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STUDYING THE DIAGNOSTIC ACCURACY OF CONVENTIONAL CYTOLOGY AND LIQUID-BASED CYTOLOGY IN THE BODY FLUIDS

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ABSTRACT

Background: Cytological assessment of serous effusions has been performed for nearly 100 years for the diagnosis of malignancy and further detection of primary lesions which helps in the prognosis and staging of malignant tumors and provides information on different inflammatory lesions of serous membranes. Cytology has gained high acceptance where a positive diagnosis is considered a positive diagnosis.

Aim: The present study aimed to study the diagnostic accuracy of conventional cytology and liquid-based cytology in body fluids.

Methods: The study assessed 200 subjects from both genders and all age groups where body fluid samples such as peritoneal fluid and pleural fluids were assessed and evaluated. The results were formulated after statistical analysis.

Results: the majority of subjects (n=68) were in the age of above 60 years. Among 200 subjects, 108 subjects were males and 92 were female subjects. In the majority of subjects, malignancy was assessed using cytocentrifuge followed by conventional and LBC methods. The majority of subjects presented with carcinoma ovary in 30 subjects followed by carcinoma colon, carcinoma liver, carcinoma gall bladder, carcinoma lung, and thyroid carcinoma in 8, 6, 4, 2, and 2 subjects respectively. The majority of LBC cases were benign with 170 and 178 on conventional and cytocentrifuse.

Conclusions: The present study concludes that for cellularity, background, cell morphology, and cell distribution demonstration, cytocentrifuge was superior compared to LBC and the conventional method.

Keywords: benign, Cytocentrifuge, cytology, LBC, malignant

INTRODUCTION

Effusions in the body cavity are symptoms of various diseases. Accumulation of fluid in preformed body cavities is seen in pericardial effusion, ascites, and pleural effusion. In body cavities, the accumulation

of fluid rich in inflammatory cells and protein is associated with malignant conditions, infarction, or inflammation. More advanced cancer stage is indicated with malignant cells detection in serous effusion.[1]

The cytological diagnosis of peritoneal, pericardial, or pleural effusion is an effective method that gives correct results and helps assess the primary origin of cancer. The diagnostic efficacy of cytological study in the fluid can be attributed to the cell population seen in sediment as a feature of a larger surface area than what is obtained using a needle biopsy.[2]

Recent literature data showed that 20% of serous membrane effusions every year are malignant with nearly 50% diagnosed as metastatic adenocarcinomas followed by leukemias/lymphomas and pulmonary large cell carcinoma with nearly 15% incidence each.[3] The cytological methods of both liquid-based cytology ad direct smear methods can be utilized for effusion cytological diagnosis. Conventional smear may show cell clumping at one corner, debris, inflammatory cells, hemorrhage, and cells obscuring of cells by mucus along the cells multilayering which will inhibit cytological interpretation of the smear.[4]

LBC (liquid-based cytology) has been approved by the US FDA (food and drug administration) since 1996. LBC was initially introduced for assessing gynecological cervical smears. In the recent data, LBC utility is assessed in FNAC and non-gynecological material. The alcohol-based solution is used for fixation of LBC causing limited RNA and DNA destruction making structure stable for a long period.[5]

Some literature reported that despite being high cost, LBC showed decreased air-dry artifacts better than direct smear, well-preserved cells, long storage time, less screening time, well-preserved cytomorphology, good-cell distribution, and clean background smear. Most studies reported LBC as equivalent to or better than conventional preparations in non-gynecological cytology.[6]

The present study aimed to study the diagnostic accuracy of conventional and LBC in body fluids and to study clinical profiles in malignant cases.

MATERIALS AND METHODS

The present prospective cross-sectional study was aimed at studying the diagnostic accuracy of conventional and LBC in body fluids and clinical profiles in malignant cases. The study subjects were from the Department of Pathology of the Institute. Verbal and written informed consent were taken from all the study subjects before participation.The study included 200 subjects from both genders where body fluid samples such as peritoneal fluid and pleural fluids were collected in the Department from both genders and all age groups. The inclusion criteria for the study were subjects from all age groups and both genders where peritoneal or pleural fluid was collected. The exclusion criteria for the study were subjects where urine sample was collected, pericardial fluid was collected, CSF, pap smear, or subjects that did not give consent for participation.

After final inclusion, smears were prepared with both liquid-based cytology and conventional methods from all 200 samples. All the smears were screened and a comparative assessment was done for conventional and liquid-based methods. For data collection, a structured questionnaire was used to gather the necessary data. The questionnaire assessed general data such as address, parent's occupation, religion, gender, and age of the subjects followed by chief complaint, medical history, systemic examination, general examination, and history. In subjects from the medical ward, clinical outcome data, treatment

methods, medical history, personal history, investigations, and demographic data of stroke patients were assessed. Screening was done for all the subjects.

Sample collection was done for three different body cavity fluids including urine, peritoneal fluid, and pleural fluid. Each fluid was collected using different techniques. Thoracocentesis was used for collecting pleural fluid which was performed by needle insertion in the sixth or seventh intercostal space. The peritoneal fluid collection was done by needle insertion into the abdominal wall at the most dependent portion of fluid accumulation. Random voided urine samples were used. Samples were sent to the laboratory with labels. All samples were divided into 3 parts and assessed with cytocentrifuge, LBC, and conventional method. The data gathered were analyzed statistically using SPSS (Statistical Package for the Social Sciences) software version 16.0 (SPSS Inc., Chicago, USA) for assessment of descriptive measures and the Chi-square test. The results were expressed as mean and standard deviation and frequency and percentages. The p-value of <0.05 was considered statistically significant.

RESULTS

The present prospective cross-sectional study was aimed at studying the diagnostic accuracy of conventional and LBC in body fluids and clinical profiles in malignant cases. The study included 200 subjects from both genders and body fluid samples such as peritoneal fluid and pleural fluids were collected in Departments from all the age groups. The majority of the study subjects were in the age range of >60 years with 34% (n=68) subjects followed by 28% (n=56) subjects from 46-60 years, 24% (n=48) subjects from 31-45 years, 12% (n=24) subjects from 18-30 years, and 2% (n=4) subjects from <18 years respectively as shown in Table 1.

Among 200 participants assessed for the study, there were 54% (n=108) male subjects, and 46% (n=92) female subjects respectively. For assessment of case distribution based on the malignancy status in the present study, there were 73% (n=146) lesions that were non-malignant and there were 27% (n=54) lesions that were found malignant as summarized in Table 2. For malignancy case distribution based on methods used, among 54 cases assessed, cytocentrifuge was used for assessment in 34 samples, the conventional method was used in 22 samples, and liquid-based cytology was used in 30 samples respectively (Table 3).

The study results showed that for the distribution of malignant cases in the study subjects, the most common lesion seen was carcinoma ovary seen in 55.5% (n=30) samples out of 54 followed by carcinoma colon in 14.81% (n=8) study subjects, hepatocellular carcinoma in 11.1% (n=6) study subjects, carcinoma gall bladder in 9.25% (n=5) study subjects, carcinoma lung in 5.55% (n=3) study subjects, and thyroid carcinoma in 3.70% (n=2) study subjects respectively as depicted in Table 4.

It was seen that for the distribution of study subjects based on cytological diagnosis, on centrifuge assessment, benign, suspicious, and malignant lesions were seen in 83% (n=166), 15% (n=30), and 2% (n=4) subjects respectively. Conventional assessment depicted benign, suspicious, and malignant lesions in 89% (n=178), 8% (n=16), and 3% (n=6) study subjects respectively. Liquid-based cytology reported benign, suspicious, and malignant lesions in 85% (n=170), 13% (n=26), and 2% (n=4) subjects respectively as shown in Table 5.

DISCUSSION

The present study included 200 subjects from both genders where body fluid samples such as peritoneal fluid and pleural fluids were collected in Departments from all age groups. The majority of the study subjects were in the age range of >60 years with 34% (n=68) subjects followed by 28% (n=56) subjects from 46-60 years, 24% (n=48) subjects from 31-45 years, 12% (n=24) subjects from 18-30 years, and 2% (n=4) subjects from <18 years respectively. These findings were similar to the studies of Lee MY et al[7] in 2014 and Campion MB et al[8] in 2010 where authors assessed subjects with demographic data comparable to the present study.

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CONCLUSIONS

The present study, considering its limitations, concludes that for cellularity, background, cell morphology, and cell distribution demonstration, cytocentrifuge was superior compared to LBC and the conventional method. Future studies with longer follow-ups and more number of patients are needed for further exploration of the issue.

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Age (years)	Number (n)	Percentage (%)
<18	4	2
18-30	24	12
31-45	48	24
46-60	56	28
>60	68	34
Total	200	100

Table 1: Age range in study subjects

Malignancy status	Number (n)	Percentage (%)
Non-malignant	146	73
Malignant	54	27
Total	200	100

Table 2: Case distribution in study subjects following malignancy

Malignancy status	Number (n=54)
Cytocentrifuge	34
Conventional	22
LBC	30

Table 3: Malignancy case distribution based on methods used

Malignancy status	Number (n=54)	Percentage (%)
Thyroid carcinoma	3	5.55
Carcinoma lung	2	3.70
Carcinoma gall bladder	5	9.25
Hepatocellular carcinoma	6	11.1
Carcinoma colon	8	14.81
Carcinoma ovary	30	55.5
Total	54	100

Table 4: Malignant case distribution in study subjects

Malignancy status	Number (n=200)	Percentage (%)
Cytocentrifuge		
Benign	166	83
Suspicious	30	15
Malignant	4	2
Conventional		
Benign	178	89
Suspicious	16	8
Malignant	6	3
LBC		
Benign	170	85
Suspicious	26	13

Malignant	4	2

Table 5: Distribution of study subjects based on cytological diagnosis