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Review

A sensitivity and specificity comparison of fine needle aspiration cytology and core needle biopsy in evaluation of suspicious breast lesions: A systematic review and meta-analysis

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ABSTRACT

Purpose: Breast cancer detections for women with suspicious lesions mainly depend on two non-operative pathological tests-fine needle aspiration cytology (FNAC) and core needle biopsy (CNB). The aim of this systematic review was to compare the sensitivity and specificity of CNB and FNAC in this setting.

Methods: The data sources included MEDLINE, EMBASE, PubMed, and the Cochrane Central Register of Controlled Trials (CENTRAL) till February 2016. We included prospective series of studies which directly compared the accuracy of FNAC and CNB. We used forest plots to display the sensitivity and specificity of FNAC and CNB respectively. Pre-specified subgroup analyses and sensitivity analysis were conducted.

Results: Ultimately, 12 articles (1802 patients) were included in the final analysis. The pooled analysis shows that the sensitivity of CNB is better than that of FNAC [87% (95% CI, 84%–88%, $I^2 = 88.5\%$) versus 74% (95% CI, 72%–77%, $I^2 = 88.3\%$)] and the specificity of CNB is similar to that of FNAC [98% (95% CI, 96% –99%, $I^2 = 76.2\%$) versus 96% (95% CI, 94%–98%, $I^2 = 39.0\%$)]. For subgroup analysis, the sensitivities of both tests are better for palpable lesions than that of non-palpable lesions. Sensitivity analysis shows the robustness of the primary analysis.

Conclusion: Our study suggests that both of FNAC and CNB have good clinical performance. In similar circumstances, the sensitivity of CNB is better than that of FNAC, while their specificities are similar. FNAC could be still considered the first choice to evaluate suspicious nonpalpable breast lesions.

Contents

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1. Introduction

Based on the analysis of the entry database from 187 countries between 1980 and 2010, it was estimated that the global breast cancer incidence was 1,643,000 (1,421,000–1,782,000) cases in 2010 and the annual incidence increasing tendency is 3.1%.[1] Breast lesions are associated with an increased risk of breast cancer even though most of the breast lesions in women are benign.[2] As reported by Barton MB et al. that 42% of their recruited women (40–69-year-old) in a large health maintenance organization in New England had breast lesion(s) and breast cancer was found in 10.7% of those patients with lesion(s).[3] The cytological or histological diagnosis of suspicious breast lesions by fine needle aspiration cytology (FNAC)/Core Needle Biopsy (CNB) has its advantage of allowing the planning of surgery or scheduling of neoadjuvant therapies for malignancy patients and limiting the number of operations for patients who do not have a malignant disease.

Concerning the preoperative assessment of breast cancer, both CNB and FNAC are promising tools for the non-operative pathological diagnosis of breast cancer. Nevertheless, FNAC and CNB are methodologically different and have their advantages and disadvantages.

FNAC is a diagnostic procedure that a pathologist or radiologist or surgeon uses a very thin needle (usually 22- to 25-gauge) connected to a vacuumed syringe to aspirate a small amount of tissue from the suspicious area. FNAC was first introduced by Martin and Ellis in 1930.[4] Its use to detect breast lesion became increasingly important from the 1980s as a diagnostic adjunct in the population-based screening setting. FNAC is a safe, economical, effective, and accurate technique, but its efficacy largely depends on the experience of aspirators and pathologists.

CNB is a technique that usually performed by a radiologist or surgeon using a large, hollow needle (a special 8- to 16-gauge) to withdraw small cores of tissue from the abnormal area in the breast. CNB was introduced to the assessment process in late 1990s.[5] In addition to its high accuracy, CNB provides more material for grading tumors and for assessing predictive factors like hormone receptor status and HER2 (human epidermal growth factor receptor 2) status.[6] On the other hand, it is a costly, invasive and has a potential risk of track recurrence.[7]

Among the majority of variable clinical studies, overall but not invariably, CNB has both higher sensitivity and specificity than FNAC in diagnosing suspicious lesions, e.g., sensitivity and specificity values can range from 35%–95% and 48%–95% for FNAC and 85%–100% and 86%–100% for CNB respectively.[8] Although thousands of people with suspicious breast lesions have been enrolled in diagnostic studies for breast cancer by using FNAC and/or CNB, no formal quantitative review of the available evidence has been published that comprehensively compare the accuracy performance of those two techniques.

Nowadays, FNAC is on the decline due to its limitations and its replacement with CNB, but it is still the important modality as FNAC is quick, convenient and economical. Our study aimed to quantitatively summarize the sensitivity and specificity of FNAC and CNB for suspicious breast lesions and supply useful information for clinical practitioners.

2. Materials and methods

2.1. Literature search

We performed a comprehensive search of the literature to identify articles that compared the diagnostic accuracy of FNAC and CNB for patients with suspicious breast lesions. We systematically searched the following databases (see details in Appendix 1). 1) MEDLINE. 2) EMBASE 3) PubMed. 4) The Cochrane Central Register of Controlled Trials (CENTRAL) till February 29, 2016. We searched for additional references by cross-checking bibliographies of retrieved full-text papers and contacted researchers in the field to identify additional studies that may have been eligible for inclusion. We also searched the Conference Proceedings Citation Indexes, which allowed for assessment of this type of gray literature.

2.2. Study selection

The review authors (Mei Wang (WM), Xiaoning He (XH) and Guangwen Sun (GS)) independently selected the studies, resolved discrepancies by iteration, discussion, and consensus. When we