

Comparative analyses of cavity effusions by cell blocks and smear examination

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Abstract

Background: The cytological examination of serous effusions has increasingly gained acceptance in clinical medicine, to such an extent that a positive diagnosis is often considered the definitive test and obviates exploratory surgery¹. Cell block study is valuable in cytopathology because it provides histopathologic correlation and additional material for immunohistochemical studies². **Aim:** To study cavity effusions and to compare fluid smear cytology (CS) and cell block (CB) as diagnostic methods **Material and Method:** The study was conducted in the Cytology section of the Department of Pathology. Forty serous fluids were subjected to diagnostic evaluation in a period of nine months. Conventional smears and cell block using 10% alcohol: formalin fixative, were prepared. After the Cytological diagnosis, each case was objectively analysed as per the point scoring described by Mair *et al.* Statistical analysis was done. **Results:** Cellularity and additional yield for malignancy was found by CB method. **Conclusion:** With CB technique positive results were increased and demonstrated better architectural patterns which were helpful in approaching the correct diagnosis of the primary site.

Keywords: Cell block, Conventional smear, effusion, cytology

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INTRODUCTION

Accumulation of fluid in a serious cavity in excess of the normal amount is referred to as an effusion. Fluid samples are invaluable specimens and help in diagnosis of particular lesional pathology, identifying the immediate precipitating factors causing the effusion and mostly, results in a specific diagnosis. Cytologic evaluation is the best way to detect the presence of malignancy in body cavity fluids. The general cytologic examination can be performed easily, quickly, and inexpensively. Although a positive diagnosis is highly

reliable, a negative result does not rule out a malignant cause. Adenocarcinomas, well differentiated squamous carcinomas, small-cell carcinomas, malignant melanomas, large-cell lymphomas, and acute leukemias are accurately classified when present in effusions. With a few exceptions, the detection of exact causes of benign effusions by cytologic methods can be a daunting yet not a impossible task.³ Another method which can be used is cell block which is least expensive method.⁴ Cell blocks prepared from residual tissue fluids and fine needle aspirations can be useful adjuncts to smears for establishing a more definitive cytopathologic diagnosis. They can be particularly useful for categorization of tumours that otherwise may not be possible from smears themselves.⁵ The cell block technique not only increases the positive results but can also be of great help in approaching the correct diagnosis and the primary site. Apart from this, morphological details can also be obtained with the cell block method, which include preservation of the architectural pattern like cell balls and papillae and three dimensional clusters, excellent nuclear and cytoplasmic details, and individual cell characteristics. On the other hand, fragments of tissue can

easily be interpreted in a biopsy like fashion.^[6]The cell block technique has an added advantage that multiple sections of the same material can be obtained for special stains and immunohistochemistry.

AIMS AND OBJECTIVE

Aims:

To study cavity effusions.
To compare fluid smear cytology and cell block as diagnostic methods.

Objectives:

To assess the diagnostic accuracy of cytology smears versus cell blocks.
To establish cell block as an effective diagnostic tool.

MATERIAL AND METHODS

- The study was conducted in PEOPLE’S HOSPITAL, BHOPAL (MP). A prospective study from Sep 2012 to Feb. 2013 was carried.
- All the patients attending the Surgery and Medicine OPD as well as admitted in the wards having cavity effusions were evaluated.
- All fluid samples (from body cavities) were included after thorough radiological and clinical examination. Fluid thus obtained were first examined by naked eye and then divided into two aliquots for further evaluation.

1. One aliquot of the specimen was centrifuged at 1500 rpm and the smear prepared was stained by H and E stain and Papanicolaou.
2. For the cell block preparation, the other aliquot of the fluid specimen was
 - fixed in a 1:1 solution of 10% alcohol: formalin for one hour.
 - After fixation, the specimen was centrifuged at 2500 rpm for 15 minutes.
 - The supernatant was poured off and the sediment completely drained off by inverting the tube over What man filter paper.

- The sediment was then wrapped in the same filter paper and processed in histokinette as part of routine paraffin section histopathology.⁷
- Cytological diagnosis was rendered for each case and each individual slide was objectively analysed for cellularity, arrangement (acini, papillae, cell balls, and proliferation spheres), cytoplasmic, and nuclear details using the point scoring system described by Mair *et al.*⁸
- Statistical analysis was done by *Chi-square test*.

RESULTS

Fourty serous fluids were subjected to conventional smear and cell block techniques. Female outnumbered male (22 females and 18 males) large proportion of the patients belong to 51-60 age group, peritoneal fluids were more than pleural fluids(24 peritoneal fluids and 16 plural fluid) The samples were categorized into benign and malignant lesions, on conventional smear method 36 cases were benign, while when the same samples were subjected to cell block, 34 cases were benign. Additional 2 cases were reported as malignant after cell block technique, thus 4 cases were malignant on smear study and 6 cases after block study.

Table 1

| | Conventional smear method | Cell block Method |
|-----------|----------------------------------|--------------------------|
| Benign | 36 | 34 |
| Malignant | 4 | 6 |
| Total | 40 | 40 |

- Out of reactive effusion cases the majority revealed scant cellularity with predominant population of lymphocytic in most of them, while few showed predominant polymorphic population while some cases showed reactive mesothelial population predominantly.
- Final diagnosis was made with the help of fine needle aspiration cytology and histopathology in malignant cases, which comprised of germ cell tumor, Adenocarcinoma colon and stomach, Squamous and Large cell carcinoma of lung.

Table 2

| Distribution of malignant cases according to smear and cell block method | |
|---------------------------------------------------------------------------------|---------------------|
| Diagnostic yield of smear and block method | No. of cases |
| Smear positive, cell block positive | 04 |
| Smear negative, cell block positive | 02 |
| Smear positive, cell block negative | 00 |
| Smear negative, cell block negative | 34 |

- When the cytological smears and cell block techniques were studied for their quality by using the point scoring of Mair *et al*, which was based on following points

Table 3

| Criterion | Qualitative description | Point score |
|------------------------------------------------|---------------------------------------------|-------------|
| 1)Volume of obscuring background blood or clot | Large amount: Diagnosis greatly compromised | 0 |
| | Moderate amount: Diagnosis possible | 1 |
| | Minimal amount: Diagnosis easy | 2 |

Table 4

| Criterion | Qualitative description | Point score |
|--------------------------------------------------|-------------------------------------------|-------------|
| 2)Amount of diagnostic cellular material present | Minimal or absent: Diagnosis not possible | 0 |
| | Sufficient for cytodiagnosis | 1 |
| | Abundant : Diagnosis simple | 2 |

Table 5

| Criterion | Qualitative description | Point score |
|--------------------------------------------------------|------------------------------|-------------|
| 3) Degree of cellular degeneration and cellular trauma | Marked: Diagnosis impossible | 0 |
| | Moderate: Diagnosis possible | 1 |
| | Minimal: good preservation | 2 |

Table 6

| Criterion | Qualitative description | Point score |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------|
| 4)Retention of appropriate architecture and cellular arrangement | Minimal to absent: non-diagnostic | 0 |
| | Moderate: some preservation eg: follicles, papillae, acini, syncytia or single cell pattern. | 1 |
| | Excellent architectural display, closely reflecting histology: diagnosis obvious | 2 |

According to the criteria mentioned above, qualitative grouping was done into three categories:

Table 7

| Category | Smear | Block |
|---------------------------|-------|-------|
| Diagnostically superior | 15% | 25% |
| Diagnostically adequate | 57% | 55% |
| Diagnostically unsuitable | 28% | 20% |

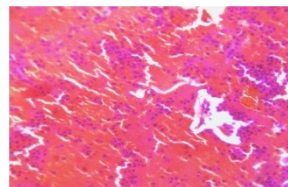
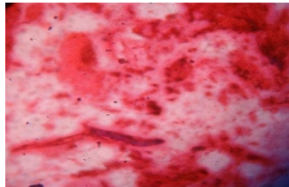


Figure 1: Photo micrograph showing hemorrhagic material obscuring the field: unsuitable for diagnosis (40x) **Figure 2:** Photo micrograph showing mixed population of inflammatory cells against hemorrhagic background in smear (40x)

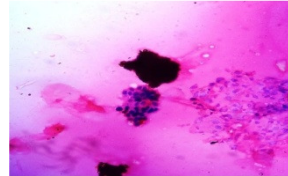
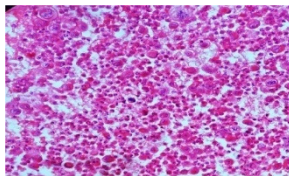


Figure 3: Photo micrograph showing malignant cells with nuclear degeneration and few cells showing nuclear hyperchromasia (40X) **Figure 4:** Photo micrograph showing three dimensional clusters of cells with features of malignancy (40X)

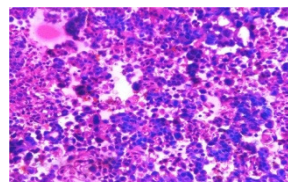
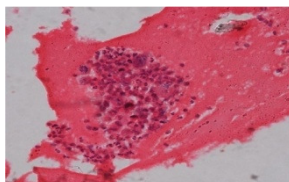


Figure 5: Photo micrograph showing malignant cells admixed with inflammatory cells against hemorrhagic background.(40x) **Figure 6:** Photomicrograph showing acini, papillae and pleomorphic cells in Cellblock (H and E, x40)

DISCUSSION

The sensitivity of cell blocks varies from 60-86%, depending upon sample type and size. The overall sensitivity of pap and H-E stained smear is slightly lower when compared to cell block method. Other study by Udasimath Shivakumarswamy *et al*, found that cellularity and additional yield of malignancy was 15% more by cell block method⁹, similarly our study reported 5% increase in yield by the cell block method. In their study of effusion, Luse and Reagan reported that maximum number of cases of non-malignant effusion were of pleural followed by peritoneal whereas least number of pericardial effusion. According to them the majority of the cases were due to underlying congestive heart failure comprising 18% of all cases, followed by cirrhosis and tuberculosis comprising 11% and 8% respectively¹⁰. In our study, the majority of reactive effusion cases were due to underlying Cirrhosis followed by Congestive heart failure followed by Tuberculosis. Foord and Wetmore, conducted cellular studies of effusions by using smears and paraffin sections, they preferred to study paraffin sections before giving the final diagnosis because it was more accurate and it was easier to demonstrate cellular relationships with the cell block technique. In all malignant effusion suspects, cell block preparation is superior and more informative regarding the nature and type of the tumour¹¹. The results of point scoring system obtained by Thappar *et al* were 26% of the smears and 12% of cell blocks scored 0 and that is unsuitable for diagnosis. 20% of the smears and 21% of the cell blocks scored one and their quality was diagnostically adequate. 54% of the smears and 67% of the cell blocks were considered diagnostically superior,¹⁰ while in current study 57% of the smears and 55% of the blocks were diagnostically adequate, while 15% smears and 25% blocks were superior.

CONCLUSION

Thus we concluded from our study that it is advisable to practice routinely, the study of paraffin sections by using the cell block method before discarding specimens that are suspicious for malignant cells by smear examination

Advantages of cell block include...

- Recognition of histological patterns of diseases that sometimes cannot be identified reliably in conventional smears.

- Multiple sections can be studied by routine staining, special staining and immunocytological procedures.
- Less cellular dispersal, which permits easier microscopic observation than do traditional smears.
- Possibility of storing slides for retrospective studies. Storage of the CS is a practical problem.

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