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ORIGINAL ARTICLE

Imprint cytopathology of core needle biopsies: a "first responder" role for cytotechnologists

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Introduction Imprint cytopathology (IC) of image-guided core needle biopsies (CNBs) is used to ensure adequate sampling. In our institution, cytotechnologists (CyTs) are the "first responders" for on-site adequacy assessment (OSAA) of image-guided CNBs. We report our experience with this expanded and relatively unexplored role for CyT.

Materials and methods We reviewed all image-guided CNBs performed over a 12-month period that required OSAA. OSAA was provided primarily by CyT. Interpretation between all IC specimens and tissue diagnoses (concordance) and between adequate IC specimens and tissue diagnoses (accuracy) were analyzed. Performance was compared using the Fisher exact test. We retrospectively reviewed discrepant cases to deduce the reasons for discordance.

Results We evaluated 255 CNBs: 179 computed tomography-guided, 74 ultrasonography-guided, 2 endoscopy-guided. Lung (39%) followed by liver (16%) and lymph node (11%) were the most frequent sites of OSAA IC. Overall adequacy and accuracy rates were 80.8% and 87.9%, respectively, with a concordance rate of 81.2%. The performance for CyT alone, CyT/cytopathology fellow, and CyT/cytopathologist were comparable ($P > 0.05$). Review of discordant cases showed agreement with 91% of OSAA IC cases originally interpreted as inadequate, but with only 19% interpreted as adequate.

Conclusions OSAA IC of CNBs expands the CyT's role in an effort to ensure adequate sampling. CyT performance was high in recognition of adequate versus inadequate IC slides when compared with the tissue. Reasons for discrepancy included sampling error and overinterpretation of atypia as being sufficient evidence of adequacy. Organ-specific cytologic criteria to assess adequacy are required to reduce interpretation error.

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Introduction

Imprint cytology (IC) or touch imprint smears have historically been shown to improve diagnostic accuracy when used as an adjunct to frozen section interpretation to provide rapid intraoperative diagnosis.[1] It has been suggested as a replacement to frozen section interpretation in lymph node metastases due to its high accuracy rate.[2] IC during image-guided percutaneous core-needle biopsy (CNB) of abdominal masses has been recommended as means to provide rapid evaluation based on its equivalent diagnostic yield to fine-needle aspiration biopsy (FNAB) smears.[3] Subsequent studies have shown IC improves diagnostic accuracy in transthoracic core biopsies,[4-6] endoscopic ultrasonography-guided biopsies,[7] and spinal CNB biopsies.[8] Adjunctive use of IC with CNB of breast has primarily aided in improved diagnostic accuracy[9,10] and rapid diagnosis to alleviate patient anxiety and plan further surgical treatment.[11,12] More recently, IC as a tool for immediate on-site adequacy assessment (OSAA) of image-guided CNB procedure is gaining acceptance because of its clinical utility applicable to a variety of superficial and deeply located lesions.[13-18]

The primary providers of OSAA have been physicians, that is, cytopathologists (CPs) or cytopathology fellows (CFs) (where a training program exists). However, a transition has occurred in our institution (as well as other medical centers) toward using the skill set possessed by cytotechnologists (CyTs) for OSAA, particularly in the evaluation of FNAB smears. As previously elucidated, OSAA is not only time-consuming, but also inadequately compensated for using current billing codes for physician's professional services.[19] Thus, in the past few years, we have shifted the primary responsibility to our CyT staff for OSAA of IC from CNB (in addition to our already well-established use of having them analyze FNABs on site) as a means to meet the increasing demands placed on our laboratory and to better use a CP's time and departmental resources. Recent studies have demonstrated that CyTs are highly accurate in OSAA and comparable to CPs in the interpretation primarily of FNAB smears.[20-24] However, scant literature exists on the performance of CyTs in the evaluation of IC from CNBs in this clinical setting. Although previous OSAA studies for CNBs mention CyTs as assessors, their performance has not been specifically elaborated.[13,15,18] We report our experience using CyTs as the initial interpreters of OSAA using IC of CNB, not FNA, smears. We also discuss possible reasons for discrepancy between OSAA IC and the ultimate tissue diagnosis.

Materials and methods

We analyzed all consecutive (N = 259) image-guided CNBs performed over a 12-month period for which the radiologist (infrequently a nonradiologist) requested OSAA of imprints made from tissue cores. Because our CyTs had been successfully performing OSAA of FNAB smears for slightly more than 2.5 years prior to the onset of this study period, no specific additional training for evaluation of CNB imprints per se was carried out for CyTs prior to their assuming this task. The decision to perform IC of CNB instead of frozen section or FNAB was at the sole discretion of the radiologist. Cases in which FNAB was performed prior to a CNB were excluded. Interventional radiologists were responsible for preparing IC slides by touching tissue cores to clean glass slides and handing them off to the CyT, who air-dried, Romanowsky stained, and then evaluated them for adequacy. Results were reported to the radiologist as "adequate" or "inadequate" by the CyT on site. If a more specific interpretation/diagnosis was required or if the CyT needed assistance in interpretation, then a CF or CP would be called to attend the procedure and issue a report. After OSAA, all IC slides along with tissue cores were sent to the surgical pathology division where a final diagnosis was rendered by the surgical pathologist who, in most instances, was not a practicing CP. A separate cytopathology report by an attending CP was not issued.

An adequate IC interpretation is defined by us as containing diagnostic cellular material on the slide, which appeared representative of the body site being needled. The cytologic findings had to be abnormal with respect to that anatomic location with well-visualized lesional cells *and* with sufficient quantity so that a diagnosis could be rendered eventually by the surgical pathologist assigned to the case. Thus, in nearly all instances, adequate meant either neoplastic or inflammatory cells were seen on IC slides, and the presence of these abnormal cells made clinical sense in the context of the site being biopsied. An occasional exception to this was in sampling of presumed lymph nodes where the radiologist merely wanted to be reassured that lymphoid tissue/cells were actually present, not necessarily abnormal. If lymphocytes were seen, then the IC was deemed adequate. When an IC had no abnormal cells, limited cellular material, or poorly visualized cellular material, it was considered inadequate.

The final histopathologic diagnoses of 255 CMBs were categorized as malignant, benign, atypical/suspicious, or nondiagnostic. We retrospectively reviewed these OSAAs to determine agreement between the IC interpretation and the CNB diagnosis. Cases were deemed concordant between the OSAA IC and the CNB in either of the following situations: (1) an adequate IC was coupled with a specific benign, malignant, or suspicious for malignant CNB diagnosis; or (2) an inadequate IC was coupled with a nondiagnostic CNB, or one containing normal tissue. Conversely, cases were deemed discordant between the IC OSAA and the CNB in either of the following situations: (1) an adequate IC was coupled with a nondiagnostic CNB, or the CNB contained only normal tissue; or (2) an inadequate IC was coupled with a diagnostic CNB. In other words, "concordance" was defined as agreement between *all* IC specimens (both adequate and inadequate) and CNB diagnoses. Accuracy was measured by calculating the proportion of adequate IC interpretations that were concordant with the corresponding CNBs. Performance of cytopathology