

Clinical Surgery

Predictors of 5-year local, regional, and distant recurrent events in a population-based cohort of breast cancer patients



Filgen Fung, M.D.^a, Sylvie D. Cornacchi, M.Sc.^a,
Thuva Vanniyasingam, M.Sc.^b, Dyda Dao, M.Sc.^a,
Lehana Thabane, Ph.D.^b, Marko Simunovic, M.D., M.P.H.^{a,c},
Nicole Hodgson, M.D., M.Sc.^{a,c}, Mary Ann O'Brien, Ph.D.^d,
Susan Reid, M.D.^{a,c}, Barbara Heller, M.D.^{a,c}, Peter J. Lovrics, M.D.^{a,c,*}

^aDepartment of Surgery, McMaster University, St. Joseph's Healthcare Hamilton, 50 Charlton Avenue East, Hamilton, Ontario L8N 4A6, Canada; ^bDepartment of Clinical Epidemiology and Biostatistics, McMaster University and Biostatistics Unit, St. Joseph's Healthcare Hamilton, Hamilton, ON, Canada; ^cDepartment of Surgical Oncology, Hamilton Health Sciences, Juravinski Hospital and Cancer Centre, 699 Concession Street, Hamilton, ON, L8V 5C2, Canada; ^dDepartment of Family and Community Medicine, University of Toronto, Toronto, ON, Canada

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Mastectomy

Abstract

BACKGROUND: The study purpose was to identify tumor and surgeon predictors of local recurrence (LR), regional recurrence (RR), and distant metastasis (DM) after breast cancer (BC) surgery in a population-based cohort.

METHODS: Consecutive BC surgical cases from 12 hospitals in South Central Ontario between May 2006 and October 2006 were included. Data collected on chart review included patient and tumor factors, surgery type, adjuvant treatment, surgeon specialty, surgeon case volume, and practice type. Univariate and multivariable survival analyses were performed.

RESULTS: Median follow-up was 5.5 years for 402 patients (97% of sample). LR, RR, and DM occurred in 18 (4.5%), 10 (2.5%), and 47 (12%) patients, respectively. Significant predictors of BC recurrence (LR or RR or DM) were tumor size and grade, nodal status, and lymphovascular invasion on multivariable analysis.

CONCLUSION: Tumor factors such as size, grade, lymphovascular invasion, and nodal status predicted BC recurrence, while practice type, surgeon specialty, and case volume did not.

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* Corresponding author. Tel.: +1-905-521-6060; fax: +1-905-521-6042.

E-mail address: lovricsp@mcmaster.ca

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Breast cancer (BC) is usually managed with axillary staging combined with breast conserving surgery (BCS) and radiation therapy or mastectomy alone. Based on multiple randomized controlled trials, both treatment options have demonstrated equivalent survival.^{1–4} In most series, local recurrence (LR) occurs in approximately 4% to 20%.^{5,6} LR is an important clinical outcome, leading to significant morbidity. Clarke et al⁷ found that 75% of LRs occur within the first 5 years and the lack of LR within this time period was a comparable predictor of 15-year BC mortality. LR has been thought of as a marker of aggressive tumor biology and is associated with an increased risk of metastatic disease and death.⁸

The presence of a microscopically negative surgical margin is the most important indicator available to ensure completeness of surgical excision. Residual cancer is detected in approximately 50% of re-excisions after BCS with positive margins.^{9,10} A positive margin is a major predictor of LR, independent of tumor factors and adjuvant therapies.^{9,11,12} Other reported risk factors of LR include young age, tumor size, tumor grade, multifocal disease, and residual disease in re-excision specimen.^{6,13–16} Conversely, the use of adjuvant radiation therapy has been demonstrated to reduce LR.^{13,16–18}

Recent trends have led to a shift in certain surgical procedures from low- to high-volume centers. Studies in surgical oncology have found that higher provider volume (hospital or surgeon case volume) was associated with improved outcomes, including mortality for esophagectomies,¹⁹ pancreaticoduodenectomies,²⁰ radical cystectomies,²¹ and colon resections.²² It is yet to be established whether provider volume or surgeon specialty is associated with improved outcomes in breast oncology. Although some studies have found no difference in outcomes between higher and lower volume centers,^{23–25} other studies have found improved outcomes with higher volumes. Hebert-Croteau et al²⁶ found improved survival for patients treated in larger academic hospitals. Higher hospital volumes were also associated with improved 5-year survival in a study of 25,178 women in Belgium.²⁷ Skinner et al²⁸ found that being treated by a surgical oncologist as compared with a general surgeon was associated with a 33% decreased risk of death at 5 years and that there was a 23% decreased risk of death at 5 years when surgery took place at a high-volume hospital (>125 BC surgeries/year). A recent systematic review of 12 studies by Gooiker et al²⁹ reported a survival benefit with high-volume providers as compared with low-volume providers.

The potential mechanisms underlying a volume–outcome relationship are not clear. Vrijens et al²⁷ postulated that survival benefit is due to differences in processes of care, where higher provider volume leads to increased multidisciplinary care, use of neoadjuvant chemotherapy, and adjuvant radiotherapy after BCS. Lovrics et al³⁰ have previously found that positive margin

rates were associated with surgeon case volume and specialization in univariate analysis; however, in the multivariable analysis, only intrinsic tumor factors (eg, size, multifocality) and technical factors (specimen resection volume and preoperative core biopsies) were significant.

LR, regional recurrence (RR), and distant metastasis (DM) are clinically important outcomes, and this study adds to the current literature regarding whether provider volumes affect BC outcomes. Most previous population studies have relied on information held in administrative databases, which may have incomplete data on recurrence³¹ resulting in spurious conclusions. The study objective was to identify tumor and surgeon predictors of LR, RR, DM, and mortality 5 years after BC surgery in a population-based cohort. This study was a detailed chart-level review of all cases within a defined geographical health region in South Central Ontario.

Methods

Cohort and data collection

We conducted a chart review of a population-based cohort of consecutive patients with BC surgery performed at 12 hospitals in Local Health Integration Network 4 of South Central Ontario, with a population of 1.4 million people. From May 1, 2006 to October 31, 2006, patients were identified by each hospital decision support department, and baseline data on patients, tumor factors, type of surgery, and adjuvant therapies were collected. Hospital charts were reviewed again in 2012 to collect follow-up information about recurrence. Exclusion criteria included patients who underwent surgery for recurrent or benign breast disease, patients receiving neoadjuvant therapy, and men. Relevant data were abstracted from clinical, pathological, radiological, and operative reports. Margin status was defined as positive if there were microscopically confirmed tumor cells (invasive or in situ) at the inked margin. Patient and tumor characteristics were collected (eg, patient age, tumor size and grade, type of cancer [ductal carcinoma in situ or invasive], presence of lymphovascular invasion [LVI], nodal stage, type of breast operation (BCS or mastectomy), type of lymph node surgery [sentinel lymph node biopsy or axillary lymph node dissection], estrogen and progesterone receptor status, and Her2neu status). Adjuvant therapies received were also recorded (ie, chemotherapy, radiation therapy, hormonal therapy). Type of practice (community or academic hospital), surgeon specialty (surgical oncologist or general surgeon), and surgeon practice volume (low volume was defined as 1 to 3 cases per month and high volume was defined as 4 or more cases per month). The study protocol was approved by the Institutional Research Ethics Boards.

Data on LR, RR, and DM were also collected. LR was defined as recurrence in the original tumor site (quadrant)

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