THYROID FINE-NEEDLE BIOPSY: ASPIRATION VERSUS CAPILLARY

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THYROID FINE-NEEDLE BIOPSY: ASPIRATION VERSUS CAPILLARY (Abstract)
Thyroid nodules are a common pathology of the thyroid gland. Thyroid fine-needle biopsy (FNB) is a technique used as the first step in the assessment of thyroid nodules. Some authors have demonstrated the superiority of nonaspiration compared with aspiration biopsy.

Aim: The objective was to assess whether there are significant differences between the two thyroid biopsy techniques.

Material and methods: The study group comprised 309 patients with thyroid nodules admitted to the Endocrinology Clinic of the Iasi “St. Spiridon” Hospital between 2005 and 2008 in which fine-needle nonaspiration or aspiration biopsy was performed. The slides were read by one pathologist. The smears were stained using the May-Grunwald-Giemsa method (MGG). The quality of smears obtained by the two sampling techniques was evaluated by using the scoring system developed by Mair.

Results and discussion: No differences in smear quality between the two sampling techniques in terms of blood contamination, amount of cellular material, degree of cellular degeneration, degree of cellular trauma, and preservation of appropriate architecture were found.

Conclusion: The results of this study show that the sensitivity and specificity of both techniques allow their use as standard screening methods for thyroid nodular lesions.

Keywords: THYROID NODULE, THYROID CANCER, BIOPSY, THYROID.

Thyroid nodules are a common pathology of the thyroid gland. Fine-needle aspiration (FNA) is a technique used as the first step in the assessment of thyroid nodules (1). An alternative to this technique is fine-needle nonaspiration (FNNA) technique using capillary pressure to suck cells into the needle lumen. This technique was originally used for collecting cellular material from other organs such as liver or mammary gland. It uses a thin 25 gauge needle (0.50 mm outer diameter, 25 mm length) the cells being detached by the sharp edge of the needle and pushed into the needle lumen by the capillary pressure (2). Subsequently, the needle is removed and the cells are expelled on a slide. FNNA was for the first time used in the assessment of thyroid lesions by Santos in 1988 (3). Subsequent studies have given conflicting results on the effectiveness of the two methods (4, 5). Some authors support the superiority of FNNA compared with FNA. Among their arguments are less cellular and tissue trau-
ma and the reduced amount of background blood in smears. Also FNNA is less painful providing better patient compliance (6, 7, 8). Other authors have demonstrated that FNA is superior or equivalent to FNNA offering as arguments the reduced amount of cellular material obtained by FNA compared to FNNA (8).

The aim of this study was to assess whether there are significant differences between the two thyroid bioptic techniques.

MATERIAL AND METHODS

The study group comprised 309 patients with thyroid nodular lesions admitted to the Endocrinology Clinic of the Iasi "St. Spiridon" Hospital in the interval 2005-2008 in which one of the two techniques was performed. The slides were read by one pathologist. The smears were stained using the May-Grunwald-Giemsa method (MGG). The quality of smears obtained by the two sampling techniques was graded by using the scoring system developed by Mair and consisted in evaluation of blood contamination, amount of cellular material, degree of cellular degeneration, degree of cellular trauma and preservation of appropriate architecture. A score ranging from 0-2 was assigned to each of these criteria (tab. I).

| TABLE I

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<th>Scoring system for the assessment of smear quality (4)</th>
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<td><strong>Criterion</strong></td>
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Excluded from the study group were the patients in which thyroid biopsy was not completed with paraffin histology of surgical specimen obtained by the surgical removal of the thyroid gland. The cell samples obtained by fine needle biopsy and surgical specimens were processed and diagnosed in the Pathology Department of the "St. Spiridon" Hospital Iasi. The smears were assessed and classified according to Mair score, a score being assigned to every smear. The score (0-2) was considered C
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(unsuitable for cytological diagnosis), (3-5) was considered B (suitable for cytological diagnosis) and (6-8) was considered and A (excellent for cytological diagnosis). The obtained scores were then compared between the two biotic techniques, aspiration and capillary sampling. A total score ranging from 0 to 8 was assigned to each smear obtained by one of the two techniques. The obtained data were compared with the literature data and statistically processed using the statistical functions in Excel and SPSS. Because the variables did not have a normal distribution, for comparing the two methods the nonparametric chi-square test was used. Chi-square test is a nonparametric test that compares two or more frequencies in the same population. The accepted significance threshold was 95%, p <0.05, but the lower this p value the stronger the significance. For the comparative evaluation we calculated the sensitivity, specificity, positive and negative predictive value of each of the two methods. The samples that could not be interpreted were excluded and the suspicious ones were considered malignant. The cytological diagnosis on each biopsy was compared with a diagnostically superior investigation, the "gold standard" in this study being the postoperative histopathological examination conducted in the Pathology Department of the "St. Spiridon" Hospital Iasi.

RESULTS AND DISCUSSION

A total of 309 patients were assessed by thin needle biopsy (287 women – 92.8 % and 22 men -7.2 %). In 34 patients (11%) biopsy was performed by aspiration (FNA) and in 275 patients (89%) by non aspiration (FNNA).

Cytologically, the massive blood contamination obscured the thyroid cell masses preventing microscopic examination, moderate blood contamination consisted of a moderate red blood cell mass mainly consisting of intact red blood cells together with intact thyroid cellular elements and minimal blood contamination was diagnosed in smears with isolated intact red blood cellular elements.

Of the smears obtained by fine-needle non aspiration (FNNA) 6.90%, confidence interval (CI): 4.46 to 10.53 showed massive blood contamination, diagnosis impossible, 66.54% (CI: 60.77 to 71.86) moderate blood contamination, diagnosis possible, and 26.54% (CI: 21.67 to 32.06) minimal blood contamination, diagnosis easy.

By aspiration technique massive background blood contamination, diagnosis impossible, was found in 2.94 % of the samples (CI: 0.52 to 14.91), moderate blood contamination, diagnosis possible in 58.23% (CI: 42.22 to 73.63), and minimal blood contamination, ideal for interpretation in 38.23% (CI: 23.90 to 54.95).

No statistically significant differences in the quality smears in terms of blood contamination were found between the two techniques (p = 0.28).

Amount of cellular material classified the smears into three categories: minimal, sufficient and abundant amount of cellular material.

The minimum amount of cellular material consisted of isolated thyroid cellular elements, less than 30 cells or free nuclei, sufficient amount of cell material was considered when the smear contained up to six groups of thyroid cellular elements, each group containing 10 thyrocytes, and the amount of cellular material was abundant when over six groups of thyroid cellular elements, each group containing 10 thyrocytes were visualized.
Of the FNNA smears 23.27% (CI: 18.66 to 28.61) showed minimal cellularity, diagnosis impossible, 47.63% (CI: 41.80 to 53.33) sufficient cellularity, and 29.02% (CI: 24.04 to 34.71) abundant amount of cellular material, ideal for diagnosis. Of the FNA smears 23.52% of cases (CI: 12.43 to 39.99) showed minimal cellularity, diagnosis impossible, 41.17% of the cases (CI: 26.36 to 57.77) sufficient cellularity, and 35.29% (CI: 21.48 to 52.08) abundant amount of cellular material, ideal for diagnosis.

No statistically significant differences in the quality smears in terms of the amount of cellular material were found between the two techniques (p = 0.71).

Degree of cellular degeneration: three categories were identified: marked, moderate and minimal degree of cellular degeneration.

In the marked degree of cellular degeneration the thyroid cellular elements are mainly represented by free nuclei and thyrocytes, the moderate degree of cellular degeneration is characterized by the presence of less than 6 cell groups of 10 thyrocytes showing intact cytoplasm, and the minimum degree of cell degeneration is considered in the presence of more than 6 groups of 10 thyrocytes with intact cytoplasm.

On FNNA smears the degree of cellular degeneration was marked, diagnosis impossible, in 24.36% (CI: 19.66 to 29.76), moderate in 58.9% (CI: 53.01 to 64.56) and minimal, ideal for diagnosis in 16.72% (CI: 12.78 to 21.59). With FNA the degree of cellular degeneration was marked in 23.52% (CI: 12.43 to 39.99), moderate in 47.05% (CI: 31.45 to 63.26) and minimal in 29.41% (CI: 16.83 to 46.16) of the samples.

No statistically significant differences in the quality smears in terms of the degree of cellular degeneration were found between the two techniques (p = 0.17).

Cellular trauma. Marked cellular trauma consisted of a marked degree of degeneration of cellular elements, most of them with free nuclei lysis and destroyed cytoplasm. Moderated cellular trauma consisted of a moderate degree of degeneration of the cellular elements, most of them with free nuclei lysis and destroyed cytoplasm, the number of intact cell groups ranging for 1 to 6, and minimal cellular trauma was characterized by a low degree of degeneration of cellular elements, most of them with free nuclei lysis and destroyed cytoplasm, and over 6 groups of intact cells.

Of the FNNA smears 24.36% (CI: 19.66 to 29.76) showed a marked degree of cellular trauma, diagnosis impossible, 58.9% (CI: 53.01-64.56) a moderate degree of cellular trauma, and 16.72% (CI: 12.78 to 21.59) a minimal degree of cellular trauma, ideal for diagnosis.

In terms of cellular trauma 23.52% (CI: 12.43 to 39.99) of FNA smears showed marked cellular trauma, 47.05% (CI: 31.45 to 63.26) moderate cellular trauma, and 29.41% (CI: 16.83 to 46.16) minimal cellular trauma.

No statistically significant differences in the quality smears in terms of the degree of cellular trauma were found between the two techniques (p = 0.17).

Preservation of appropriate architecture. The smears were divided into 3 categories: minimal, moderate, and excellent preservation of appropriate architecture.

Smears with minimal preservation of appropriate architecture were those characterized by the presence of some cellular elements isolated, rare intact thyrocytes
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arranged in large cell aggregates. Smears with a moderate preservation of appropriate architecture consisted of a single layer of thyrocytes in honeycomb or microfolicular arrangement. When some cellular elements were intact with well-preserved cellular border and intact cytoplasm the smear was considered as having an excellent preservation of appropriate architecture.

In 24.36% (CI: 19.66 to 29.76) of FNNA smears preservation of appropriate cellular architecture was minimal, non-diagnostic, moderate in 58.54% (CI: 52.64 to 64.21) and excellent in 15.63% (CI: 11.82 to 20.39).

By FNA, preservation of appropriate architecture was: minimal, non-diagnostic in 23.52% (CI: 12.43 to 39.99), moderate in 50% (CI: 34.09 to 66.93) and excellent in 26.47% cases (CI: 14.80 to 43.11) of the smears.

No statistically significant difference in the quality smears in terms of the preservation of appropriate architecture was found between the two techniques (p = 0.39).

According to smear quality, 23.53% of FNA smears were categorized as C, unsuitable for diagnosis (score 0-2), 47.06% as B, diagnostically adequate (score 3-5) and 29.41% as A, excellent for diagnosis (score 6-8). Twenty-four percent of FNNA smears were categorized as C, unsuitable for diagnosis (score 0-2), 56.36% as B, diagnostically adequate (score 3-5), and 19.64% as A, excellent for diagnosis (score 6-8).

The difference in quality of the smear was not statistically significant (p = 0.39). When comparing the sensitivity and specificity of the two techniques we found that sensitivity was 71.43% (CI: 35.89 to 91.78) for FNA and 75% (CI: 56.64 to 87.32) for FNNA, and specificity was 91.67% (CI: 74.15 to 97.68) for FNA and 93.75% (CI: 89.65 to 96.33) for FNNA.

The differences in sensitivity and specificity between the two techniques were not statistically significant.

Although cytology is less reliable than histopathology (9) thyroid biopsy is a minimally invasive investigation with a high sensitivity and specificity (10). There are several techniques of sampling cellular material, the most commonly used being fine-needle aspiration (FNA) and fine-needle non-aspiration (FNNA).

Both methods have at least theoretically advantages and disadvantages. FNA usually yields more material but also more blood contamination due to the applied aspiration which will affect the quality of the sample and implicitly the possibility of interpreting it, while FNNA may produce less material, but may cause less bleeding and produce a specimen of higher quality. However, both methods are equally used in practice.

What constitutes and adequate smear? Follicular cells are essential for a good interpretation, decreasing the number of false negative reports. Goellner et al (11) noted that the number of false negative results was lower or even eliminated by the presence of 5 or 6 groups of well-preserved follicular cells, with at least 10 cells per group.

Hamburger and Hussain (12) suggested the need of six cell groups, each containing an average of 16 cells while Nguyer et al. (13) required 10 cell groups containing about 20 cells or 8-10 well preserved follicular fragments.

In our study approximately 24% of biopsy was considered diagnostically inadequate. There were no significant differences between FNA and FNNA in terms of the assessed parameters: background blood, amount of cellular material, degree of cel-
lular degeneration, degree of cellular trauma, and preservation of appropriate architecture. In studies conducted by Kamal and Santos a higher number of adequate smears were obtained by FNNA (8). Both studies found no significant differences between the two methods (14, 15).

CONCLUSIONS
Our study shows that the sensitivity and specificity of both techniques allow their use as standard screening methods for thyroid nodular lesions. The obtained results demonstrate that FNA and FNNA have similar efficacy.

REFERENCES