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A Comparative Study of Cytomorphology and Flow Cytometry to Detect Malignant Cells in the Body Cavity Fluid

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Abstract

Background: Many types of cancer metastasize to the epithelial linings of the body cavity causing malignant fluid to accumulate in such spaces. Cytomorphological evaluation is considered essential in the diagnosis of malignant body fluid. Nevertheless, the accuracy of cytomorphological results is subjective and can vary depending on the cytopathologists' experience.
Objective: To determine if DNA content analysis using propidium iodide (PI), anti-CD45 (leukocyte common antigen) and anti-AE1/AE3 (pan-cytokeratin) as analyzed by flow cytometry could be used to detect and differentiate malignant cells in the body fluid when compared to cytomorphological evaluation.
Material and Method: A cross-sectional, laboratory based, observational study on 90 specimens was conducted. Flow cytometric analysis was done. Sensitivity, specificity, positive predictive value negative predictive value and accuracy were reported.
Results: The DNA index (DI) cut-off value, as determined by the receiver operating characteristic curve of 1.215 or more, had 51.7% sensitivity and 89.1% specificity to detect malignant cells. When DI was combined with AE1/AE3 positivity, the sensitivity increased to 62.1% with 80.3% specificity. When such techniques were used in adjunct to cytospin preparation, the sensitivity and specificity increased to 89.7% and 65.6%, respectively. Twelve specimens (13.3%) had positive results by flow cytometry but negative cytomorphological results by pathologists, 4 of which were later confirmed as cancer from pleural biopsy. Eleven specimens (12.2%) had false negativity, 6 of which were unspecified metastatic carcinoma. Four specimens with negative flow cytometric results were cerebrospinal fluid (CSF) specimens with a low cell count. Subgroup analysis in the cases of non-CSF fluid showed 72% sensitivity and 72.1% specificity.
Conclusion: Immunophenotypic analysis using DI and AE1/AE3 in conjunction with cytospin preparation had a moderately high sensitivity to detect malignant cells in the body fluid (~90%). Non-CSF specimens yielded better results than CSF. Further modifications are ongoing in order to increase the detection capabilities of our screening panel.

Keywords: Body cavity fluid, Flow cytometry, Effusion, DNA content analysis, Cytomorph

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