



DIAGNOSTIC UTILITY OF CELL BLOCK CYTOLOGY IN PERITONEAL EFFUSIONS USING THE INTERNATIONAL SYSTEM FOR REPORTING SEROUS FLUID CYTOPATHOLOGY (ISRSFC): A CROSS-SECTIONAL STUDY FROM A TERTIARY CARE CENTER IN TELANGANA

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ABSTRACT

Background: Cytological evaluation of ascitic fluid plays a vital role in identifying malignant effusions, but conventional smears may have low sensitivity due to cell loss and poor architectural preservation. Cell block (CB) technique enhances diagnostic accuracy and allows ancillary testing. ISRSFC provides standardized reporting for serous effusions. **Aim:** To assess the diagnostic utility of cell block technique in ascitic fluid cytology and categorize findings based on ISRSFC. **Materials And Methods:** This prospective study evaluated 100 ascitic fluid samples over 6 months. Both conventional smears (CS) and CBs (10% alcohol-formalin method) were prepared and assessed for cellularity, morphology, and diagnostic categorization. IHC markers (CK7, CK20, TTF1) were applied in selected malignant cases. **Results:** Cellularity was abundant in 44% CB vs. 14% CS. Malignancy detection improved from 16% (CS) to 25% (CB). CB reduced non-diagnostic cases (7% vs. 5%). Sensitivity significantly improved (64% CS vs. markedly higher with CB). ISRSFC categorization improved reporting consistency. **Conclusion:** Cell block technique provides superior diagnostic performance over smear cytology by enhancing cellularity and morphology and enabling IHC for tumor typing. Routine incorporation of CB and standardized ISRSFC reporting improves accuracy in evaluating malignant ascites.

KEYWORDS : Ascitic fluid, Cell block, Cytology, ISRSFC, Malignant effusion, Immunocytochemistry.

INTRODUCTION

Serous effusions represent significant diagnostic specimens, especially in advanced malignancies. (1) Peritoneal effusion occurs in >50% of gastrointestinal and gynecological cancers. (2) Conventional cytology has lower sensitivity due to overcrowding of the cells or degenerative artifacts. (2) Cell block technique enhances morphological detail and allows immunohistochemistry (IHC). (3)

ISRSFC standardizes reporting into five diagnostic categories: ND, NFM, AUS, SFM, MAL. (1) This study evaluates CB utility compared with CS in ascitic samples.

MATERIALS AND METHODS

Sample Size: 100 consecutive ascitic effusions

Duration: December – May

Setting: Department of Pathology, Osmania General Hospital, Hyderabad

Techniques:

- o CS: centrifuged smears stained with H&E/Pap
- o CB: alcohol-formalin sediment fixation □ paraffin blocks □ H&E

Evaluation Parameters:

- o Cellularity
- o Architecture
- o Background
- o ISRSFC classification

IHC markers: CK7, CK20, TTF1 (in malignant cases)

Statistical analysis: Chi-square test; $p < 0.05$ significant.

RESULTS

- Mean age: 54.1 years (range 23–87)
- Female: male ratio = 1.8:1

Parameter	CS	CB
Abundant cellularity	14%	44%
Malignancy detected	16%	25%
Suspicious category	9%	2%
Non-diagnostic	7%	5%

Strong correlation between CS and CB diagnoses ($\chi^2 = 174.8$, $p < 0.001$).

IHC improved tumor origin identification in metastatic adenocarcinomas

RESULTS

Age Particulars:

The mean age of the study subjects was 54.1 ± 13.53 years. The age of patients ranged from 23 to 87 years.

Table - 1: Age Group-wise Distribution Of The Study Subjects (n=100)

Age group	Frequency	Percentage
21-40 years	19	19
41-60 years	52	52
61-80 years	27	27
>80 years	02	02

The 41-60 years age group has the highest frequency, representing 52% of the total sample. The 61-80 years group follows with 27%, indicating a significant portion of the sample is from older age groups. The 21-40 years group represents 19% of the total, which is a smaller portion compared to the older age groups. The >80 years group represents the smallest portion at 2%.

Table 2: Distribution As Per Gender (n= 100)

Gender	Frequency	Percentage
Male	35	35
Female	65	65

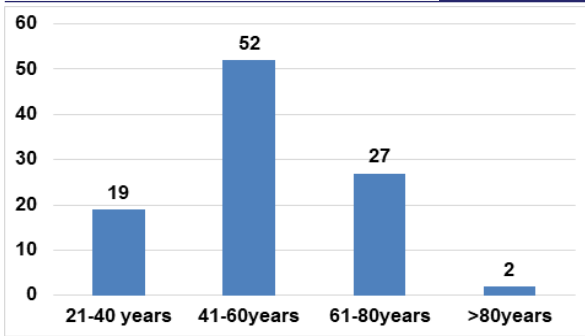


Fig 1: Age Group-wise Distribution Of The Study Subjects (n=100)

Females represented a larger portion of the sample (65%) compared to males (35%).

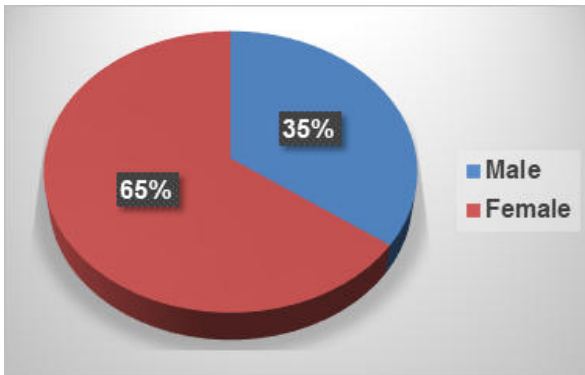


Fig 2: Gender Wise Distribution Of The Study Subjects (n=100)

Table - 3: Comparison Of Cellularity In Ascitic Effusion

Cellularity	Conventional Smear	Cell Block
Minimal	14	8
Sufficient	72	48
Abundant	14	44

The cellularity in conventional smear showed minimal cellularity in 14% cases (14%), sufficient cellularity in 72 cases (72%), and abundant cellularity in 14 cases (14%). The cellularity in cell block were minimal in 8 cases (8%), sufficient in 48 cases (48%), and abundant in 44 cases (44%).

Table - 4: Distribution Of Cytological Smear Diagnoses In A Study Population (n=100)

Smear	Frequency	Percent
Benign	71	71.0
Malignant	16	16.0
Suspicious of malignancy	9	9.0
Non-diagnostic	4	4.0
Total	100	100.0

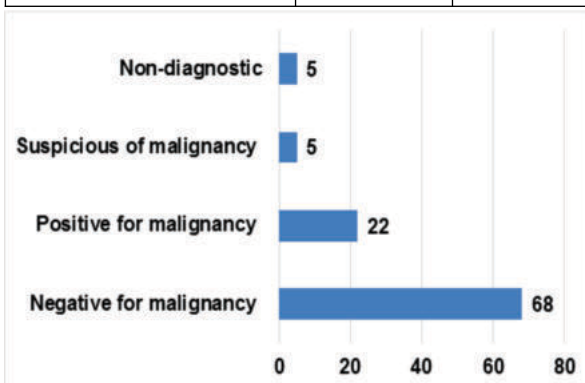


Fig 3: Distribution of Cytological Smear Diagnoses in a Study Population (n=100)

Among 100 cytological smears evaluated, the majority (71%) were diagnosed as benign, while 16% were malignant, 9% were categorized as suspicious of malignancy, and 4% were non-diagnostic. The high proportion of benign cases indicates a predominance of non-malignant findings in the sample. However, the combined 25% of malignant and suspicious cases highlights the importance of further diagnostic confirmation, such as cell block analysis or histopathology, particularly for suspicious or unclear results.

Table - 5: Distribution Of Cell Block Diagnoses In A Study Population (n=100)

Cell block	Frequency	Percent
Negative for malignancy	68	68.0
Positive for malignancy	21	21.0
Suspicious of malignancy	6	6.0
Non-diagnostic	5	5.0
Total	100	100.0

68% of the samples were negative for malignancy, indicating that the majority of the samples do not show signs of cancer. 21% of the samples were positive for malignancy, suggesting a significant proportion of the samples were diagnosed with cancer. 6% of the samples were suspicious of malignancy, meaning these samples could not be definitively categorized but raised concern for potential cancer. 5% were non-diagnostic, meaning these samples did not provide conclusive results, either due to quality issues or insufficient material.

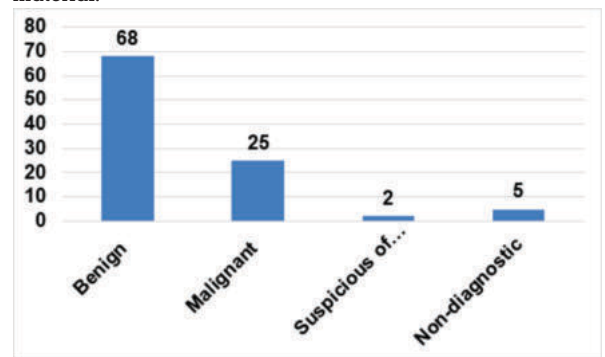


Fig 5: Cell Block Diagnosis Distribution (n=100)

Table - 6: Cell Block D Diagnosis Distribution (n=100)

Cell Block Diagnosis	Frequency	Percent
Benign	68	68.0
Malignant	25	25
Suspicious of malignancy	2	2
Non-diagnostic	5	5
Total	100	100.0

68% of the samples were diagnosed as benign, meaning most of the samples showed no signs of cancer. 25% of the samples were diagnosed as malignant, indicating a notable portion of the samples had cancer. 2% of the samples were suspicious of malignancy, suggesting that a small number of samples raised concern for possible cancer, but the results were not definitive. 5% of the samples were non-diagnostic, meaning the results were inconclusive due to insufficient or poor-quality material.

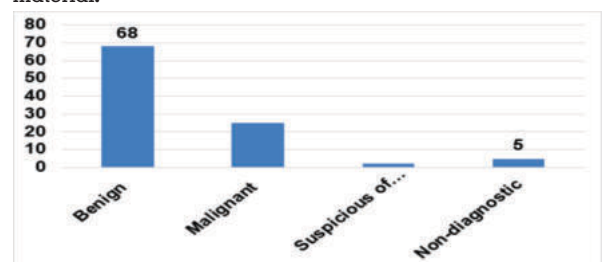


Fig 5: Cell Block Diagnosis Distribution (n=100)

Table - 7: Comparison Of Diagnostic Yields Between Cell Block And Smear Techniques In Cytological Evaluation (n=100)

Diagnosis	Cell Block	Smear
Benign	71	68
Malignant	25	16
Suspicious of malignancy	2	9
Non-diagnostic	2	7
Total	100	100.0

The Cell Block technique demonstrated a higher detection rate of malignant cases (25%) than the Smear method (16%), suggesting improved diagnostic sensitivity. However, the Smear method identified more cases as "Suspicious of malignancy" (9% vs. 2%) and had a slightly higher yield of benign diagnoses (71% vs. 68%). Both techniques had comparable non-diagnostic rates. Overall, the Cell Block method may offer better definitive diagnostic clarity, especially in identifying malignancies.

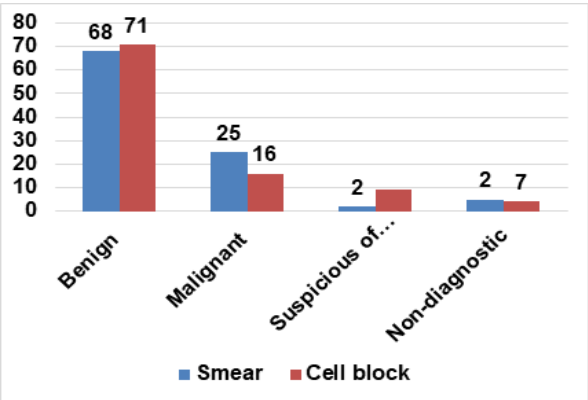


Fig 6: Comparison Of Cell Block And Smear Diagnosis (n=100)

Table - 8: Correlation Between Smear and Cell Block Diagnoses in Cytological Evaluation

Smear Diagnosis	Cell block				Total
	Benign	Malignant	Suspicious of malignancy	Non-diagnostic	
Benign	68	1	1	1	71
Malignant	0	16	0	0	16
Suspicious of malignancy	0	8	1	0	9
Non-diagnostic	0	0	0	4	4
Total	68	25	2	5	100
Chi-square /p-value	174.8/<0.001				

The table demonstrates a strong concordance between smear and cell block diagnoses, as indicated by a highly significant Chi-square value ($\chi^2 = 174.8, p = <0.001$). Most benign smear diagnoses corresponded with benign cell block results (68 out of 71), and all malignant smears matched malignant cell block diagnoses (16 out of 16). There is also a high level of agreement for "suspicious" and "non-diagnostic" categories. The significant p-value suggests that the observed association between smear and cell block diagnoses is unlikely due to chance, highlighting the complementary diagnostic value of cell block preparations in cytology.

While smear cytology demonstrates excellent specificity (100%) and positive predictive value (PPV, 100%), indicating that a malignant smear result is highly reliable, its moderate sensitivity (64%) reveals a significant limitation: over one-third of malignant cases may be missed when relying on smear alone.

In contrast, cell block preparation identified a greater number of malignant cases (25 vs. 16) and provided more definitive

diagnoses across all categories. This is reflected in the highly significant Chi-square value ($\chi^2 = 174.8, p = <0.001$), underscoring a strong and non-random association between smear and cell block results, with cell block offering greater diagnostic accuracy.

Importantly, cell block reduced the number of cases labeled as "suspicious" or "non-diagnostic," offering clearer categorization and reducing diagnostic uncertainty. While smear cytology correctly classified most benign cases (68/71 also benign on cell block), only the cell block was able to capture all malignant cases, highlighting its superior sensitivity and broader diagnostic utility.

In summary, although smear remains a reliable tool when it detects malignancy, cell block significantly enhances detection rates and diagnostic precision, making it a crucial complementary technique, especially in cases where smears yield equivocal or suspicious results.

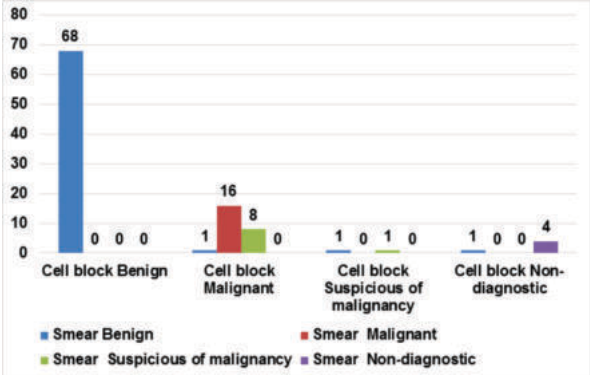
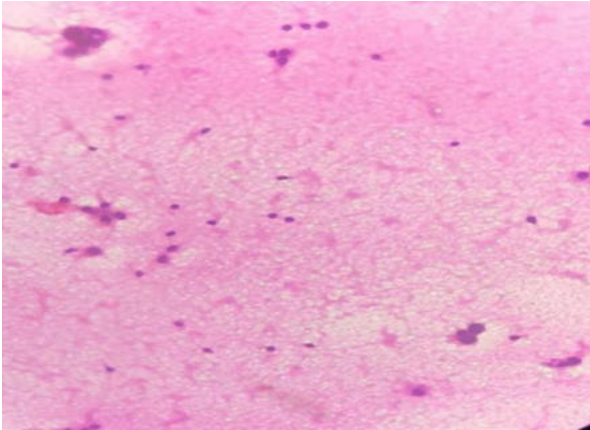
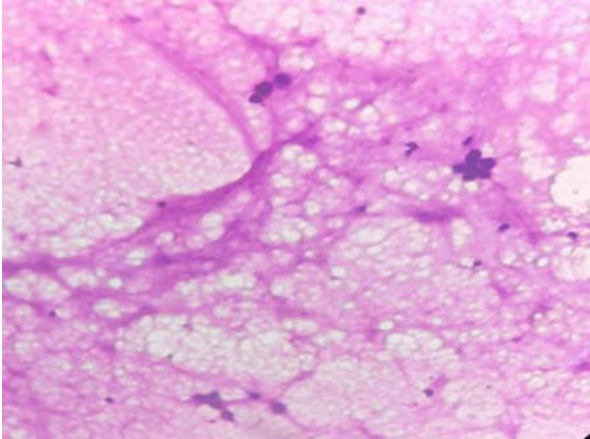


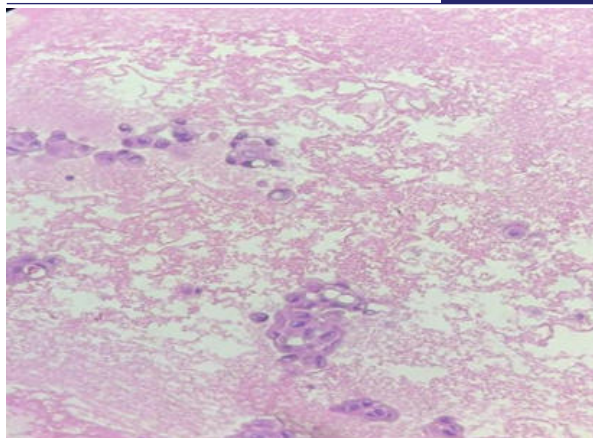
Fig 7: Correlation Between Smear and Cell Block Diagnoses in Cytological Evaluation



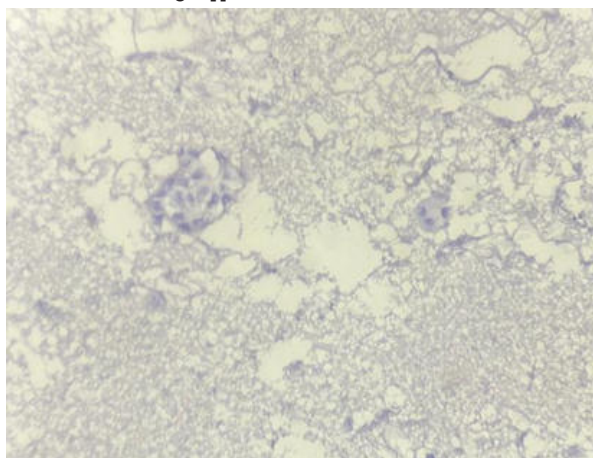
Conventional smear showing atypical cells 40x



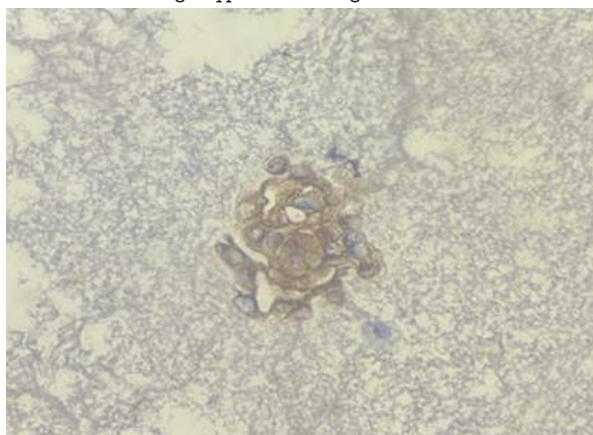
Conventional smear showing atypical cells 40x



Cell block showing atypical cells 40x



Cell block showing atypical cells negative for CK 20



Cell block showing atypical cells positive for Ck7

DISCUSSION

The cytodiagnosis by conventional smears have got low sensitivity due to overcrowding of cells or degenerative artifacts. To overcome this drawbacks cell block technique was first employed. Cell block technique enhances morphological details works as adjunct tool to conventional smear for establishing a definitive cytopathological diagnosis.

In this study routine conventional smears and cell block from ascitic fluid were studied for Cellularity, cytological preservation of architecture and its diagnostic utility and grading of malignancy by applying IHC markers.

In this study 10% alcohol formalin method of cell block preparations is used in ascitic fluid samples. Cell block method significantly increased malignant cell detection and

architectural clarity, consistent with previous studies (Bhanvadia et al, Thapar et al).

Importantly Cell Block allowed tumor typing via IHC critical for targeted therapy decisions.

There are no uniform guidelines for the diagnostic categorization of the fluid samples.

The use of a five-tiered system as per the ISRFC and IAC guidelines are feasible for the standardized reporting of effusion samples, thus avoiding subjective variation of reporting.

CONCLUSION

Cell Block:

Increases sensitivity for malignancy by better Cellularity, morphology by Preserving tissue architecture, better nuclear and cytoplasmic details.

Helps distinguish reactive from neoplastic cells and reduce inadequacy rates. Enables IHC for primary site identification, molecular testing and special stains Standardizes reporting with ISRSFC

It should be routinely used alongside conventional smears.

ETHICS:

The study received approval from the Institute Ethics Committee of Osmania Medical College, Hyderabad. All participants provided informed written consent.

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