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ORIGINAL ARTICLE

Rapid on-site evaluation improves fine-needle aspiration biopsy cell block quality

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Introduction For fine-needle aspiration (FNA) biopsy, the cell block is used for precision ancillary diagnostic tests and personalized molecular evaluation. It is important to maximize quality cell blocks. Rapid on-site evaluation (ROSE) provides specimen adequacy and guides cell block collection. The study examines how immunohistochemistry (IHC) utilization correlates with cell block quality and the impact of ROSE on cell block quality.

Materials and methods The pathology database identified consecutive FNA biopsy cases with cell blocks. Procedural data and reporting elements were collected including ROSE, adequacy and diagnosis categories, and IHC. Each archived case was reviewed. Cell block cellularity quality scores were categorized as <10%, 10% to 25%, and >25%. Various data points were correlated with the cell block quality score.

Results The ROSE cohort had a higher group score of 38.8% versus 26.3% for non-ROSE. Low scores on cell block quality were higher with the unsatisfactory and indeterminate groups (85.2% and 78.5%). A higher grouping score was 3× as likely for a satisfactory as an unsatisfactory group (46.5% versus 14.8%). Positive cases with IHC had higher cell block quality scores compared with those without IHC (56.7% versus 33.2%).

Conclusions It is important for pathologists to contribute to improving FNA biopsy cell block quality. This series shows that higher cell block quality provides better utilization for IHC assessment and for IHC testing in positive diagnostic category cases. Providing ROSE service can improve cell block quality and an assurance of a satisfactory FNA biopsy significantly contributes to improved cell block quality.

Introduction

Fine-needle aspiration (FNA) biopsy is becoming more important in evaluating patients, and progress with personalized medicine using new prognostic markers makes

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having material for the corresponding tests critically important.[1-3] For FNA biopsy, the cell block is the standard method and platform for the application of necessary ancillary tests for precision diagnosis and personalized molecular evaluation.[4] Pulmonary non−small cell carcinoma is the current paradigm for the standard practice model.[5,6] Immunohistochemistry (IHC) is used to stratify cases into adenocarcinoma or non−small cell carcinoma, not otherwise specified and squamous cell carcinoma.[7] The adenocarcinoma and non−small cell carcinoma group is selectively evaluated by molecular testing to determine which personalized tyrosine kinase inhibitor might be clinically effective. FNA biopsy cell blocks from pulmonary neoplasms, either within the lung or intrathoracic lymph nodes, is a common way to sample these entities, particularly when they present in an unresectable stage.[8]

However, insufficient FNA biopsy cell blocks can severely limit extending the procedure beyond basic morphologic observations of the aspirate smears.[1] A non−small cell carcinoma can often be accurately categorized by aspirate smear morphology; however, a cell block without sufficient cellularity precludes further evaluation and standard of care testing. This can lead to a delay in treatment and a necessity for repeat procedures or other more invasive interventions to obtain the tissue.[9]

Therefore, it can be critically important to maximize the opportunity to procure an adequate high-quality cell block at the time of FNA biopsy. There are many variables that contribute to producing high-quality FNA biopsy cell blocks, many of which involve procurement and processing.[10] There are a variety of preanalytic variables that have the potential to impact improved cell block acquisition. Among these is rapid on-site evaluation (ROSE) service where the cytopathologist works with the clinicians performing the FNA biopsy to assess for procedural diagnostic adequacy and assist in appropriate specimen triage. ROSE service communicates whether the FNA biopsy is adequate or unsatisfactory. If unsatisfactory, the performing clinician has the option of persisting in FNA biopsy samples and making procedural adjustments to obtain an adequate sample. If adequate, the appropriate clinical circumstances can support the use of additional dedicated biopsy samples for cell block.

However, do these theoretical advantages provided by ROSE contribute to improved higher quality FNA biopsy cell blocks? Does the cell block quality impact utilization for ancillary IHC testing by pathologists? The aim of the study is to examine the impact of ROSE service on cell block quality score and how IHC utilization correlates with cell block quality.

Materials and methods

The pathology database was searched to identify consecutive FNA biopsy cases over a 6-month period. Specimens that had cell blocks prepared were selected. FNA biopsy specimens without a cell block were excluded. When possible, a cell block is prepared for a FNA biopsy. Judgment as to whether to perform a cell block on a non-ROSE FNA biopsy typically rests with the cytotechnologist and depends on the appearance and viscosity of the liquid preservative and clinical history. For cases with ROSE, the pathologist makes the determination about cell block preparation. Some specimens only infrequently have cell blocks prepared, and these include thyroid FNA biopsies. Other specimens almost always have a cell block prepared, such as endobronchial ultrasonography FNA biopsies.

The processing method used during the length of the study did not change. Within the cytopreparation area, multiple dedicated individuals rotated on the service assigned to cell block preparation. The cell block method was optimized to produce a focused, concentrated cell block. The specimen was poured into a 50-ml centrifuge tube and Roswell Park Memorial Institute medium. It was centrifuged at 800 *g* for 2 minutes. The supernatant was decanted and the specimen was vortexed. The specimen was then evaluated, if sediment was bloody, CytoRich Red preservative was added and the process was repeated. After the last CytoRich Red wash, isotonic saline was added and centrifuged at 800 *g* for 2 minutes, and then the supernatant was decanted. Two drops of O plasma and 4 drops of thromboplastin were added to the centrifuge tube. The specimen sat for 2 minutes while a clot formed. The centrifuge tube was inverted and tapped onto tissue paper to dislodge the clot. A wooden applicator stick was used to gently roll the clot onto the dry surface of tissue paper and then folded to be placed into a labeled cassette. The cassette was placed into a 10% neutral buffered formalin, labeled, and then processed in histology for a formalin-fixed, paraffin-embedded cell block.

Cytopathologists and cytotechnologists attend FNA biopsies procedures if ROSE is requested. A procedural worksheet, which includes data for pathologist ROSE, is used in all cases and is used to record procedural specifics in all cases attended by a cytotechnologist. Dedicated FNA biopsy samples are variably taken and placed in the liquid preservative, which was Roswell Park Memorial Institute medium in our laboratory. Routine practice involved rinsing all needles in the liquid fixative after making aspirate smears and placing the entire sample in the liquid preservative when it was taken as a dedicated FNA biopsy pass for the cell block.

Cases were pulled from the archived files. The pathology reports and FNA worksheets for each corresponding specimen were collected. Aspirate glass smears and hematoxylin-and-eosin stained cell block slides were retrospectively reexamined and scored based on a series of objective and semiobjective criteria for a variety of categorical data points. These various measured data points were designated and a Microsoft Excel spreadsheet was created to systemically evaluate and record findings from individual specimens. Cases where $\geq$1 data points were absent or not adequately recorded on the FNA worksheet or cytopathology report were excluded.