when comparing CNB and combined FNA/CNB. **Conclusions.** We consider that the utility of CNB for thyroid nodules is still a matter of discussion. CNB can be used as a complementary diagnostic tool when the first FNA diagnosis is unclear, because of the ability to sample tissue in large amounts.
Key worlds: thyroid nodules, core-needle biopsy (CNB), fine-needle aspiration (FNA)

INTRODUCTION

Amongst the medical conditions that affect the world, Thyroid Nodular Disease (TND) is one of the most common ones that have been observed. It affects many individuals and it is more prevalent amongst women, elders and subpopulations living in regions which are deficient in iodine. As for its prevalence, TND affects up to 70% of the population and malignancies can be observed from 3% to 10% of patients [1].

Despite the fact that ultrasonography (US) has played an important role in predicting the malignancy risk of thyroid nodules [2], FNA (fine-needle aspiration) has become the standard tool to diagnose nodules in the thyroid gland, due to its high accuracy in placing a diagnosis and its few complications [3].

Although it has many advantages, such as high specificity and safety, FNA presents some limitations [4]. These limitations of fine-needle aspiration can lead to repeating said method or even unnecessary surgery. Core Needle Biopsy (CNB) is a method that has been suggested to overcome these limitations and establish a more accurate diagnosis. According to one of the studies, it provides sufficient tissue in order to enable histologic diagnosis and additional immune-histochemical staining [5].

MATERIALS AND METHODS

Relevant articles were obtained from the databases of PubMed, Scopus, Research Gate and Web of Science through April 2020. We used the following search formula ((LNAB) OR (LNB) OR (large-needle thyroid biopsy) OR (large-needle biopsy) OR (CNB) OR (core needle biopsy)) AND ((FNB) OR (FNAB) OR (fine-needle biopsy)) AND ((thyroid) OR (thyroid nodules)). We have searched for all the relevant, full-text journal articles written in English that were published in the last 5 years. In the end we have managed to include a total of 19 articles in our review.

RESULTS AND DISCUSSION

The present paper is a review of published scientific articles on the diagnostic role of CNB compared with a repeated use of the FNA method after the initial fine-needle aspiration, or using CNB as a first line tool. Amongst the limitations mentioned before, AUS and FLUS are of note. CNB has been suggested as an alternative method in order to overcome those limitations.

Most of the studies, twelve out of nineteen, report the use of CNB after the initial use of the FNA method. Even though guidelines from the Bethesda System recommend repeating the FNA (RFNA) [6] method

after a non-diagnostic result, studies show that the results after said RFNA could still be unclear.

The KSThR (Korean Society of Thyroid Radiology Thyroid) claims that CNB can differentiate non-neoplastic nodules from encapsulated follicular neoplasms and it cannot differentiate between follicular thyroid carcinoma and follicular adenoma [7].

The CNB method has demonstrated a smaller rate of non-diagnostic results, between 0 to 1.8% [8,11], alongside lower AUS/FLUS (atypia/follicular lesion of undetermined significance) and higher rates of FN/SFN (follicular neoplasm/suspicious for follicular neoplasm). Despite those promising results, no significant differences in malignancy were observed between CNB and FNA. To diagnose follicular neoplasm using CNB, it is recommended that tumor tissue, the tumor capsule and adjacent normal parenchyma [9] should be included in the sampling scope.

In a CNB study group it is noticed that the frequency of suspicious US characteristics, such as spiculated margins and marked hypo-echogenicity, is higher than in a FNA group [10]. Meanwhile, other studies show that CNB was better for the diagnosis of thyroid nodules compared with RFNA and CNB shows equivalent results with surgical excision [6, 11]. We learn from another study that CNB after the initial FNA had a higher conclusive rate [12].

It should be noted that other studies found the diagnostic performance of FNA to be mostly the same as CNB and said studies do not recommend using CNB as a first-line diagnostic tool for diagnosing thyroid nodules without more supportive evidence [13, 14].

Six articles debate the use of CNB as a first-line diagnosis tool [4, 15-18]. The usage of CNB based on US gathered suspicion has demonstrated no significant difference in the diagnosis performance between nodules smaller than 1 cm and nodules equal or bigger than 1 cm [15, 18, 19]. The diagnosis accuracy, sensitivity, specificity, positive predictive value, and negative predictive value of CNB for a diagnosis of malignancy were 95 – 96.7%, 89.7 – 93.8%, 100%, 100% and 78.9 – 95.3% [15, 18]. As a first-line option for assessing thyroid nodules, CNB has accrued a higher rate of conclusive results (88.1 – 97.7%) with low inconclusive (11.9%) and non-diagnostic (1.1 – 7.2%) rates compared to conventional FNA. However, according to a few of the selected studies, this difference was explained by the advancement of devices and technology during recent years [4, 15].

One of the benefits of CNB is that it can prevent unnecessary surgery and repeated biopsy. One study claims that only 2 of the patients in their study group underwent unnecessary surgery [15]. It has also been noted that CNB can achieve a higher rate of malignancy diagnosis compared with FNA [17, 18]. Another study shows that CNB didn't display any non-diagnostic results for suspicious thyroid nodules, meanwhile the result was not influenced by US characteristics [18]. From this we learn that CNB has an independent diagnosis value and it does not rely on US characteristics.

A better use of CNB is when it is combined with FNA or following uncertain results after FNA. Combined FNA with CNB show a significantly lower AUS/FLUS rate than either FNA or CNB taken on their own. No difference has been found either in sensitivity or accuracy for malignancy when comparing CNB and combined FNA/CNB. As a matter of fact, FNA/CNB shows fewer inconclusive results than either FNA or CNB used on their own [5, 17].

One study presents the benefits of CNB as being the sharp tip of the guiding needle, making both skin and thyroid capsule penetration easier; accessible multiple sampling done via the single insertion of a guiding needle; minimized complications by reducing the number of repeat thyroid punctures [4]. CNB can also be advantageously used to differentiate between encapsulated follicular neoplasm and non-neoplastic nodules [16]. These advantages can be explained to due the method's ability to sample tissue in large ammounts, assess histologic achitecture (rather than cytological evaluation) and function on a low rate of operator dependence if the targeting of the thyroid nodules has been successful.

Each of the studies establishes CNB as a safe, feasible and well-tolerated technique associated with a low incidence of complications. To improve its accuracy, diagnosis wise, CNB should be performed by radiologists with experience and who have undergone specialized training and are familiar with cervical anatomy so they can minimize any eventual complications.

Some common complications after CNB are the following ones: post-biopsy hematomas, incision site bleeding, pain, infections, hemoptysis, edema, dysphagia and nerve injuries [3-5, 10, 11, 13, 16, 17]. Pain and discomfort during or after CNB are also a common problem [3, 4, 16]. One article compared the pain, tolerability and complications of FNA and CNB and concluded that there was no difference detected between the groups [16]. Other studies report that the complication rate is also acceptable, between 0% and 4.1%, with a low rate of major complications (0 to 1.9%). None of the patients included in the studies and, therefore, in this review, experienced any complications serious enough to require hospitalization or medical intervention. Although some of the patients developed hematoma after the procedure, its resolution came quickly after compression and rest.

Although US-CNB is more expensive, when we take into consideration the collective cost of repeat US-FNA, surgery and the patient suffering due to surgery, the cost of US-CNB is reasonable [20].

Another limitation of CNB was the lack of proper guidelines, but in 2020 an article titled "Guidelines for thyroid core needle biopsy" [3] was published. These practical guidelines are to serve as a clinical guide for

successful thyroid CNB procedure and provide a standardized system for pathology reporting of CNB subjects.

CONCLUSION

The broad implication of the present research is that the utility of CNB for thyroid nodules is still a matter of discussion. CNB can be used as a complementary diagnostic tool when the first FNA diagnosis is unclear, because of the ability to sample tissue in large amounts. Also, using CNB as a first line tool demonstrated a higher rate of diagnosis than FNA, but not more different than combined FNA/CNB. In recent years, the utility of CNB as a first line tool has been more analyzed, and this was explained by the development of devices, technology and the experience of radiologists. Each study of CNB has been established as a feasible, safe, as well as a well-tolerated technique that is associated with a low incidence of complications.

Conflict of interest

There are no conflicts of interest to declare.

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