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Dr. Saravanakumar P
PG, Department of Pathology,
Sree Mookambika Institute of
Medical Sciences,
Kulasekharam, Kanyakumari,
Tamil Nadu, India

Dr. Bindhuja J
Associate Professor,
Department of Pathology,
Sree Mookambika Institute of
Medical Sciences,
Kulasekharam, Kanyakumari,
Tamil Nadu, India

Morphological spectrum of effusion cytology in a tertiary care hospital

Dr. Saravanakumar P and Dr. Bindhuja J

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Abstract

Background: The exfoliated cells in the body fluids are easily obtained by tapping and are subjected to biochemical and cytological examination. The study of fluid cytology has paramount importance in identifying atypical cells as the finding of cancer cells in such a specimen denotes that the patient has advanced cancer.

Materials and Method: The present study is a descriptive study carried out over a period of one year from December 2018 to November 2019. Various body fluids including peritoneal, pleural, cerebrospinal fluids were included in this study. H&E stain and papanicolaou stain were done. They were then reported and classified as malignant and non-malignant lesions.

Results: A total of 532 body fluids were included in this study. Peritoneal fluid comprised the majority of the samples with 228 (42.86%) followed by pleural fluid in 190 (35.71%) cases. Among the samples received a male preponderance was noted. Majority of the fluid specimens were reported as negative for malignant cells.

Conclusion: Body fluid cytology is a rapid and simple diagnostic modality. In our study, majority of the malignancies were found in the peritoneal fluid with maximum cases being adenocarcinoma. Conventional smear method is a fairly good method for all types of effusions.

Keywords: body fluid, effusion cytology, serous fluid examination

Introduction

The study of cytology of body fluids is simple, inexpensive and combined with biochemical analysis, reveals a lot of information. The fluids on which this examination can be done includes pleural, peritoneal, pericardial and cerebrospinal fluid. An outer parietal and inner visceral layer of epithelium lines these cavities ^[1]. Effusion results in imbalance between fluid formation and removal based on Starling's law ^[2]. Approximately 50 ml of lubricating fluid is usually present in them. Cause of effusion includes various infectious, inflammatory and neoplastic processes. Malignant or dysplastic cells in the fluids are marker of disease progression. Hence, the body cavity fluids serve as a window of study of underlying pathologic process ongoing in the body ^[3]. The overall cytological evaluation in the light of clinical, radiological and physical examination is an aid to the primary provisional diagnosis. The study described here also helps understanding various conditions underlying the main disease process.

Proper assessment of multiple specimens of fluids increase detection rate of malignancy ^[4].

Materials & Methods

The present study conducted by us is a descriptive study. It was conducted in the Department of Pathology, Sree Mookambika Institute of Medical sciences for a period of one year. It included 532 cases for which cytological examination was requested for by the clinical team. Additional required clinical data was collected and compiled. The fluid sample was first centrifuged at 3000 rpm for five minutes. After discarding the supernatant the remaining sediment was transferred onto two glass slides with pipette and spread evenly. 95% alcohol was used to fix the slide and Haematoxylin & Eosin Stain, pap stains were used for staining. Smears were studied under light microscope and categorized based on their cellular details. Results were compiled and scrutinized based on their relevance.

Corresponding Author:
Dr. Saravanakumar P
PG, Department of Pathology,
Sree Mookambika Institute of
Medical Sciences,
Kulasekharam, Kanyakumari,
Tamil Nadu, India

Results

Table 1: Categorization of body fluids

Type of Fluid	Non-malignant	Malignant	Total
Peritoneal	192	36	228
Pleural	176	14	190
CSF	46	8	54
others	50	10	60
Total	464	68	532

A total of 532 body fluids samples were studied. Majority of the patients were in the 40 to 70 years of age group with mean age of presentation being 52.6 years. Majority of cases (289 cases -54.32%) were male. Females population of patients were 243 of 532 cases. The commonest fluid received in the current study was peritoneal fluid : 228 cases with 126 males (55.26%) and 102 females (44.74%), followed by pleural fluid 190 cases, CSF 54 cases and others include sputum 34 cases and synovial fluid 26 cases.

Table 2: Body fluid study among male and female population

Type of Fluid	Male	Female	Total
Peritoneal	126	102	228
Pleural	110	80	190
CSF	19	35	54
others	26	34	60
Total	289	243	532

Discussion

Klebs and Lucke in 1867 first identified abnormal cells in ascetic fluid. In 1882, Quincke, described malignant cells in pleural effusion. After introduction of lumbar puncture in 1891 in Germany, examination of CSF also began. Since then body fluid aspiration has become a part of routine investigation. It is easy to perform, time saving, economical, and patient friendly [2, 5]. It also helps significantly in reaching the diagnosis of underlying disease.

Serous effusion cytology is instrumental in detecting various diseases entities. Clinical history, clinical findings, serum marker levels, Radiological findings and previous cytological diagnosis should be correlated before arriving at a conclusive diagnosis.

The morphology of reactive mesothelial cells mimics and malignant cells and can pose diagnostic difficulty very often.

Mesothelial cell cellularity can be sparse or numerous in benign effusions and mainly dispersed as isolated cells or occasional small clusters. Large clusters composed of more than 12 cells are highly unusual in benign effusions. Binucleation and multinucleation are common, and mesothelial cells in mitosis can be seen in benign effusions. The dense cytoplasm reflects the abundance of tonofilaments, and the clear outer rim (“lacy kirt” or “halo”) corresponds to long, slender microvilli, better visualized with electron microscopy. Two or more mesothelial cells in groups are often separated by a narrow space or “window.” Differential diagnosis of reactive mesothelial cells are mesothelioma and metastatic malignancy.

Malignant cells show high nuclear-to-cytoplasmic ratio, nuclear hyperchromasia, or macronucleoli, second population of cells, numerous large clusters, lacunae (cell block sections). Exceptions to this rule occur. Notably mesothelioma, for which a sharp distinction between benign and neoplastic mesothelial cells is not appreciated.

In our study, we focus on the impact and significance of fluid cytology in diagnosis of malignant and non neoplastic lesions.

In the current study, most of malignancy was detected on evaluating the first specimen similar to other study [6]. In study conducted by Sherwani R *et al.* [7], most common site of effusion was peritoneal followed by pleural and pericardial effusions.

In the current study, number of male cases were 289 (54.32%) and females were 243 (45.68%). The mean age group was 40-70 and mean age at presentation is about 52.6 years. This finding correlated with studies done by Shulbha *et al.*, Pradhan *et al.* and Joshi *et al.* [8, 9, 10]

The effusion fluid most frequently analyzed was peritoneal fluid (42.86%) 228 cases followed by pleural fluid with 190 (35.71%) cases. 68 (12.78%) cases were malignant and 464(87.22%) cases were non-malignant in the current study. The findings were similar to other other studies [8, 9, 10].

The most malignancies in the current study were noted with peritoneal fluid examination, adenocarcinoma being the commonest. A study by Wong JW *et al.* had highest rate of malignancy in pleural fluid [5].

Whereas study by Jha R *et al.*, showed adenocarcinoma as the most common malignancy among all fluids [11].

Body fluids are further divided into transudates, modified transudates and exudates. Fluid leakage from efferent interstitial lymphatics and hypoalbuminemia casues Transudates.

Increased in vascular permeability and increased intra hepatic hydrostatic pressure cause modified transudate.

Exudates may be inflammatory, neoplastic or chylous effusion.

Chylous exudates predominantly have neutrophils, macrophages and lymphocytes and in malignant effusions neoplastic cells were the predominant cells [12].

Out of 228 cases of peritoneal fluid, 192 were non neoplastic and 36 were neoplastic. Of the non-neoplastic fluids, transudates were 161 and non-neoplastic exudates were 31. All 36 cases of malignancy were adenocarcinoma.

Out of 190 cases of pleural fluid, 176 were non neoplastic and 14 were neoplastic. Of the 176 cases, 161 were non neoplastic transudates and 15 were non neoplastic exudates. Adenocarcinoma was the most common malignancy seen in 12 cases.

In a study conducted by Kumavat PV *et al.* [2] showed 90.44% as non suppurative and 8.8% as suppurative.

Study conducted by Kushwaha *et al.* [13] had similar findings.

The presence of neutrophils in fluids indicate acute pleural inflammation, highly suspicious of pneumonia with effusions and emphysema, hepatic abscess and pelvic abscess and post myocardial infarction, Transudative effusions contain plenty of lymphocytes.

Out of 54 cases of CSF samples, 46 cases showed normal findings, 08 cases were positive for malignancy.

We received 34 samples of sputum for malignant cells and 10 samples were positive for malignancy. Of the 26 cases of synovial fluid studied, 12 were non suppurative and 14 cases had suppurative effusions.

Current study used conventional smear method & Cytospin method. While conventional smear method is useful for all types of specimen with different cellularity, Cytospin is used for concentrating the scanty cellular sample.

Bloody fluid is often highly suspicious of malignancy. In our study, hemorrhagic aspirates were noted in cases with

malignant effusions^[14].

Scattered cells are more in favour of benign effusions. Smears positive for malignant cells were highly cellular and had cells arranged in acinar pattern. In addition, other features were high N:C ratio, pleomorphic nuclei, prominent nucleoli and scant eosinophilic cytoplasm.

Role of immunocytochemistry in effusions

- used to confirm malignancy when morphology alone is Equivocal,
- distinguishing adenocarcinoma from mesothelioma,
- establishing the primary site of a malignant effusion,
- a patient with:
 - an occult primary
 - multiple primaries
 - assessing receptor status (e.g., HER2) for patients with breast and gastric cancers

Conclusion

In our study, majority of the malignancies were found in the peritoneal fluid with maximum cases being adenocarcinoma. Conventional smear method is a fairly good method for all types of effusions. For scanty material, Cytospin method serves better. Clusters, 3 dimensional balls, papillary patterns are prominent features in malignant effusions. It has worst prognosis.

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