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Cytopathological Analysis of Body Fluids in Conventional Smear Method versus Cell Block Method for Diagnostic Evaluation

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Abstract
Introduction: *The cytological analysis of serous effusions helps in diagnostic, therapeutic and prognostic implications. The accurate identification of cells as either malignant or reactive mesothelial cells is a diagnostic problem in conventional cytological smears. The cell block (CB) technique is one of the oldest and complementary methods for the evaluation of body cavity fluids.*
Methods: *The present study was conducted on 130 patients who subjected for the diagnosis of body fluid effusion cytology by CS & CB method. A total 130 fluid specimen were received in the Cytology section, Department of Pathology, M.G.M. Medical College, Indore, (M.P.) from DEC 2015 to DEC 2017. All the 130 body fluid specimens were included in the study.*
Results: *In our study a total of 130 body cavity fluid samples were studied. Out of 130 samples, 63 samples were peritoneal fluid, 60 were pleural, 4 were synovial and 3 were pericardial. All the14.6% cases which were malignant on CS remained so on CB. On CB 23.07 % cases were positive for malignancy, 1.5 % suspicious and rest benign & inflammatory. CB increased the yield of malignancy by approx 8.46% (11 cases). Out of these 11 cases, 9 were suspicious on CS and 2 were benign but turned out to be malignant on CB.*
Conclusion: *In developing countries like India, where health facilities are in adequate, and cost of investigations and management is often unaffordable, fluid analysis and cytology should continue to be the first line of investigation to screen out the benign and malignant effusion cases. A combined use of smears and cell block is recommended to increased further diagnostic accuracy.*

Introduction

The cytological analysis of serous effusions helps in diagnostic, therapeutic and prognostic implications.[1] The information provided by body fluid analysis serves several functions as it assists the clinician in formulating, in order of priority, a list of differential diagnosis and also allows one to follow the result of therapy.

The accurate identification of cells as either malignant or reactive mesothelial cells is a

diagnostic problem in conventional cytological smears. The cell block (CB) technique is one of the oldest and complementary methods for the evaluation of body cavity fluids[2]. Cell block preparation increases the sensitivity of detecting malignancies, and also has the ability to reduce false-positive interpretations. .

In order to overcome these difficulties in this study an attempt was made to utilize cellblock technique, in addition to the routine centrifuge method from fluid sample

Methods

The present study was conducted on 130 patients who subjected for the diagnosis of body fluid effusion cytology by CS & CB method. A total 130 fluid specimen were received in the Cytology section, Department of Pathology, M.G.M. Medical College, Indore, (M.P.) from DEC 2015 to DEC 2017. All the 130 body fluid specimens were included in the study. The clinical information including age, sex, history, provisional diagnosis was noted. 10 ml of fresh various body fluid samples received were first submitted for gross examination for physical characteristics and then subjected to conventional smear and cellblock techniques. Around 5ml of sample was taken in test tube and centrifuged at 2500 rpm for 10 minutes. A minimum of 2 thin smears were prepared from the sediment and fixed in 95% alcohol, were stained with papanicolaou stains.

The rest 5ml of the sample was fixed with 5ml of 10% alcoholic formalin (90% Ethyl alcohol and 10% formalin) for 24hours.Next day sediment which contained the cell button of the sample was taken on to a filter paper. This cell button was processed by automated tissue processor. A 3 micrometer thickness cell block sections were made from the cell button and the smears were stained with H& E and Papanicolaou stains. Morphological criteria including cellularity, arrangement of cells, nuclear and cytoplasmic characteristics were put together and used for the categorization of the fluid specimens. Patients were diagnosed through clinical history, laboratory tests, radiological examination, cytological examination, cell block technique, and subsequently, each was categorized by An impression of acute or chronic inflammation, reactive effusion, suspicious for malignancy and positive for malignancy was given after detailed cytological assessment. The cytological diagnosis was correlated with clinical diagnosis and other specific laboratory investigations. The results were tabulated and analyzed using SPSS version 20.0.

Results

In our study a total of 130 body cavity fluid samples were studied. Out of 130 samples, 63 samples were peritoneal fluid, 60 were pleural, 4 were synovial and 3 were pericardial. Out of 130 samples, 96 samples were from male patients and 34 were from females though male preponderance with male to female ratio 2.8:1 was noted, yet malignant effusions were more common in females. The maximum number of samples were in the age group of 41-65years.least number of samples were in the age group of 0-10 years. Exudates were commonly caused by infection, TB and malignancy while transudates were due to chronic liver disease, chronic obstructive pulmonary disease and renal failure. Cell blocks (CBs) showed preservation of architectural patterns and better nuclear morphology. CSs and CB sections were categorized separately and compared.

On CS 68.5% were inflammatory, 6.92% were benign, 10% were suspicious for malignancy and14.6 % were positive for malignancy. Out of the 6.92% cases (09 cases) which were benign on CS, 2 cases proved to be malignant on CB. Out of the 10% cases (13 cases) suspicious for malignancy, 9 cases turned out to be malignant, 2 benign and 2 remained suspicious on subsequent CB.

All the14.6% cases which were malignant on CS remained so on CB. On CB 23.07 % cases were positive for malignancy, 1.5 % suspicious and rest

benign & inflammatory. CB increased the yield of malignancy by approx 8.46% (11 cases). Out of these 11 cases, 9 were suspicious on CS and 2 were benign but turned out to be malignant on CB.

Table-1 Distribution of number of fluid specimen among gender & type by CS based diagnosis.

Types Of Fluid	Total no.	Male	Female
Peritoneal	63	50	13
Pleural	60	40	20
Synovial	04	03	01
Pericardial	03	03	00
Total	130	96	34

Table-2 Analysis of CS and CB method in total 130 fluids samples

No.	Diagnostic category	CS Method Total	CB Method Total
1	Inflammatory	89(68.46%)	89(68.46%)
2	Benign	09(6.92%)	09(6.9%)
3	Suspicious for malignancy	13(10.0%)	02(1.5%)
4	Malignant	19(14.61%)	30(23.07%)

Table-3 Analysis of peritoneal fluid on CS and CB method according to diagnostic category

site of effusion	Diagnostic category	CS Method Total	CB Method Total
Peritoneal fluid	Inflammatory	41(65.07%)	41(65.07%)
	Benign	08(12.69%)	06(9.5%)
	Suspicious for malignancy	06(9.5%)	02(3.17%)
	Malignant	08(12.69%)	14(22.2%)

Table-4 Analysis of Pleural fluid on CS and CB method according to diagnostic category

site of effusion	Diagnostic category	CS Method Total	CB Method Total
Pleural fluid	Inflammatory	43(71.66%)	43(71.66%)
	Benign	00	00
	Suspicious for malignancy	07(11.66%)	02(3.33%)
	Malignant	10(16.66%)	15(25.0%)
Total			

Table-5 Analysis of synovial fluid on CS and CB method according to diagnostic category

site of effusion	Diagnostic category	CS Method Total	CB Method Total
synovial fluid	Inflammatory	04(100%)	04(100%)
	Benign	00	00
	Suspicious for malignancy	00	00
	Malignant	00	00

Table-6 Analysis of pericardial fluid on CS and CB method according to diagnostic category

site of effusion	Diagnostic category	CS Method Total	CB Method Total
pericardial fluid	Inflammatory	01(33.33%)	01(33.33%)
	Benign	01(33.33%)	01(33.33%)
	Suspicious for malignancy	00	00
	Malignant	01(33.33%)	01(33.33%)

Discussion

Serous effusion cytology is well documented and accepted as a complete diagnostic modality, to the extent that a positive diagnosis is considered definitive and obviates the need of explorative surgery.[3,4] This is due to the fact that the cells present in body cavity fluids represent a much larger surface than that obtained by needle biopsy.[5] Cytology of body fluid helps to differentiate the causes of effusion including malignancy and also to type the tumour cells in case of unknown primary malignant site.[3] In patients with known malignancy, malignant effusion has prognostic implications which need change in treatment.[3,5] At times, effusion cytology can help in determining the cause of non-neoplastic effusion e.g. certain infectious diseases or in inflammatory conditions like systemic lupus erythematosus, rheumatoid arthritis.[3]

More definitive cytopathological diagnosis can be established by preparing cell block from the residual tissue fluid.[5] This technique is simple, safe, reproducible and cost-effective.[5] Use of cell block increases diagnostic accuracy.

So we performed cellblock technique to avoid difficult diagnosis in centrifuged samples. in this study we used 10% alcohol-formalin as a fixative for cellblock preparation. Similar fixative was used in a study done by Bodele et al and in similar studies[6,7]

In the present study, body cavity effusion was found in age range of 2-80 years. Other studies such as Kumavat et al (2013) had 550 cases in the age range of 1-89 years,[8] Hathila et al (2013) had 355 cases in the age range of 9-80 years.[9] Serous effusion was observed more in males (73.84%)

than in females (26.1%), with a ratio of 2.8:1 which was comparable to the study of Kumavat et al (2013).[8] In our study, majority were peritoneal fluid (48.46%) followed by pleural fluids samples (46.15%). Similar findings were noted by Pradhan et al (2006).[3]

After the study with cell block method, 13 cases suspicious for malignancy on cytology 02 were turned out to be benign on cell block and 02 case suspicious on cytology remained so on cell block. remaining 09 turned to be malignant on cell bock cases which were suspicious for malignancy and 02 benign on cytology turned out to be malignant on cell block. Thus, our study showed additional yield of malignancy by 8.46%. This result was similar to the study of Bhanvadia et al (2014).[5]

Other studies which have shown additional cases of malignancy on CB- increasing the diagnostic yield were Dekker et al (1978)- 38%,[10] Pal et al (2015)- 24%,[11] Joshi et al (2014)- 13.3%,[4] Bodele et al (2003)- 7%,[12] Thapar et al (2009)- 5.3%[13] and Gayathri et al (2014)- 2%.[14]

Table 7: Analysis of additional yield of malignancy on cell block in various studies

Sr no.	Authours	Additional yield%
1	Thapar et al (2009) [13]	5.3
2	Joshi et al (2014) [4]	13.3
3	Bhanvadia et al (2014) [5]	10.0
4	Dekker et al (1978) [10]	38
5	Pal et al (2015) [11]	24
6	Bodele et al (2003) [12]	7.0
7	Gayathri et al (2014) [14]	2.0
8	Present study (2018)	8.5

Conclusion

In developing countries like India, where health facilities are inadequate, and cost of investigations and management is often unaffordable, fluid analysis and cytology should continue to be the first line of investigation to screen out the benign and malignant effusion cases. We conclude that the cellblock technique by using 10% alcohol formlin as a fixative is simple, cost effective and does not require any special training or instrument .Cell block study has increased the diagnostic accuracy because of better preservation. It shows good architectural pattern, particularly in cases where there is a diagnostic dilemma between the malignancy and suspious for malignancy cases. Definite diagnosis of serous effusion can be accomplished cytopathologically in the majority of cases and is very important to clinician and surgeon for further management of patients. A combined use of smears and cell block is recommended to increased further diagnostic accuracy.

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Conflicts of Interest: Conflict of interest declared none.

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