# A COMPARATIVE STUDY OF FLUID CYTOLOGY WITH SMEAR AND CELL BLOCK PREPARATION

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**ABSTRACT**

**BACKGROUND**

Exfoliative cytology has got a key role in the diagnosis of variable pathological conditions. This technique is noninvasive and performed in the practice of cytopathology. The cell block technique now takes an intermediate position between histological and cytological techniques.

**METHODS**

A prospective study was done from October 2009 to October 2011 in the Department of Pathology.

**RESULTS**

Among 140 fluids, 12 were clinically diagnosed as malignant effusions out of which 11 were reported as positive for malignant cells and 1 case was negative. 12 cases were reported as positive for malignant cells in which they were clinically not diagnosed.

**CONCLUSIONS**

In the present study, increased diagnostic utility of 10% is noted in cell block method. The cell block technique not only increased the positive results but also helped to demonstrate better architectural patterns which could be of great help in approaching the correct diagnosis of the primary site.

**KEYWORDS**

Exfoliative Cytology, Non-invasive Technique, Cell Block Method, Cytodiagnosis of Fluids.

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**INTRODUCTION:** Exfoliative cytology has got a key role in the diagnosis of variable pathological conditions. Exfoliative cytology is the study of cells that have been shed or removed from the epithelial surface of various organs. The technique is non-invasive; the obtained sample contains various types of cells.[1] Cytologic examination of fluids obtained from the serous cavities is among the most common tasks performed in the practice of cytopathology.[2] The lower sensitivity of cytodiagnosis of effusions is mainly attributable to bland morphological details of cells, overcrowding or overlapping of cells, cell loss and changes due to different laboratory processing methods.[2]

The cytological examination of fluids by means of smears, though carefully prepared, leaves behind a large residue that is not further investigated which might contain valuable diagnostic material. This residual material can be evaluated in a simple and expedient fashion by treating it as a cell block, embedded in paraffin and examined in addition to the routine smears.[3]

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The cell block technique now takes an intermediate position between histological and cytological techniques.[4] The main advantage of cell block technique is that the cells resemble those seen in histology. Cell blocks are particularly useful when the cytological abnormalities are misleading, such as in reactive mesothelial cells, or obscure as in occasional well-differentiated adenocarcinoma.[5] The present study is undertaken to assess the utility of the cell block preparation method in increasing the sensitivity of cytodiagnosis of fluids. The cell block method, by using 1:1 solution of alcohol and formalin as a fixative is a simple and economical method, gives better cell yield and better morphological details for reporting the fluid specimens.

**AIMS AND OBJECTIVES:**

- To study the diagnostic value of cellblock as adjunct to smear in cytological investigation of body fluids.
- To assess the utility of cell block preparation in increasing the sensitivity of cytodiagnosis.
- To assess the overall utility of cell block preparation in correlating the clinical and pathological diagnosis.

**MATERIALS AND METHODS:** The prospective study was done from October 2009 to October 2011 in the Department of Pathology, Sri Venkateswara Medical College. An analysis of 140 cases of various lesions of pleural, peritoneal and synovial fluids during the above period was done.

Out of 300 fluids, 140 cases were studied. All the cases were carefully analysed by both smear and cell block technique. All the cases were carefully screened to pinpoint the age and sex wise incidence of inflammatory and malignant lesions.[6,7] The study was taken to compare the diagnostic value of cell block versus smear technique in detecting primary lesions in malignant effusion cases and to observe the specific cytomorphological features in cell blocks and smears.[8] The present study included 140 patients. After clinical and radiological investigation, fluids thus obtained were first examined by naked eye for physical characteristics and divided in to two halves. Fresh fluids were used for analysis.

Half of the specimen was centrifuged at 1500 rpm for 15 min. and the smear prepared was stained with H & E (Annexure – I). For the cell block preparation, other half of the fluid specimen was fixed in a 1:1 solution of alcohol and formalin for one hour. After fixation, the specimen was centrifuged at 2500 rpm for 10-15 min. The supernatant fluid is discarded and the sediment is wrapped in filter paper and processed in Histokinette as part of routine paraffin section histopathology, arrangement, cytoplasmic and nuclear details.[9] A comparative evaluation of smear versus cell block technique was done and tabulated. The slides were carefully evaluated by applying the following criteria.

1. The presence of aggregated/isolated cells.
2. Predominant pattern of aggregate – spherules, loose clusters, etc.
3. Presence of patterns such as Indian file arrangement, rosettes and acini.
4. Uniformity or irregularity of cells - pleomorphism.
5. Presence of vacuolated cells - cytoplasmic features.
6. Presence of multinucleated cells.
7. Presence of nucleoli.
8. Abnormal mitosis.

**RESULTS:** From October 2009 to October 2011, 300 samples of various fluids were received in the Department of Pathology, Sri Venkateswara Medical College, Tirupati. We have studied 140 fluids for present study which constitutes 46% of total fluids.

| Type of Fluid | Number | Percentage (%) |
|---|---|---|
| Pleural | 91 | 65% |
| Peritoneal | 45 | 32.1% |
| Synovial | 4 | 2.9% |
| **Total** | **140** | **100%** |

***Table 1: Quantitative Analysis of Various Fluids***

| Age Group (Years) | No: of Cases | Percentage (%) |
|---|---|---|
| <40 | 18 | 12.9% |
| 41-60 | 97 | 69.3% |
| 61 & above | 25 | 17.9% |
| **Total** | **140** | **100%** |

***Table 2: Age Distribution of Cases***

In our study most of the patients are aged between 41-60 yrs. (Mean age is 50.19+14.81)

| Sex | No. of. Cases | Percentage (%) |
|---|---|---|
| Male | 83 | 59.3% |
| Female | 57 | 40.7% |
| **Total** | **140** | **100%** |

***Table 3: Sex Distribution of Cases***

| Clinical Diagnosis | No. of Patients | Percentage (%) |
|---|---|---|
| Pleural effusion | 71 | 50.7% |
| Empyema | 18 | 12.9% |
| Cirrhosis of liver | 18 | 12.9% |
| Malignancy | 11 | 7.9% |
| Koch's abdomen | 7 | 5% |
| Chronic liver disease | 6 | 4.3% |
| Ovarian cyst | 3 | 2.1% |
| Septic arthritis | 4 | 2.8% |
| Miscellaneous | 2 | 1.4% |
| **Total** | **140** | **100%** |

***Table 4: Clinical Diagnosis of Patients***

| Cellularity | No. of Centrifuged smears | No. of Cell blocks |
|---|---|---|
| Lymphocytes | 39(27.85%) | 41(29.28%) |
| Neutrophils | 29(20.71%) | 29(20.71%) |
| Mixed inflammatory cells | 35(25%) | 38(27.14%) |
| Lymph + Reactive mesothelial cells | 9(6.42%) | 9(6.42%) |
| Malignant cells | 17(12.14%) | 23(16.42%) |
| Suspicious for malignancy | 4(2.85%) | - |
| Unsatisfactory smear | 7(5%) | - |
| **Total** | **140(100%)** | **140(100%)** |

***Table 5: Comparison of Smear versus Cell Block of All Fluids***

$X^2$=531.43, P<0.001; Significant

| Centrifuged Smear | Cell Block Positive for Malignant Cells | Cell Block Negative for Malignant Cells | Total |
|---|---|---|---|
| Positive for malignant cells | 21 | 0 | 21 |
| Negative for malignant cells | 2 | 117 | 119 |
| **Total** | **23** | **117** | **140** |

***Table 6: Efficacy of Centrifuged Smear with Cell Block in Detecting Malignant Cells***

Sensitivity=91.3%, Specificity=100%, PPV=100%, NPV=98.3%.

Diagnostic accuracy=98.6%, Kappa Statistic=0.95.

| Clinical Diagnosis | Cell Block | | Total |
|---|---|---|---|
| | Positive for Malignant Cells | Negative for Malignant Cells | |
| Malignant effusions | 11 | 1 | 12 |
| Others | 12 | 116 | 128 |
| **Total** | **23** | **117** | **140** |

***Table 7: Efficacy of Clinical Diagnosis with Pathological Diagnosis (Cell Block) in Detecting Malignancy***

Sensitivity=47.8%; Specificity=99.1%; PPV=91.7%; NPV=90.6%.

Diagnostic accuracy=90.7%; Kappa Statistic=0.58.

Among 140 fluids, 12 were clinically diagnosed as malignant effusions. Out of which 11 were reported as positive for malignant cells and 1 case was negative. 12 cases were reported as positive for malignant cells in which they were clinically not diagnosed.

**DISCUSSION:** In the present study, the most common effusion was pleural followed by peritoneal correlating with the study of Meenu Thapar et al.[5] The majority of the cases were pleural followed by peritoneal fluids. This may be due to prevalence of tuberculosis in the region of our study. In the present study, 11 cases of malignant peritoneal fluid was diagnosed in which 7 were women and 4 were men with female to male ratio 1.75:1. The most common age group was 41-60 years with a median age of 50 years. So my study is correlating with Risberg B et al.[10] In the present study, lymphocyte rich effusion was noticed in 73 cases. Among these, 39 were tuberculosis, 9 were reactive, 35 were non-specific inflammation in contrast to Lorenzo M Galindo.[11]

Cytology of pleural effusion is a commonly practiced technique and it is particularly important in diagnosis of tuberculous and malignant pleural effusions. ESR was very high in tuberculous pleural effusion when compared to nonspecific inflammatory conditions. These findings correlated with study made by Sherwani R et al.[12] In the present study, 16 (17.6%) cases are diagnosed as a non-specific inflammation by both smear and cell block techniques. It was observed that effusion contained a mixture of inflammatory cells-neutrophils, lymphocytes, occasional macrophages and mesothelial cells in various proportions and a few fibrin strands. Similar findings were observed by Thomas Kransz et al.

In 2005, Khan N et al.[13] in a study of cytodiagnosis of malignant effusion and of determination of primary site found that adenocarcinomas are the commonest type of neoplastic cells found in serous fluids. Similar findings are observed in our study. In our present study, out of 136 samples of pleural and ascitic fluids studied, 23 cell blocks were malignant. Thus, the use of cell block increased the diagnostic yield of malignancy from 21 to 23 samples similar to the study done by Sujathan et al.[14]

**SUMMARY AND CONCLUSIONS:** To conclude the present study, increased diagnostic utility of 10% is noted in cell block method. The cell block technique not only increased the positive results, but also helped to demonstrate better architectural patterns which could be of great help in approaching the correct diagnosis of the primary site. Cell blocks were particularly useful when cytological abnormalities were misleading, such as in reactive mesothelial cells, or obscure, as in well differentiated adenocarcinoma. Morphological details which include preservation of the architectural pattern like cell balls, papillae, three dimensional clusters, excellent nuclear and cytoplasmic details can be obtained with the cell block method. It has an added advantage that multiple sections of the same material can be obtained for special stains and immunohistochemistry. On the other hand, fragments of tissue can easily be interpreted in a biopsy like fashion.

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