

## ORIGINAL ARTICLE

# Comparison of Direct Smear and Cell Block Preparation for the Evaluation of Thyroid Epithelial Lesions on Fine Needle Aspiration

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## ABSTRACT

**Objective:** To determine the effectiveness of cell block technique by comparing cytomorphological features on cell blocks and conventional fine needle aspiration smears and to assess the utility of combined approach for cytodiagnosis.

**Study Design:** Cross sectional study.

**Place and Duration of Study:** Pathology Department of Pakistan Railway Hospital Rawalpindi and Pakistan Institute of Medical Sciences from April 2017 to April 2018.

**Materials and Methods:** Sixty cases were included in the study through non- probability convenient sampling. All patients having palpable solitary or dominant thyroid nodules were included in the study. In addition to the routine cytological smears, cell blocks were prepared from the residual aspirates and cytomorphological criteria like cellularity, obscuring background material, morphological and architectural preservation were compared. Data was analyzed using SPSS software version 21. Wilcoxon signed rank test was used for significant difference.  $P$  value  $\leq 0.05$  was considered significant.

**Results:** Male to Female ratio was 1:6.5 (13%: 87%). Age ranged from 22 to 81 years with mean age of 44.9 and standard deviation of  $\pm 14.5$  years.

According to the Mair et al scoring system, the mean values for the cellularity and morphological preservation parameters of the cell block technique were 0.86 and 1.13, while that of the cytological smears were 0.95 and 0.86 simultaneously. And the mean values for the obscuring background material and architectural preservation of the cell block technique were 1.13 and 0.82 and that of the cytological smears were 0.86 and 0.54 simultaneously.

**Conclusion:** Cell block technique was found effective in decreasing obscuring background material and in preserving architectural preservation. Hence, this technique facilitated in the diagnosis when reviewed along with the cytological smears.

**Key Words:** FNAC, Cell Block, Mair et al criteria, Cytopathology.

## Introduction

Thyroid swellings are a common clinical presentation in our setup especially in endemic areas.<sup>1</sup> The prevalence of these thyroid nodules ranges from 4% to 7% in adult population and 0.2% to 1.2% in children.<sup>2</sup> The incidence of malignancy in the clinically solitary nodules is 14% compared to 10% for

the dominant nodules and the chances of malignancy in a cold solitary thyroid nodule is 15-20 %.<sup>3</sup>

Since imaging modalities cannot differentiate benign from malignant nodules; fine needle aspiration cytology becomes a valid procedure for the evaluation of these lesions.<sup>2</sup> FNAC is a rapid, simple and safe office procedure to evaluate thyroid nodules. It is the most accurate and cost-effective screening test. Its diagnostic accuracy is 94-96 % from different studies.<sup>4</sup> However this technique has its limitations i.e. limited availability of material for adjuvant diagnostic investigation and also there may be paucity of representative cells, overcrowding of cells, air drying artifacts or poor cellular architecture preservation.<sup>5</sup>

Cell block (CB) preparation has been resorted to make best use of the available material and to

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improve cellular yield and increase diagnostic accuracy.<sup>6</sup> These are micro biopsies prepared from residual tissue fluids and FNA, processed, embedded, sectioned and stained. Simultaneous use of both techniques increases the diagnostic accuracy up to 98.33%.<sup>7</sup> The main advantage of cell block is that it preserves cellular architecture which closely resembles that of surgical specimen on microscopy. Other benefits are that it provides several sections of the same material for special staining, immunocytochemistry, ultrastructural analysis and molecular testing.<sup>8</sup> However, cell block technique has some limitations such as sparse cellularity, distortion artifacts, increased cost and increased processing time.<sup>7</sup> Studies have shown that use of cell blocks has been increasingly advocated as they provide better architectural information and allow additional investigations which complement FNA smears, but its use is limited in thyroid lesions in our setup. The objective of our study is to determine the effectiveness of cell block technique by comparing cytomorphological features on cell blocks and conventional fine needle aspiration smears.

### Materials and Methods

A cross sectional study was carried out at Pathology Department of Pakistan Railway Hospital Rawalpindi and Pakistan Institute of Medical Sciences from April 2017 to April 2018. A total of sixty cases were included in the study. Non-Probability convenient sampling method was used. Approval for the study was taken from the Ethical Approval committee. The study included patients from all ages and from both genders that have palpable solitary or dominant thyroid nodules. Patients not willing for fine needle aspiration cytology of their thyroid lesions, after explaining the purpose and utility of the procedure were excluded.

Patients having thyroid lumps were referred from Surgical outpatient department to the Pathology department with a pre requisite FNAC form. Bio demographic data was collected on a data collection form. Verbal informed consent was taken from each patient.

A standard procedure of fine needle aspiration was followed and a 22-23 gauge needle with 5 ml syringe attached was used to aspirate. Minimum of two needle passes were made. First cytological smears were made and stained with hematoxylin & eosin

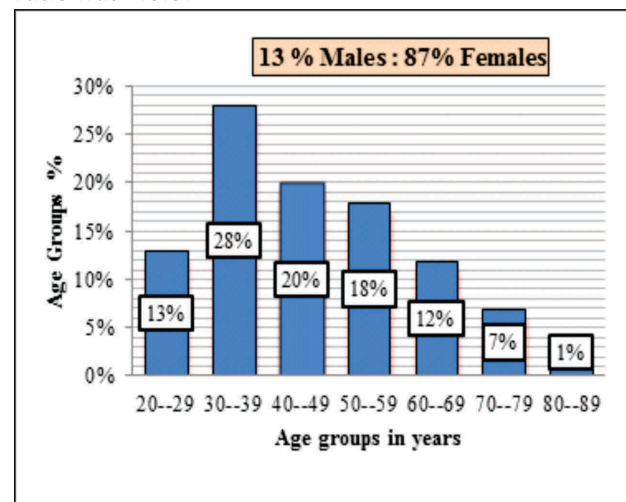
stain according to the standard procedure. Cell blocks were either made from an additional pass and/or remnant aspirate in the needle hub and syringe. Needle rinses in alcohol formalin fixative (50% of 95% ethyl alcohol and 10% formalin each) and then was centrifuged at 1500 rpm for 3-4 minutes. The supernatant was discarded and further 3 ml of fresh fixative added and kept for one day. The cell button was scooped out and processed as a routine surgical specimen and stained with hematoxylin and eosin stain. Both smears and blocks were reviewed by two consultant histopathologists independently.

Qualitative assessment of both slides was graded according to the Mair et al criteria<sup>9</sup> i.e. cellularity, obscuring background material, degree of cellular degeneration and architectural preservation. The data was analyzed by using SPSS version 21. Frequencies and percentages were calculated for the categorical variable data and mean and standard deviation for numerical data. Wilcoxon signed rank was used for test significant difference. P value  $\leq 0.05$  was considered significant.

### Results

The age range was from 22 to 81 years with mean age of 44.9 years and standard deviation of  $\pm 14.5$  years. The highest percentage of cases were in the third decade (28%) followed by the fourth decade (20%) of life. (Figure 1).

Majority of the cases were females, accounting for 87% (52/60) of total participants. The male to female ratio was 1:6.5.



**Fig 1: Bar Graph Showing Age Group Distribution (Percentages)**

The details of cytodiagnosis are given in Table I

**Table I: Frequency Table of Cytodiagnosis**

| Cytodiagnosis  | Frequency (%) |
|----------------|---------------|
| Unsatisfactory | 4 (6.6%)      |
| Colloid Cyst   | 8 (13.3%)     |
| Colloid goiter | 43 (71.6%)    |
| Thyroiditis    | 3 (5%)        |
| Malignant      | 2 (3.3%)      |
| Total          | 60 (100%)     |

Four cases out of sixty showed no cellular material and were therefore not scored. Using Mair et al criteria, the cytomorphology of the two processing techniques was compared. The comprehensive cytomorphological details of both the processing techniques are given in the table II.

**Table II: Comparison of the Cytomorphological Parameters for both Cytological Smear and Cell Block (%)**

| Mair et al Category                   | Cytological Smears                     | Cellblock                          |
|---------------------------------------|--|------------------------------------|
|                                       | Percentage (%)<br>Frequency (n)<br>/56 | Percentage (%)<br>Frequency (n)/56 |
| CELLULARITY                           |  |                                    |
| Minimal                               | 35.7% (20)                             | 37.5% (21)                         |
| Moderate                              | 37.5% (21)                             | 39.3% (22)                         |
| Abundant/Excellent                    | 26.8% (15)                             | 23.2% (13)                         |
| OBSCURING BACKGROUND MATERIAL         |  |                                    |
| Minimal                               | 14.3% (8)                              | 32.1% (18)                         |
| Moderate                              | 57.1% (32)                             | 48.2% (27)                         |
| Marked                                | 28.6% (16)                             | 19.6% (11)                         |
| DEGREE OF CELLULAR DEGENERATION       |  |                                    |
| Well preserved                        | 75% (42)                               | 58.9% (33)                         |
| Moderately preserved                  | 19.6% (11)                             | 30.4% (17)                         |
| Poorly preserved                      | 5.4% (3)                               | 10.7% (6)                          |
| ARCHITECTURE AND CELLULAR ARRANGEMENT |  |                                    |
| Minimum                               | 51.8% (29)                             | 32.1% (18)                         |
| Moderate                              | 42.8% (24)                             | 53.6% (30)                         |
| Excellent/Marked                      | 5.4% (3)                               | 14.3% (8)                          |

Descriptive statistics were calculated for both techniques using SPSS version 21, the details of which are given in the table.

**Table III: Comparison of Descriptive Statistics for Each of the Four Parameters of both the Techniques and the Statistical Significance of Difference**

|                            | Conventional Smear |                    | Cell Block |                    | P value |
|----------------------------|--------------------|--------------------|------------|--------------------|---------|
|                            | Mean               | Standard Deviation | Mean       | Standard Deviation |         |
| Cellularity                | 0.95               | ± 0.793            | 0.86       | ± 0.777            | 0.699   |
| Obscuring background       | 0.86               | ± 0.645            | 1.13       | ± 0.715            | 0.014   |
| Cellular Degeneration      | 1.70               | ± 0.570            | 1.48       | ± 0.687            | 0.123   |
| Architectural preservation | 0.54               | ± 0.602            | 0.82       | ± 0.664            | 0.003   |
| Total                      | 1.01               | ± 0.65             | 1.07       | ± 0.710            | 0.21    |

No significant difference was found on cellularity and cellular degeneration, while significant difference was noted on obscuring background material and architectural preservation.

## Discussion

A total of 60 patients were recruited from the Pakistan Railway Hospital Rawalpindi and Pakistan Institute of Medical Sciences. The age of patients ranged from 22 to 81 years with mean of 44.9 years which is similar to the findings of Thanigaminai et al<sup>10</sup> and Revati et al.<sup>11</sup> This finding proves that thyroid lesions are present in wider age ranges. The majority of patients 28.3% were in their third decade of life followed by 20% of patients in their fourth decade. These findings are similar to Zariqa A. et al<sup>12</sup> and Basnet et al.<sup>13</sup> study results which show that majority of patients were in their third decade of life. The male to female ratio was 1:6.5, which is in correspondence to Chowhan et al.,<sup>14</sup> and Song et al.,<sup>15</sup> studies.

In our study 6.6% of the cases were reported as unsatisfactory for the cytodiagnosis. Majority of the studies show that the unsatisfactory rate ranges from 5 to 20%. 72% of cases were reported as benign, which is similar to the findings of Shipra A et al<sup>16</sup> study. Three cases were reported as chronic thyroiditis, two cases were malignant (anaplastic carcinoma). This findings is similar to Zariqa A. et al<sup>17</sup> study, which show 2.13% are malignant. The mean value of Mair et al., scores for the cellularity parameter was lower for the cell block technique (0.86) than that of the cytological smears (0.95). This finding agrees with the findings of Sanchez N. et al.,<sup>18</sup>

Raafat A Hegazy et al.,<sup>19</sup> and Michelle H et al.,<sup>20</sup> studies and contrary to the findings of Basnet et al.<sup>11</sup> and Thanigaimani et al.<sup>10</sup> studies. The reason of this low cellularity is that most of the times no special passes were done for the cell block, instead, the remnant in the needle hub was fixed in alcohol formalin fixative and then removed for tissue processing.

The mean value of Mair et al scores for the obscuring background material parameter was better for the cell block technique (1.13) than that of the cytological smears (0.86). This finding is similar to the findings of Raafat A et al.,<sup>19</sup> and Nithyananda et al.<sup>21</sup> studies. The reason for this decrease obscuring background material is that the cell block technique requires dilution and centrifugation of the aspirated fluid that allow the follicular cells to settle down.

The mean value of Mair et al., scores for the morphological preservation parameter was lower for the cell block technique (1.48) than that of the cytological smears (1.70). This finding is similar to the findings of Khan. S et al.,<sup>22</sup> and contrary to the Nithyananda. A et al.,<sup>21</sup> study results. The reason for this decrease morphological preservation can be pre-fixation lag time.

The mean value of Mair et al., scores for the architectural preservation parameter was higher for the cell block technique (1.0) than that of the cytological smears (0.54). This finding agrees with Basnet et al.,<sup>13</sup> and Shenaz K. et al.,<sup>18</sup> which conclude that cell block preserves better architecture pattern . Cell block also provide additional information in most cases which is similar to the studies of Rajib et al.,<sup>20</sup> and Katherine et al.<sup>23</sup>

## Conclusion

In our study, the cell block technique was found effective in decreasing obscuring background material and in preserving architectural preservation. Hence this technique facilitated in the diagnosis when reviewed along with the cytological smears.

## Limitations and Recommendations

Patients were recruited from two centers; a multicenter study should be carried out with increased sample size. A Prospective study can be carried out, comparing direct smear and cell block with histopathology as gold standard in thyroid lesions.

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