

Core needle biopsy of thyroid nodules – evaluation of diagnostic utility and pain experience

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Abstract

OBJECTIVE: A crucial problem in the non-operative diagnosis of thyroid nodules is the significant amount of non-diagnostic biopsies. This is a challenge for practicing endocrinologists especially when the results of the repeated biopsies remain non-diagnostic. The lack of a concrete preoperative diagnosis may result in unnecessary thyroidectomies in patients. Alternatively, it may also lead to the delayed diagnosis of cancer. One method of biopsy specimen acquisition that could potentially increase the diagnostic accuracy of thyroid biopsies is the application of core-needles. The aim of the study was to compare the diagnostic value and patient tolerability of core-needle aspiration biopsies (CNAB) with fine-needle aspiration biopsies (FNAB).

PATIENTS AND METHODS: The study included patients with thyroid nodular goiter in whom previous conventional FNAB yielded non-diagnostic results. CNABs were performed using 22G core-needles. The control group consisted of patients undergoing conventional FNAB with 25G fine-needles. Pain during core-needle biopsies of thyroid nodules was assessed using the 10-point visual analog scale.

RESULTS: There were a total of 30 lesions in 26 patients undergoing CNAB (22 women, 4 men, mean age 48.3) and a total of 59 lesions in 40 patients undergoing FNAB (34 women, 6 men, mean age 57.3). 56.6% of CNABs and 50.8% of FNABs were diagnostic ($p=0.60$). When assessing pain via the visual analog scale, the median score for biopsies performed with core-needles was four. 60.0% of patients considered the pain of core-needle aspiration biopsies to be similar to the pain experienced during the previous conventional fine-needle aspiration biopsies, while 40% of patients claimed that the pain was more intense.

CONCLUSIONS: CNAB did not prove to be superior to FNAB. Despite the larger needle gauge used during core-needle biopsies, the patients' tolerability was comparable to conventional fine-needle biopsies.

INTRODUCTION

Thyroid nodular disease (TND) is a common medical problem. This is especially found in iodine-deficient regions, women, elderly and even in some clinical conditions, such as acromegaly (Akarsu *et al.* 2005; Karaszewski *et al.* 2006; Ruchala *et al.* 2009, 2012). Different studies report the prevalence of TND to be from 10–70%, while the risk of malignancy is small but still noticeable – estimated to be 3–10%. The differentiation between highly suspicious nodules with potential malignancy and low-risk ones, which require simple patient follow-ups, is a vital problem in endocrinology (Tan & Gharib 1997; Stanicic *et al.* 2009). Fine-needle aspiration biopsy (FNAB) remains the basic tool for the differential diagnosis of thyroid lesions (Renshaw *et al.* 2007; Wojtczak *et al.* 2012). However, the common occurrence of non-diagnostic results is one of the most important limitations of this method. (Raab *et al.* 2006). Lack of a pre-surgical diagnosis may result in unnecessary thyroidectomies, and alternatively, may delay the definite diagnosis of thyroid cancer. Thusly, in the recent years, many promising methods and improvements of preoperative thyroid lesion diagnosis have been developed. Such include: elastography, molecular marker analysis in washout fluid, and the use of alternative tools for thyroid biopsy (Wojciechowska-Durczynska *et al.* 2011; Ruchala *et al.* 2011, 2012b).

The aim of the study was to compare the diagnostic value and patient tolerability of core-needle aspiration biopsies (CNAB) with fine-needle aspiration biopsies (FNAB).

PATIENTS AND METHODS

Patients and needles

The study involved subjects recruited from the local endocrinological outpatient clinic. All participants had a history of thyroid nodular goiter in which conventional FNABs yielded non-diagnostic results. CNABs were performed using a 22G×1.5" (0.7×40 mm) core needle. The control group consisted of patients undergoing conventional FNAB with 25G×1.5" (0.5×40 mm) needles, who also had previous non-diagnostic results from previous FNABs. All the biopsies were performed under ultrasound guidance by two experienced sonographers. As a routine medical procedure, collected specimens were immediately smeared and fixed in alcohol. Results were reported using the Bethesda system (Cibas *et al.* 2009).

Pain experienced during core-needle biopsies was assessed using the 10-point visual analog scale. Patients undergoing CNAB were also asked to compare their pain with their previous experiences with conventional FNAB.

The Poznan University of Medical Sciences Ethical Committee approved the study. All participants were educated about the study and were asked to sign a written consent.

Statistical analysis

Calculations were performed using Statistica 10 from Stat-Soft. A *p*-level of less than 0.05 was considered statistically significant. The Fisher's exact test was used to calculate the significance of proportion differences of diagnostic and non-diagnostic results from CNABs and FNABs.

RESULTS

Rate of non-diagnostic biopsies

Thirty CNABs and 59 FNABs of thyroid lesions with previous non-diagnostic results were included. There were 30 lesions in 26 patients undergoing CNAB (22 women, 4 men, mean age 48.3) and 59 lesions in 40 patients undergoing FNAB (34 women, 6 men, mean age 57.3). 56.6% of CNABs and 50.8% of FNABs were diagnostic (*p*=0.60). Among non-diagnostic CNABs, 12 (70.6%) were described by cytopathologists as hemorrhagic, 2 (11.8%) as predominately colloid, and 3 (17.6%) as both hemorrhagic and colloid. The most common descriptions of the non-diagnostic FNABs were "inadequate number of follicular cells" – 15 (51.7%), "obscuring blood" – 12 (41.4%) and "high amount of colloid" – 2 (6.9%).

Among the diagnostic CNAB results, there were 15 lesions belonging to the second Bethesda category (10 colloid nodules, one hyperplastic nodule and four cases of thyroiditis), one to the fourth category (follicular nodule) and one to the fifth category (suspicion of medullary thyroid carcinoma).

In the group of diagnostic FNAB results, there were 26 lesions from the Bethesda second category (22 colloid nodules, two hyperplastic nodules and two cases of thyroiditis) and four lesions belonging to the fourth category (follicular nodules).

Pain experience

When assessing pain via the visual analog scale, the median score for biopsies performed with core-needles was four. 60.0% of patients considered the pain of core-needle aspiration biopsies to be similar to the pain experienced during the previous conventional fine-needle aspiration biopsies, while 40% of patients claimed that the pain was more intense.

Complications

In both groups (CNAB and FNAB), none of the patients were observed to have hematomas exceeding 1cm in diameter or any sign of infections post-biopsy. There were no complications in either of the two groups, which required patient hospitalization.

Cost effective analysis

Core-needles were about 1.40 € more expensive than fine-needles. As there was no significant difference in the effectiveness of needle type or increased risk of complications, CNABs were summed up to be more expensive than FNABs (per one puncture).

DISCUSSION

According to our results, core-needle aspiration biopsy (CNAB) did not prove to be superior to conventional fine-needle aspiration biopsy (FNAB). Both methods gave slightly over 50% of diagnostic results, while almost half of the biopsies gave consecutive non-diagnostic results. This only stresses the gravity of the problem. It is important to note that the reasons for non-diagnostic specimen results differ in CNAB and FNAB. The main reason in FNABs is the little acquisition of material, while in CNAB, the samples provided have higher blood or liquid content. The larger gauge diameter delivers a higher quantity of material, however it also favors the aspiration of liquids being under high pressure, such as blood in the arteries. This finding suggests that CNAB is an inadequate method for highly vascularized nodules or partially cystic lesions, especially if the avoidance of liquid components is practically impossible as in the case of lesions with a spongiform appearance. A substantial number of hemorrhagic biopsies can be also a result of greater traumatization of thyroid tissue by core-needles. These results are in accordance with those reported by Gümüş *et al.*, who compared 21G with 27G fine-needles. Biopsies performed with larger needles contained more cellular material, but the percentage of diagnostic biopsies was not significantly higher than in the cases of using smaller needles. This is due to the higher amount of blood in the samples. Such is considered to be an important limitation of this method when analyzing lesions, as in both central and central with concomitant peripheral vascularization is considered a marker of malignancy (Gietka-Czernel *et al.* 2010; Bojunga *et al.* 2012). CNAB seems to be an inadequate method in the diagnosis of such suspicious nodules.

Results of previously published studies on the diagnostic utility of CNAB are strongly diverse. Park *et al.* (2011) compared the effectiveness of FNAB and CNAB in repeated biopsies of previously indeterminate results of FNAB. 41.8% of FNABs and only 1.7% of CNABs gave non-diagnostic results. In another study, Na *et al.* reported similar results – 1.8% of CNABs and 28.1% of FNABs returned non-diagnostic. However, some authors did not confirm these enthusiastic reports. According to Pisani *et al.* (2000), CNAB had no advantage over FNAB. It is worth noting that not all of the patients had agreed to undergo CNAB. A study performed by Khoo *et al.* (2008) did not show any benefit in performing both a CNAB and FNAB in the same lesion. Results did not significantly differ from those results where only FNABs was repeatedly performed on the same lesion. Such large discrepancies of results of different studies are difficult to interpret. One of the main potential reasons in these discrepancies could be the difference in gauge diameters used for core and fine-needles used in the different studies. Other studies revealed that some types of nodules seem to be more suitable candidates for CNAB, whereas others are not

(Hakala *et al.* 2013). Hakala *et al.* reported that CNAB is superior to FNAB in the diagnosis of papillary thyroid carcinomas (PTCs), but not in cases of follicular thyroid cancers (FTCs). According to our results, CNAB does not seem to be suitable for lesions with high vascularity and cystic components. Further studies are needed to finally determine if there are specific types of nodules where CNAB is significantly superior to FNAB.

The initial tolerability of CNAB reported by our patients was quite high. All of the studied patients agreed for this procedure. Most of the subjects assessed the pain as moderate. This outcome is in concordance with the results of the study on the pain experienced during conventional FNAB, which was previously performed in our clinic. The median pain assessment using the VAS scale was also 4 (Stangierski *et al.* 2012). The majority of patients did not notice any difference between CNAB and FNAB. More than one in three considered the pain during CNABs as slightly stronger than during previous FNABs. The amount of reports comparing the pain experienced during both types of biopsies is limited. A study performed by Nasrollah *et al.* (2013) showed results similar to these achieved in our research. CNAB was reported to be slightly more painful, but tolerable for most patients. However, the difference in the diameter of core and fine-nodules was quite small – 21G vs. 23G.

In conclusion, according to our results, CNABs were slightly more painful and expensive than FNABs, but with the same diagnostic effectiveness. CNABs seem to be particularly ineffective in cases of strongly vascularized or partially cystic nodules. However, some previous studies on CNABs revealed high accuracy of results combined with an acceptable pain tolerability and lack of serious complications. Thus, further studies on this topic seem to be recommended, especially concerning the designation of particular types of lesions where CNAB would be superior to FNAB.

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