RESEARCH PAPER

Recategorization Of Serous Fluid According To The International System For Reporting Serous Fluid Cytopathology: A Tertiary Care Center Study

Dr. Yelda Vyas[1], Dr. Madhvi Sanwelka[2] , Dr. Irbinder Kour Bali[3]

[1]Associate Professor, Department of Pathology, Balvir Singh Tomar Institute of Medical Sciences and Research, Jaipur, Rajasthan, India
[2]Assistant Professor, Department of Pathology, Balvir Singh Tomar Institute of Medical Sciences and Research, Jaipur, Rajasthan, India
[3]Professor, Department of Pathology, MMCMSR, Sadopur, Ambala

***Corresponding author**- Dr. Madhvi Sanwelka
*Assistant Professor, Department of Pathology, Balvir Singh Tomar Institute of Medical Sciences and Research, Jaipur, Rajasthan, India

ABSTRACT

Introduction

Serous effusion can be due to local or systemic pathology. Its study is very cost effective , minimally invasive and safe procedure. It serves as diagnostic tool for establishing diagnosis , for microbiological and biochemical testing and finding origin of malignancy. The present study was conducted at Balvir Singh Tomar Institute of Medical Sciences and Research, Jaipur with an aim to recategorize and diagnose serous fluids on the basis of TIS , which can potentially direct future modifications in terminology and management.

Material and method

We retrospectively reviewed 120 cytopathology cases of all peritoneal washings, ascitic, pleural and pericardial effusion cytology from February 2025 to March 2026. All cases were reclassified according to proposed TIS system into five categories.

Result

Before recategorization various terminologies were used by faculties in diagnosis, although no definite criteria were proposed for unsatisfactory category. After combining of these cases of inadequate sample of 29 cases (24.3%) and after recategorization only 18 (14.3%) cases were found to be inadequate. Out of 18 cases,1 case was found to have blood only. Maximum cases were found to be in benign effusion. 9(7.3%) cases were reported as atypical cells. 3(2.5%) cases found to be suspicious for malignancy and 6(4.9%) cases were of malignant effusion. Recategorization led to change in distribution of cases in all categories.

Conclusion

This is a retrospective study of serous fluid to reclassify them using criteria of TIS. Our results show that this system is robust, easily applicable and improves reporting of serous fluid samples. TIS is user friendly and appear to be a consistent methodology for standardized reporting.

Keywords

Serous effusion, Non diagnostic, Negative for malignancy, Suspicious of malignancy, Malignancy

How to cite this article: Vyas Y, Sanwelka M, Bali IK., Recategorization of Serous Fluid According to the International System for Reporting Serous Fluid Cytopathology: A Tertiary Care Center Study. Int J Drug Deliv Technol. 2026;16(45s): 545-550; DOI: 10.25258/ijddt.16.45s.59

Introduction

Serous effusion can be due to local or systemic pathology. Its study is very cost effective , minimally invasive and safe procedure. It serves as diagnostic tool for establishing diagnosis , for microbiological and biochemical testing and finding origin of malignancy.

A definite diagnosis and risk stratification on fluids helps choosing appropriate treatment of patients.[1] But there is variability in reporting and diagnosing fluids. If we standardize reporting format then it can eliminate many inconsistencies and also can provide meaningful language that can be understood by clinicians.[2] Recently, the International system for Reporting Serous Fluid Cytopathology (TIS) has introduced a system which include 5 categories namely: Non diagnostic (ND), Negative for Malignancy(NFM), Atypia of Undetermined Significance (AUS), Suspicious for Malignancy(SFM) and Malignant (Primary or Secondary malignancy). [2,3,4]

Aim of this new system is to improve communication, to promote the comparison of results and providing meaningful correlation with follow-up specimens.[5,6] As per recommendation every step from sample collection to final drafting of report has been divided into five categories. AUS and SFM categories are considered to be indeterminate diagnosis (IDs), which are mostly challenging from clinical management perspective and require further diagnostic procedures, which add more cost and morbidity to the patient.[4]

The present study was conducted at Balvir Singh Tomar Institute of Medical Sciences and Research, Jaipur with an aim to recategorize and diagnose serous fluids on the basis of TIS , which can potentially direct future modifications in terminology and management.

*Author for Correspondence: Dr. Madhvi Sanwelka

Material and method

We retrospectively reviewed 120 cytopathology cases of all peritoneal washings, ascitic, pleural and pericardial effusion cytology from February 2025 to March 2026. All the incomplete requisition forms not having appropriate name, age, registration number, clinical diagnosis and relevant clinical details were rejected.

Samples were collected in an anticoagulant and contamination free container and processed with 4-6 hours of the receipt in the department. All fluid samples were centrifuged at 1500 revolutions per minutes for 10 minutes. Supernatant was decanted and sediment pellet was used to prepare slides. Two slides then prepared from this cytospin material, one of which was fixed in absolute alcohol and other was air dried. Alcohol fixed slide was stained with Hematoxylin and Eosin (H&E) stain and air dried smear was stained with May Grunwald Giemsa stain (MGG). Cell block were prepared by formalin cell block technique by fixing the cell pellet with 10% formalin. The cell pellet was wrapped in a filter paper and was processed and further embedded in paraffin wax. Sections of thickness 3-4micron were cut and stained with H&E stain. . Immunohistochemistry was not performed in present study.

All cases were reclassified according to proposed TIS system into five categories as follows:

1) ND (Non diagnostic) : scant cellularity (<10 cells) or no cells, hemorrhagic smears. The cells included scattered mesothelial cells, macrophages, lymphocytes or polymorphs.
2) NFM (Negative for Malignancy) : Benign smears having mesothelial cells, macrophages, lymphocytes and polymorphs. Cells showed no evidence of primary or secondary malignancies.
3) AUS (Atypia of undetermined significance) : Smears showing few cells having atypia in smear, but were not distinct enough to be placed in neoplastic category. Cases where mostly benign but occasional showing atypical cells.
4) SFM (Suspicious for malignancy) : Smears shows presence of cells with atypia not enough for a diagnosis of malignancy, but strongly indicates malignancy. The atypia was demonstrated by mesothelial cells, epithelial cells, lymphocytes or any malignancy.
5) MAL(Malignant): Smears shows high cellularity with malignant cells arranged in clusters or singly lying,

Statistical analysis was conducted using Microsoft office excel 2016. Immunohistochemistry was not performed in present study.

Result

In this study we included 120 cases, out of which 81 cases (70%) were males and 39 cases (30%) were females (Table 1). Maximum fluids were in age group of 60 years and older (46.4%) followed by 40-59 years (31.7%) and 20-39 years (21.9%). Male: Female ratio is2:1.

Maximum fluid obtained was ascitic fluid (55%) followed by pleural fluid (25%) and Pericardial fluid (20%) as seen in table 2.

Table 3 shows a comparison of all fluid cases in every category before and after recategorization by TIS criteria. Before recategorization various terminologies were used by faculties in diagnosis, although no definite criteria were proposed for unsatisfactory category. After combining of these cases of inadequate sample of 29 cases (24.3%) and after recategorization only 18 (14.3%) cases were found to be inadequate. Out of 18 cases,1 case was found to have blood only. Maximum cases were found to be in benign effusion. 9(7.3%) cases were reported as atypical cells. 3(2.5%) cases found to be suspicious for malignancy and 6(4.9%) cases were of malignant effusion. Recategorization led to change in distribution of cases in all categories.

Cell block were prepared for category 5 cases which shows positivity for malignant cells.

Table 1: Distribution of cases according to gender

Age Range	Male	Female	Total	Total %
20-39	16	10	26	21.9
40-59	25	13	38	31.7
≥60	40	16	56	46.4
TOTAL	81	39	120	

Table 2: Distribution of cases on the basis of gender and fluid type

Age (Years)	Pleural Fluid (N=30)		Ascitic fluid (N=66)		Pericardial Fluid (N=24)		Total (N=120)
	M	F	M	F	M	F	
20-39	8	3	6	2	2	5	26
40-59	8	3	12	8	5	2	38
≥60	3	5	28	10	9	1	56

Table 3: Comparison of cytodiagnosis before and after recategorization

Initial diagnosis	N(%)	TIS Category	N(%)
Inadequate/ blood only/paucicelluar effusion	29 (24.3%)	Non diagnostic	18 (14.6%)
Benign effusion/ negative for malignancy/ no malignant cells seen/ suppurative effusion/ lymphocyte rich effusion/ reactive mesothelial cells only	73(61%)	No malignant cells detected	84 (70.7%)
Atypical cells present	9 (7.3%)	Atypical cells, NOS	9 (7.3%)

Suspicious of malignancy	6 (4.9%)	Atypical cells, suspicious of malignancy	3 (2.5%)
Positive for malignancy/ metastatic adenocarcinoma / infiltration by lymphoma	3(2.5%)	Malignant cells seen	6 (4.9%)
Total	120		120

Discussion

Serous fluids are common to be reported in cytopathology laboratory. Due to cost effectiveness and minimal invasive techniques , fluid sample can be invaluable in diagnosing disease and for patient management.[3] With years, evaluation of serous fluids includes cytology smears, cytospins, liquid based cytology slides and cell block with Immunohistochemistry study.[1-7]

The TIS guidelines for reporting serous fluid provides a base for standardizing the processing and diagnostic categories for better communication and reduction in the variability of fluid results. It also provide standard operating procedures for processing, staining and use of ancillary techniques for reporting of fluids.[8]

Many terminologies have been used like inadequate, blood only, haemorrhagic, degenerated cells and paucicellular , these all were categorized in category I and were designated a common diagnosis of “unsatisfactory”. 29 cases that initially diagnosed as “negative for malignancy” were reclassified in category I as there was scant cellularity and presence of mostly inflammatory cells mixed with blood. It is advised to diagnose these fluids as inadequate to avoid false positive results.

The number of benign cases were 73 before the classification, and after recategorization this number increased to 84 (70.7%). Many cases that were labeled as inadequate were recategorize into benign.

Smears showing atypical cells were allotted into two categories in the TIS criteria: Category 3 (Atypical cells, not otherwise specified[NOS]) and category 4 (atypical cells, suspicious for malignancy). In our study we found 9 cases in category 3 and 3 cases in category 4. Before recategorization there were 6 cases in category 4 but later 3 cases were reclassified in category 5 which is “positive for malignant”.

Smears with distinct malignant cells were put in category 5. Initially there were 3 cases in this category but after recategorization 6 cases were found to be in this category.

Previous study done by Kundu et al[9] and Jha S et al[10] has also evaluated the utility of these guidelines. Our findings are in concordance with them. Since the publication of TIS only few studies have been published to see the importance of this categorization.[11-21] In this study we used step wise approach to evaluate Cytopathology reports of serous fluids of one year.

In order to reduce AUS and SFM cases, it is important to identify the factors that can be used in making definitive diagnosis. Rooper et al[22] study demonstrated that most common cause of ND cases are low cellularity of tumor, low volume of fluid, limited ancillary studies for confirmation. Rooper et al[22] studied 2540 pleural fluid specimens and concluded that a fluid volume of $\geq$ 75 ml and 60ml of pericardial fluid is required for definite diagnosis.

Educating clinicians about the importance and value in submitting all or appropriate volume of fluid is important, as well as timely delivering of sample is required for proper diagnosis. Cell block (CB) preparation is widely used to yield sufficient material for diagnosis.[23,24] Studies also showed that common CB prepration method used is plasma thrombin and HistoGel techniques.[25] In our study we used Formalin based technique using 10% formalin.

Conclusion

This is a retrospective study of serous fluid to reclassify them using criteria of TIS. Our results show that this system is robust, easily applicable and improves reporting of serous fluid samples. TIS is user friendly and appear to be a consistent methodology for standardized reporting.

Limitation of this study is that we were not able to do follow up of patients and thus could not identify ROM (Risk of Malignancy).

Conflict of interest- None

Financial support- None

References

1) Serous fluid cytopathology: Past, present and future:C.W.Michael; Diagn Cytopathol, 49 (2021), 577-581.
2) The international system for reporting serous fluid cytopathology; A. Chandra, B.Crothers, D.Kurtycz, F.Schmitt; Acta Cytol,63(2019),349-351.
3) Proceedings of the American society of cytopathology companion session at the 2019 united states and Canadian academy of pathology meeting part 1: towards an international system for reporting serous fluid cytopathology, B.A.Crothers, A.Chandra: J AM Soc Cytopathol, 8 (2019), 362-368.
4) Proceedings of the americal society of cytopathology companion session at the 2019 united states and Canadian academy of pathology meeting part 2: effusion cytology with focus on theranostics and diagnosis of malignant mesothelioma, M.T.Siddiqui, F.Schmitt,A.Chrug: J AM Soc Cytopathol,8(2019),352-361.
5) The international system for reporting serous fluid cytopatathology- diagnostic categories and clinical management; D.Pinto, A.Chandra,B.A. Crothers,D.F.I.Kurtycz,F.Schmitt;J Am Soc Cytopathol,9(2020),469-477.
6) The international system for serous fluid cytopatathology; A.Chandra, B.Crothers,D. Kurtycz, F.Schmitt ; Ist edition,Springer Nature, Switzerland (2020).
7) Announcement : the international system for reporting system for reporting serous fluid Cytopathology: Acta cytol,63(2019),349-351.

8) Effusin guidelines committee of IAC guidelines drafting and finaliztion committee. Srinivasan R, Rakhi B, Rajwanshi A, Pathuthara S, Mathur S, et al. Indian Academy of cytologists guidelines for collection, prepration, interpretation and reporting of serous effusion fluid samples. J Cytol.2020;37:1-11.
9) Kundu R, Srinivasan R, Dey P, Gupta N, Gupta P, Rohilla M. Application of Indian academy of cytologists guidelines for reporting serous effusions: An institutional experience. J Cytol.2021;38:1-7.
10) Jha S, Sethy M, Adhya AK. Application of the Indian Academy of Cytologists recommendations for reporting serous fluid Cytopathology in routine reporting of ascitic fluid specimen and assessment of the risk of malignancy. J Cytol. 2022 May 30;39(2):72-77.
11) A. Chandra. The Brescia panel and the International System for Reporting Serous Fluid Cytopathology Cancer Cytopathol, 129 (2021), pp. 262-263
12) T. Hou, G. Landon, J. Stewart, S. Roy-Chowdhuri. The value of a tiered cytology diagnostic reporting system in assessing the risk of malignancy in indeterminate serous effusions; Cancer Cytopathol, 129 (2021), pp. 75-82
13) R.C. Davis, G. Broadwater, W.C. Foo, C.K. Jones, L .J. Havrilesky, S.M. Bean. Evaluation of pelvic washing specimens in patients with endometrial cancer: cytomorphological features, diagnostic agreement, and pathologist experience: Cancer Cytopathol, 129 (2021), pp. 517-525
14) C. Lobo, J. Costa, S. Petronilho, P. Monteiro, L. Leç a, F. Schmitt. Cytohistological correlation in serous effusions using the newly proposed International System for Reporting Serous Fluid Cytopathology: experience of an oncological center. Diagn Cytopathol, 49 (2021), pp. 596-605
15) E.F. Rodriguez, R. Jones, M. Gabrielson, D. Santos, R.G. Pastorello, Z. Maleki. Application of the International System for Reporting Serous Fluid Cytopathology (ISRSFC) on reporting pericardial effusion cytology; Acta Cytol, 64 (2020), pp. 477-485
16) Y. Xu, A.Y. Hu, S.M. Wang, Q. Wang, Y.C. Pan, S. H. Zhang. A retrospective analysis of pleural effusion specimens based on the newly proposed International System for Reporting Serous Fluid Cytopathology; Diagn Cytopathol, 49 (2021), pp. 997-1007
17) S.J. Farahani, Z. Baloch. Are we ready to develop a tiered scheme for the effusion cytology? A comprehensive review and analysis of the literature; Diagn Cytopathol, 47 (2019), pp. 1145-1159
18) H.N. Gokozan, A. Harbhajanka, S. Lyden, C.W. Mic hael. Root cause analysis of indeterminate diagnoses in serous fluids Cytopathology; Diagn Cytopathol, 49 (2021), pp. 633-639
19) C. Kala, S. Kala, A. Singh, R.K. Jauhari, A. Bajpai, L. Khan. The International System for Reporting Serous Fluid Cytopathology: an institutional experience on its implication and assessment of risk of malignancy in effusion cytology; J Cytol, 40 (2023), pp. 159-164
20) M. Wang, T. Sun, J. Jiao, H. Wang. Application of the International System for Reporting Serous Fluid Cytopathology to pericardial fluid: root cause analysis of indeterminate diagnoses, cytohistological correlation, and assessment of malignancy risk; Cancer Cytopathol, 131 (2023), pp. 433-441
21) S. Ahuja, A. Malviya. Categorisation of serous effusions using the International System for Reporting Serous Fluid Cytopathology and assessment of risk of malignancy with diagnostic accuracy; Cytopathology, 33 (2022), pp. 176-184
22) L.M. Rooper, S.Z. Ali, M.T. Olson. A minimum fluid volume of 75 mL is needed to ensure adequacy in a pleural effusion: a retrospective analysis of 2540 cases; Cancer Cytopathol, 122 (2014), pp. 657-665
23) K.A. La Fortune, M.L. Randolph, H.H. Wu, H.M. Cramer. Improvements in cell block processing: the Cell-Gel method; Cancer Cytopathol, 125 (2017), pp. 267-276
24) V.F. Torous, J.M. Cuda, V. Manucha, *et al.* Cell blocks in cytology: review of preparation methods, advantages, and limitations; J Am Soc Cytopathol, 12 (2023), pp. 77-88
25) J.P. Crapanzano, J.J. Heymann, S. Monaco, A. Nassa r, A. Saqi. The state of cell block variation and satisfaction in the era of molecular diagnostics and personalized medicine; Cytojournal, 11 (2014), p. 7

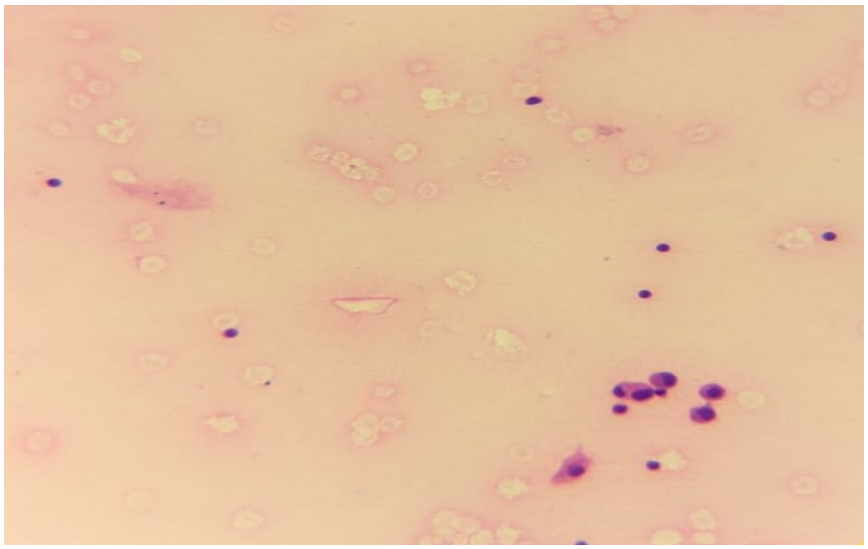

Fig 1: Category 2 (NFM) shows predominantly lymphocytes few neutrophils and many reactive mesothelial cells (H&E 400x).

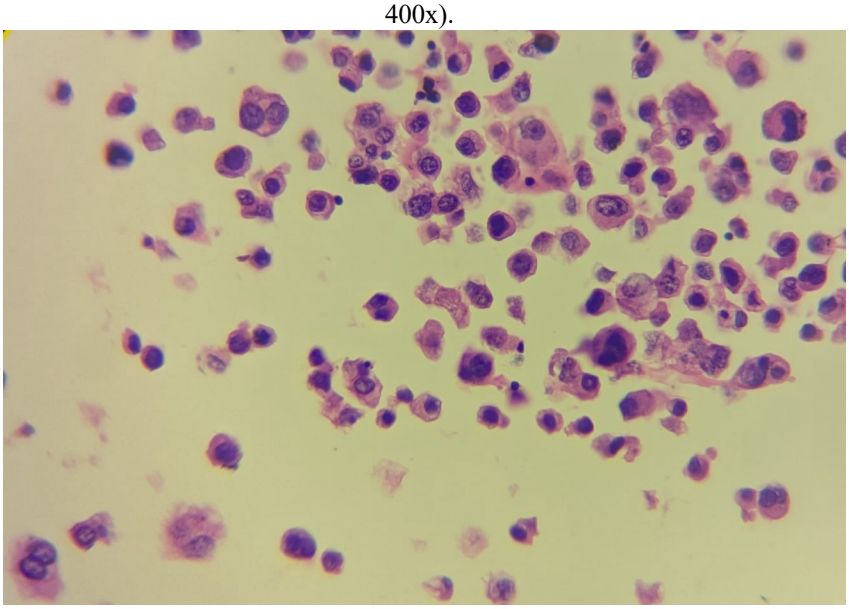

Fig 2: cell block preparation from category 5 (MAL) showing malignant cells forming acini and lying singly. (H&E 400x)

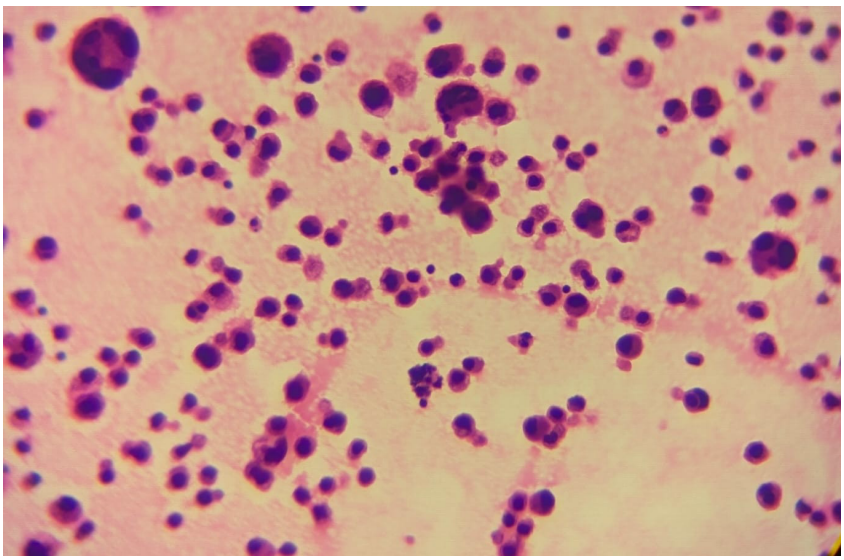

Fig 3: Category 5 (MAL): shows cells in ball and sheets and lying singly having pleomorphism, hyperchromatic nucleus, high nuclear cytoplasmic ratio and prominent nucleoli. (H&E 400x)