

Body Fluid Cytological Analysis As A Cost-Effective And Simple Screening Tool Of Diagnostic Significance – A Rural Hospital Based Study In Southern India

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Abstract

Background

Cyto - morphological evaluation of the abnormal body fluids is a well-accepted investigation method, so much so that a positive cytologic diagnosis is often considered as a definitive one. It is a widely used method in the etiologic categorization of the underlying pathology as inflammatory or non-inflammatory (Atypical/ suspicious of malignancy/ positive for malignancy). This method also plays a pivotal role in the early detection of malignancy and facilitates the staging, prognosis and management of patients with malignancies.

Objective

To study the incidence of inflammatory and non-inflammatory effusions by cytology and to evaluate the diagnostic usefulness of this method as a screening tool.

Methods

The retrospective study was carried out by studying the reports of the body fluid samples that were received between January and June 2018 in the Pathology department of the tertiary care teaching hospital that caters to a rural population. A total of 202 effusion smear

cytology reports were retrieved, reviewed and included in this study.

Results

Out of the two hundred and two (202) body fluid reports analysed, the majority was from male patients (69.3%) and most of these patients were in the age group of 41 to 60 years (50%). The results showed that the cytologic findings correlated with the preliminary clinical diagnosis of the treating physician with the overall diagnostic accuracy of this method being 80.7% in our study.

Conclusion

Cytological analysis of abnormal body fluid has been proven to be a good diagnostic tool in categorizing the underlying pathology. It is also concluded to be a cost-effective screening test in the early detection of malignancy, thereby reducing patient's morbidity and mortality.

Keywords: Effusion, mesothelial cells, reactive hyperplasia.

Introduction

The body-cavity fluid collection in abnormal proportions (effusion) occurs in a variety of pathological conditions. The serous body cavities are mesothelial-lined spaces

surrounding the lungs, heart and abdomen. Normally, these cavities are collapsed and contain only a small amount of fluid and are enough to lubricate the adjacent surfaces as they move over each other with respiration, heartbeats and intestinal peristalsis. In disease state, a greater amount of fluid known as effusion accumulates (1).

The cytological analysis of such collections of fluid can be done by microscopic examination to provide an understanding of the underlying disease process (2). The analysis of such body fluids for the detection the tumour cells have been proposed as a routine laboratory test since the mid 19s (3). Thus the effusion fluid analysis helps the clinician to narrow down on the clinical differential diagnosis and decide on the further course of management. The cytological study of body fluids is an inexpensive and simple investigation done in the cytology lab for the evaluation of the patients' disease. Fluid cytology gives information about the various inflammatory and non-inflammatory lesions and in addition it helps in staging, prognosis and management of patients with malignancies (4).

The present analysis was aimed to study the incidence of inflammatory and non-inflammatory effusions by cytology and to evaluate the diagnostic usefulness of this method as a screening tool for any underlying malignancies. To attain our aim, it was divided the study into two parts, first to categorize the effusions based on the cells seen (inflammatory/ reactive/ atypical or suspicious of malignancy or presence of malignant cells) and second to correlate the cytological findings with the clinical diagnosis of the patients.

Materials and Methods

The present study was a retrospective observational study of body fluid cytology reports of samples received in the Pathology department of Trichy SRM Medical College Hospital and Research Centre from January to June 2018.

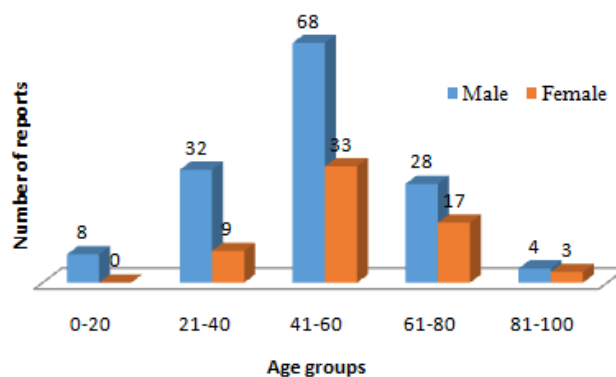
The study was done after receiving approval from the Institutional Ethics Committee (Ref. CMCH&RC/IEC-101 dated 05.12.2017). We took 202 effusion cytology reports as per the inclusion criteria and the results were reviewed after taking into account the gross features and cell counts along with the microscopic findings. The cases were then classified as inflammatory, reactive, atypical/ suspicious of malignancy and positive for malignant cells on cytologic evaluation.

The clinical findings and diagnosis (whether malignant or non-malignant) as stated in the request forms were correlated with their cytologic diagnosis. We have included only the reports of peritoneal, pleural and pericardial fluids that were received in cytology lab for analysis. We have excluded the cytology reports of other fluids. Reports that had inferred inadequacy of material or presence of degenerated cells due to various sampling errors or had incompletely filled in request forms were excluded from the study.

Results and Discussion

Out of the 202 body fluid sample reports taken for analysis, most of the samples (69.3%) were from male patients. A significant number (50%) of the samples were from patients between 41 and 60 years of age as described in figure 1.

Figure 1: Age and gender wise distribution



Categorisation of the body fluid with its clinical diagnosis

The sample reports were analysed and the clinical impression given for different body fluid samples was categorised as inflammatory/ infective; non-inflammatory and suspicious of malignancy, thereby more the data evinced predominantly of inflammatory followed by non-inflammatory (Table 1).

Table 1: Type of body fluid and clinical diagnosis

Types of fluid	Number of cases	Clinical diagnosis		
		Inflammatory/ Infective	Unknown / Non-inflammatory	Suspicious of malignancy/ Confirmed malignancy
Pleural	114	56	41	17
Pericardial	007	2	5	00
Peritoneal	081	39	25	17
Total	202	97	71	34

The categorisation of the body fluid based on the cytological diagnosis

The case reports were scrutinised and the cytological diagnosis given in different body fluid samples received were tabulated as given in Table 3, further it was impregnated that pleural fluid with maximum numbers followed by peritoneal and pericardial.

Table 2: The type of body fluid sample and their cytological diagnosis.

Type of fluid	Cytologic diagnosis				Total number of cases
	Inflammatory effusion	Reactive effusion	Atypical cells seen / Suspicious for malignancy	Malignant effusion	
Pleural	88	9	4	13	114
Pericardial	4	1	0	2	7
Peritoneal	56	11	7	7	81
Total	148	21	11	22	202

The microscopic pictures (Figures 1 to 4) of the cytologic diagnosis showed that most of the samples given as inflammatory had predominantly lymphocytes (60 to 70%) though some had neutrophils admixed when there was an acute underlying pathology. In reactive effusions, an

increase in the number of mesothelial cells along with inflammatory cells was observed.

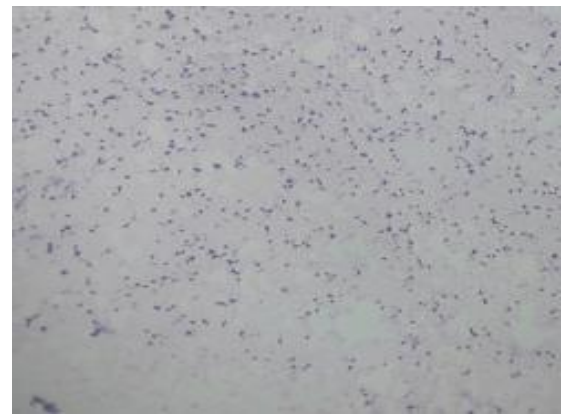


Figure 1: (On 4X; Giemsa) Inflammatory smear showing lymphocytes and occasional mesothelial cells

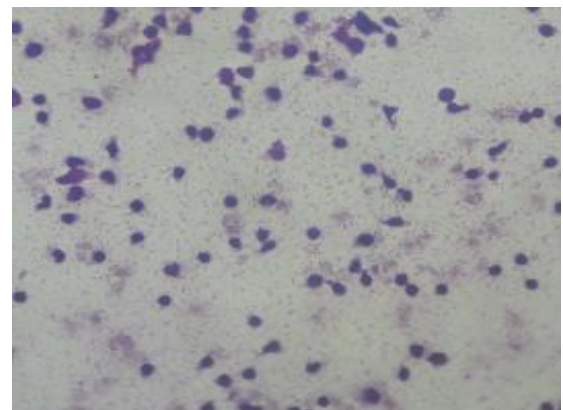


Figure 2: (On 40X; Giemsa) Inflammatory smear showing lymphocytes and occasional mesothelial cells

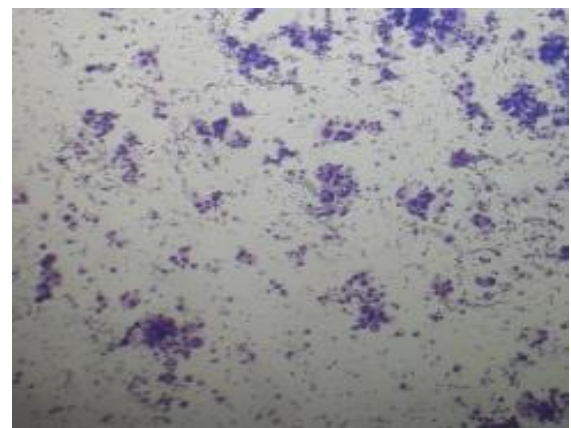


Figure 3: (On 4X; Giemsa) Reactive effusion showing clusters mesothelial cells, foamy/cyst macrophages and lymphocytes.

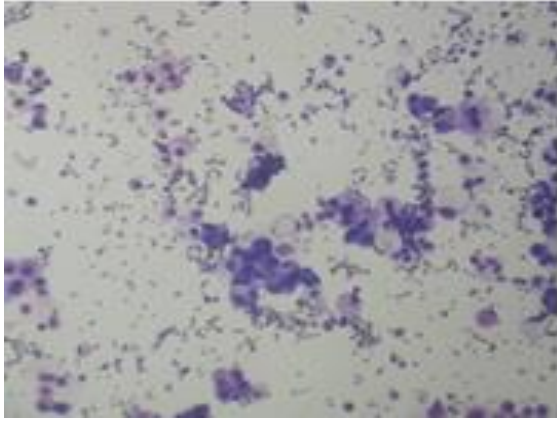


Figure 4: (On 10 X; Giemsa) Reactive effusion showing clusters mesothelial cells, foamy/ cyst macrophages and lymphocytes.

In few samples, the smears showed occasional mesothelial cells with binucleate or large nucleus mimicking the neoplastic cells (Figure 5). In such cases by using the criteria recommended in standard textbook (11), the neoplastic smears (Figure 6) were differentiated and appropriately classified. Further the cytologic diagnosis was correlated with the preliminary clinical impression given by the clinician who showed that in 163 cases (80.7%) correlation was noted.

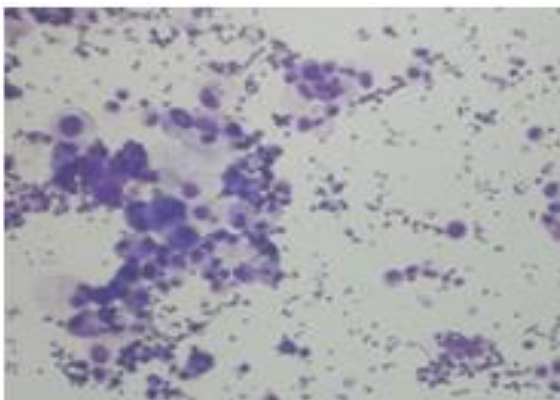


Figure 5: (On 40 X; Giemsa) Reactive effusion shows clusters mesothelial cells, foamy/ cyst macrophages and lymphocytes. Occasional cells which mimic malignant cells.

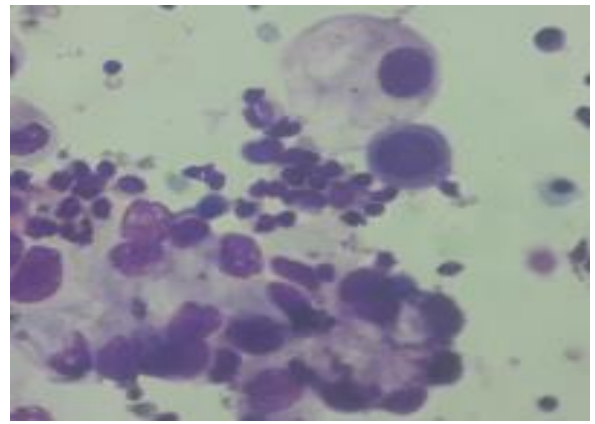


Figure 6: (On 40X; Giemsa) Positive for malignancy showing reactive mesothelial cells along with lymphocytes and malignant cells forming a glandular pattern which show nuclear hyperchromasia, pleomorphism and irregularity

Out of the 202 body fluid sample reports taken for analysis, most of the samples (69.3%) were from male patients which was already analyzed in some of the studies (9,10), controversially a study showed female preponderance (5) and this may due to the inclusion or participation of more female participants. Extensively, it was observed the predominant age groups in the case reports were between 41 and 60 years (6) and most likely same data observed in this study also. The youngest patient subjected to cytology was a 2 year old male child who had fluid tapping done for tuberculous abdomen and the oldest was from an 86 year old lady with pleural effusion with a clinical diagnosis of congestive cardiac failure.

The site distribution of various body fluids reported in this study showed the predominance of pleural followed by peritoneal and pericardial which was similar in distribution to the reference studies (7,8). The main objective of this study emphasized the significance of fluid cytology since abnormal body fluids are easily available source of diagnostic information. Our study in concurrence with the reference showed that the volume of the fluid collected was not suggestive of any particular condition (9,10).

The study showed 80.7% suggestive correlation by analysing 202 samples. Out of that, 39 cases did not show any clinico-cytological correlation whereas 26 cases were clinically determined to be malignant turned out to be inflammatory or reactive effusions on cytology and 13 cases clinically diagnosed as non-malignant turned out to have malignant cells on cytology. The literature clearly mentioned the classification and differentiation of reactive mesothelial cells from neoplastic cells on cytology was made (11). However in some samples wherein the reactive mesothelial cells and low grade malignant cells mimic each other diagnostic problems were confronted which was resolved with cell block studies and correlation with proper clinical history and ancillary studies as reported in earlier (12). It must also be noted that appropriate sample collection, handling and preparation are essential to obtain an accurate diagnosis (13).

The analysis of fluid cytology is useful to gain information about the mechanism of fluid formation and accumulation (14) and correlation of this with clinical findings can help point out whether the underlying pathology is malignant or non-malignant in origin. The treating clinician can use this information to formulate the order of priority, to list out the differential diagnosis and also to follow the results of therapy effectively (15).

Through this study we have assent with literature that careful attention to the morphology of the questionable cells and the background in which they lie would be helpful in resolving many a difficult case (16).

The preliminary body fluid cytology analysis is useful even in a basic practice setting with limited resources. In such setups, it can use as the most simple, convenient and cost effective investigation to help arrive at a near-definite diagnosis.

Conclusion

The present study showed an 80% correlation of the effusion cytology result with its clinical diagnosis. At the end of the study, it was concluded that a detailed patient history with clinical findings along with supportive evidence such as imaging studies would improve the diagnostic accuracy rate. Hence through this study, we conclude that the cytologic analysis of effusions is a good screening test that is a cost effective means for identifying patients with malignancy thereby reducing morbidity and mortality.

This screening test *does not essentially diagnose the illness*. The cases that tested cytologically positive further require gold standard tests such as histopathological examination for confirmation.

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