Lung cancer is the leading cause of cancer death in both men and women worldwide. The treatment of non-small cell lung cancer (NSCLC) has dramatically changed over the last decades. Current recommendations for advanced-stage NSCLC for molecular testing of epidermal growth factor receptor (EGFR) mutations, generally using polymerase chain reaction (PCR)-based methods, and anaplastic lymphoma kinase (ALK) gene rearrangements (usually with PCR-based methods or FISH assays or immunohistochemistry).

Substantial challenge of molecular testing is adequate and sufficient quality cellular material. The remaining liquid-based cytology samples or cell blocks after diagnosis can be used for molecular detection. Because of a significant number of samples deemed insufficient for molecular testing or very low tumor cellularity, we sought to determine the utility of liquid based cytology smears as suitable alternative specimens for the molecular analysis of NSCLC.

This study describes the use of these samples for amplification refractory mutation system (ARMS) PCR of non-small cell lung cancer and reports the DNA quality and success rates of smears.

Methods

The number of tumor cells from 47 FNA smears, 6 pleural effusion smears and 13 bronchial brushing smears in 1 calendar year were assessed by senior pathologist through a microscope. These smears underwent DNA or RNA extraction, quality assessment, and ARMS PCR.

Results

Epidermal growth factor receptor (EGFR) or anaplastic lymphoma kinase (ALK) gene could be detected by ARMS PCR method using these smears which were identified tumor cell number greater than 200. All 66 smears yielded 2 to 20ng/μl of DNA or RNA. DNA and RNA were of good quality. EGFR gene was detected in 66 smears, in which 47 cases of simultaneous detection of ALK gene. Both EGFR and ALK were successfully tested in 66 smears. The cycle threshold (Ct) values of internal control for each smear were within the normal range. The positive rate of EGFR gene was 53%, and ALK gene was 8.5%. The EGFR and ALK mutation status from smears was concordant with tissue specimens.

Conclusions

Liquid based cytology smears of non-small cell lung cancer patients are high-quality alternative specimens for molecular testing in clinical practice.

Bibliography