Preoperative Needle Biopsy Improves the Quality of Breast Cancer Surgery

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BACKGROUND: Percutaneous needle biopsy has the potential to provide a preoperative diagnosis of breast cancer, which helps to optimize surgical planning; however, its use remains an area of unexplained clinical variation. The purposes of this study were to perform a statewide assessment of diagnostic biopsy methods for women diagnosed with breast cancer and to evaluate the impact of biopsy method on the quality of breast cancer surgery.

STUDY DESIGN: Vermont cancer registries were combined with Medicare data to identify women diagnosed with breast cancer between 1998 and 2006. Demographics, margin status, surgical evaluation of axillary nodes, and total number of operations were correlated to biopsy method.

RESULTS: Percutaneous needle biopsy (PNB) was the initial biopsy method in 713 (62.8%) patients, and it increased significantly over the study period. Patients living in urban settings were more likely to receive PNB (70.6%) than patients living in rural areas (57.5%). Breast cancer surgery performance metrics including margin status, number of operations, and performance of axillary evaluation significantly favored PNB over open biopsy (OB).

CONCLUSIONS: The quality of breast cancer surgery as measured by initial margin status, total number of operations, and axillary evaluation improved with preoperative PNB; however, the use of PNB varied considerably. The potential impact of PNB on the quality of patient care and health care costs is substantial. Emphasis should be placed on understanding the barriers to the use of preoperative PNB and developing strategies to expand its use in the management of breast cancer. (J Am Coll Surg 2012;215:562–568. © 2012 by the American College of Surgeons)

The management of breast cancer ideally involves the coordination of a multidisciplinary team appropriately using a combination of treatment modalities. The first step in this process is a histologic diagnosis obtained after a biopsy. Open surgical biopsies performed in the operating room have traditionally served as the primary means of diagnosis; however, recent advances in technology have introduced alternative methods to establish a histologic diagnosis of breast cancer, including fine needle aspiration, core needle biopsy, and complete percutaneous excision. Open biopsies (OB) carry the potential disadvantages of increased patient discomfort, higher rates of wound complications, and prolonged recovery compared with nonoperative percutaneous needle biopsies.[1,2,3] Evidence supports preoperative needle biopsies (PNB) as the superior method of diagnosis compared with open surgical biopsies performed in the operating room.[4,5] Percutaneous needle biopsies performed preoperatively have the advantages of potentially avoiding surgery when benign and providing a preoperative diagnosis to facilitate multidisciplinary planning when positive for malignancy. National medical societies have issued consensus statements recommending that image-guided breast biopsy replace open surgical biopsy as the primary means of breast cancer diagnosis.[6,7]

Studies have demonstrated that surgeons performing breast cancer operations are more likely to obtain clear margins when a preoperative diagnosis has been made with a needle biopsy. In fact, recent research demonstrates that establishing a preoperative diagnosis of cancer is one of the most significant predictors of initial margin status when performing breast surgery.[8,9] The literature indicates that after OB, the positive margin rate is between 65% and 78% and the re-excision rate ranges between 30% and 74%. In comparison, after obtaining a preoperative diagnosis using percutaneous biopsy, positive margin rates are between 0% and 37% and re-excision rates are between 15% and

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Abbreviations and Acronyms

CMS = Centers for Medicare and Medicaid Services
CPT = Current Procedural Terminology
NCH = utilization data from physician
OB = open biopsy
OP = hospital outpatient
PNB = percutaneous needle biopsy
VBCSS = Vermont Breast Cancer Surveillance System
VCR = Vermont Cancer Registry

34%.[10-12] Furthermore, many breast cancer specimens obtained from a diagnostic OB are not oriented to the tumor bed, increasing the difficulty of determining which margins need to be re-excised, which may result in the entire cavity being subject to re-excision with a greater risk of compromising breast appearance.[13] In addition to improved margin clearance, establishing a preoperative diagnosis of breast cancer has been associated with reduced time to adjuvant therapy and greater cost-effectiveness.[9,11,14,15] Most of these studies have reported the experience of single institutions or small samples of patients.

Quality improvement initiatives have focused on identifying and reducing variations in clinical practice that deviate from best practices. The purpose of this study was to perform a statewide assessment of the variation in diagnostic biopsy methods for women diagnosed with breast cancer. Specifically, we sought to evaluate the impact of the method of breast cancer diagnosis on the quality of breast cancer surgery.

METHODS

Data sources

We combined the analytical dataset from 3 sources: The Vermont Breast Cancer Surveillance System (VBCSS), the Vermont Cancer Registry (VCR), and the Centers for Medicare and Medicaid Services (CMS) enrollment and claims data. The VBCSS statewide database includes patient-reported personal and health information, facility-supplied details of breast imaging events, and laboratory-supplied breast cancer pathology reports. Through its affiliation with the national Breast Cancer Surveillance Consortium (BCSC), the VBCSS supplied patient identifiers to CMS, which matched them to their Medicare data over the period between 1998 and 2006. For this project, we used enrollment information, hospital inpatient data, and utilization data from the physician (NCH) and hospital outpatient (OP) claims files.

Preliminary case selection

From the VBCSS's database of more than 100,000 women, we selected women aged 65 years or older at the time of diagnosis of either invasive breast cancer or ductal carcinoma in situ, who did not report a previous breast cancer history and were not diagnosed on the basis of either lymph node or nipple discharge specimens. These criteria resulted in a preliminary cohort of 1,239 cases, 1,138 of which were matched with a VCR record.

Definition of variables

Case and patient characteristics

We used the VBCSS database to determine the diagnosis date as well as whether the cancer was screen-detected, defined as whether the patient had a screening mammogram resulting in a Breast Imaging Reporting and Data System (BI-RADS) assessment of 0, 4, or 5 in the 6 months before the date of diagnosis.

We also used the VBCSS data to obtain self-reported patient characteristics including age at diagnosis and education level. Using the patient's ZIP code at the time of diagnosis, we classified women as living in either an urban or rural setting based on the Rural Urban Commuting Area (RUCA) ZIP code approximation. Values lower than 4 on that scale are considered urban and the others are rural.

Initial margin status

Pathology reports stored as part of the VBCSS were reviewed in order to record initial margin status after the first surgical procedure, which was either a diagnostic OB or a partial mastectomy after PNB. Because patients undergoing mastectomy have a higher likelihood of achieving negative margins, we excluded those receiving mastectomy as an initial surgical procedure. All available reports on specimens resulting from excisional biopsies were evaluated for patients in the preliminary cohort.[13]

Tumor characteristics

We obtained tumor characteristics including histology, stage, grade, size, estrogen receptor status, and final margin status from the VCR records. We categorized histology using ICD-O-3 codes. When VCR data were missing or otherwise unavailable (n = 101), values from the VBCSS database were used. Both sources are derived from the original medical record.

Major health care Current Procedural Terminology codes

From the CMS-supplied NCH and OP files, we extracted claims for patients in the preliminary cohort during a 150-day window beginning 30 days before the diagnosis date. We excluded claims that were missing a Current Procedural Terminology (CPT) code. We identified 28 CPT codes that were specific to a breast cancer-related service as being "major CPT codes."