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Peritoneal Carcinomatosis Revealed by Ascitic Fluid Cytology

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Abstract | **Case Report**

Background: Ascitic fluid cytology is a rapid diagnostic tool for malignancy, yet its sensitivity can be variable and often depends on sample volume and ancillary techniques. ***Case presentation:*** We report a case of an elderly patient presenting with progressive abdominal distension and hemorrhagic ascites. Biochemical analysis showed exudative features (total protein 38 g/L; LDH 700 U/L). Cytological examination of fresh and methylene-blue-stained preparations revealed clusters of atypical cells with nuclear pleomorphism suggestive of malignancy. Infectious causes were excluded (sterile bacteriology). Thoraco-abdominopelvic CT confirmed diffuse peritoneal carcinomatosis, and histopathology of peritoneal nodules revealed infiltrating tubulo-papillary carcinoma of gastrointestinal origin. ***Discussion:*** Ascitic cytology is highly specific for detecting malignancy, particularly peritoneal carcinomatosis, where sensitivity may approach 96–97% when adequately performed. However, sensitivity is more modest in general, ranging from approximately 56–75%, and can be improved with larger sample volumes (≥ 80 mL up to 200 mL). In this case, recognition of cytologically malignant cells allowed expedited diagnosis and directed imaging and histological confirmation, underscoring the importance of sufficient sample volume and integration with imaging and pathology for timely management. ***Conclusion:*** This case highlights the diagnostic utility of ascitic fluid cytology in suspected malignant ascites and emphasizes the role of adequate sampling and adjunctive pathological techniques to enhance detection accuracy.

Keywords: Ascitic fluid cytology, Peritoneal carcinomatosis, Sample volume sensitivity.

INTRODUCTION

Ascites refers to the pathological accumulation of fluid within the peritoneal cavity. While it most frequently results from hepatic cirrhosis, biochemical and cytological analyses of the ascitic fluid can provide critical diagnostic insights. In exudative ascites defined by a protein content exceeding 25 g/L differential diagnoses to consider include peritoneal carcinomatosis, peritoneal tuberculosis, and Budd–Chiari syndrome. We report a clinical case in which peritoneal carcinomatosis was uncovered via detection of atypical cells in ascitic fluid cytology [1].

CASE REPORT

A 78-year-old male presented with gradually progressive abdominal distension, in the absence of signs of intestinal obstruction or jaundice. Clinical examination revealed abundant ascites without stigmata of portal hypertension. Abdominal ultrasound confirmed the presence of ascites; the liver and spleen appeared normal in size. The ascitic fluid was hemorrhagic. Biochemical analysis revealed total protein of 38 g/L and LDH of 700 U/L, consistent with an exudate. Fresh and methylene blue–stained cytological preparations demonstrated cell clusters suggestive of a neoplastic process, accompanied by leukocytes (800 cells/mm³) with lymphocytic predominance. Bacteriological cultures of the fluid were sterile. Thoraco-abdominopelvic CT imaging concluded diffuse peritoneal carcinomatosis. Histopathological examination of nodular lesions confirmed an infiltrating, tubulo-papillary, carcinomatous proliferation of gastrointestinal origin.

DISCUSSION

The identification of atypical cell clusters in the ascitic fluid oriented the diagnostic process toward a neoplastic origin. Methylene blue staining highlighted adherent cellular clusters some isolated cells featuring

eccentric nuclei, anisocytosis, anisokaryosis, and variable nuclear-to-cytoplasmic ratios, congruent with cytological characteristics of malignant ascitic cells.

According to the literature, two-thirds of patients with malignant ascites have peritoneal carcinomatosis, and among those, cytology is positive in approximately 97% of cases However, when considering malignant ascites from all causes, cytological sensitivity is more variable ranging from 22% up to 81%, with an average around 58%, while specificity remains high (97–100%) [1].

Another study reports cytology's sensitivity as approximately 60% with 100% specificity. Furthermore, the diagnostic yield improves with sampling strategy: using paraffin-embedded cell blocks or increasing the sample volume to at least 200 mL increases cytological sensitivity [2].

Thus, although cytological examination offers rapid and highly specific diagnostic insights, its sensitivity is limited; negative results do not definitively exclude malignancy. Consequently, cytology should be combined with biochemical tests, imaging modalities, and histological confirmation to guide patient management.

A key diagnostic challenge in the evaluation of ascitic fluid lies in the notably high specificity but variable sensitivity of cytological analysis. Conventional cytology demonstrates excellent specificity often approaching 100% meaning that a positive cytology result is highly reliable for malignancy. However, sensitivity typically ranges from 56% to 68%, indicating that a significant proportion of malignant cases may go undetected. For instance, in a cohort of 300 ascites samples, the sensitivity was 62.4%, specificity 98.0%, with a perfect positive predictive value but an 11.7% false-negative rate due to sampling or screening errors [3]. In ovarian carcinoma specifically, cytology achieved a sensitivity of 68.9% and specificity of 93.6%, with false-negative rates reaching 30.0%, and up to 77.0% in endometrioid subtypes. To enhance diagnostic yield, increasing the volume of ascitic fluid submitted has proven effective: sensitivity rises from 56.7% for volumes under 80 mL to 75.4% for volumes of ≥80 mL ($P < 0.001$) [4].

Notably, a prospective study using cell-block techniques found that sensitivity increased with sample volume and plateaued at around 200 mL, beyond which additional volume did not significantly improve detection. Together, these findings underscore that while positive cytology is highly indicative of malignancy, negative results especially from small-volume specimens require cautious interpretation, and that submitting at least 80–200 mL of ascitic fluid markedly improves sensitivity [5].

CONCLUSION

This case highlights the utility of ascitic fluid cytology as an early and specific diagnostic tool in suspected malignant ascites arising from tumor involvement of the peritoneum. Integration of cytological findings with biochemical analyses and imaging enhances detection of malignant ascites and streamlines subsequent investigation and management.

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