A population based study of variations in operation rates for breast cancer, of comorbidity and prognosis at diagnosis: Failure to operate for early breast cancer in older women

T. Bates [a],*, T. Evans [b], C. Lagord [b], I. Monypenny [c], O. Kearins [d], G. Lawrence [b]

[a] The Breast Unit, William Harvey Hospital, Ashford, Kent TN24 0LZ, UK
[b] Public Health England, Knowledge and Intelligence Team (West Midlands), Birmingham B3 2PW, UK
[c] Llandough University Hospital, Cardiff CF 64 2XX, UK
[d] Public Health England, Cancer Screening QA Reference Centre, Birmingham B3 2PW, UK

Abstract

Background: Older women are less likely to have surgery for operable breast cancer. This population-based study examines operation rates by age and identifies groups which present with early or late disease.
Methods: 37 000 cancer registrations for 2007 were combined with Hospital Episode Statistics comorbidity data for England. Operation rates were examined by age, ethnicity, deprivation, comorbidity, screen-detection, tumour size, grade and nodal status. Early and late presentation were correlated with Nottingham Prognostic Index (NPI) groups and tumour size.
Results: The proportion of women not having surgery increased from 7−10% at ages 35−69 to 82% from age 90. From age 70, the proportion not having surgery rose by an average of 3.1% per year of age. Women with a Charlson Comorbidity Index score of ≥ 1 (which increased with age), with tumours >50 mm or who were node positive, were less likely to have surgery. Although women aged 70−79 were more likely to have larger tumours, their tumours were also more likely to have an excellent or good NPI ($p < 0.001$). Good prognosis tumours were more likely to be screen-detected, and less likely in women aged 0−39, the deprived and certain ethnic groups ($p < 0.02$).
Conclusions: From age 70 there is an increasing failure to operate for breast cancer. Younger women and certain ethnic groups presented with more advanced tumours. Older women had larger tumours which were otherwise of good prognosis, and this would not account for the failure to operate which may in part be related to comorbidity in this age group.
© 2014 Elsevier Ltd. All rights reserved.

Keywords: Breast neoplasm; Data collection; Age factors; Comorbidity; Ethnic groups; Socioeconomic status; Surgery

Introduction

The Second All Breast Cancer Report (SABCR), which analysed over 50 000 cases of breast cancer presenting in the UK in 2007, highlighted the increasing evidence that deprivation and older age are associated with late presentation of breast cancer.[1] However, this study confirmed that although older women were less likely to have small tumours and to be treated by surgery, the prognostic features of their breast cancers were otherwise more favourable.[2,3] There is increasing concern that older women may be denied surgical treatment solely on the ground of age,[4] but the actual relationship between age and operation rates for breast cancer is less well documented. It seems likely that comorbidity may be a significant confounding factor[5] and records of operation rates and comorbidity available for England and the 2007 SABCR data for England alone have therefore been further analysed across all age groups.

The aim of this study was to examine age-related operation rates for breast cancer and comorbidity in a large population and to identify those groups likely to present with early or late disease.

* Corresponding author. Lamplands, East Brabourne, Ashford, Kent TN25 5LU, UK. Tel.: +44 01233 750304; fax: +44 01233 750599.
E-mail address: bates.tom@virgin.net (T. Bates).

Methods

Data for the cohort of women in England included in the SABCR were constructed using the National Cancer Registration Database (NCDR), Hospital Episode Statistics (HES), Breast Cancer Clinical Outcome Measures (BCCOM) audit and NHS Breast Screening Programme and Association of Breast Surgery audit data.

The proportion of patients by age quintile not having an operation was assessed and a chi-squared test for trend was performed in order to identify any statistical significance.

Early breast cancer was correlated to the following prognostic markers, 1) the Nottingham Prognostic Index[6] (NPI) Excellent & Good Prognostic Groups (EPG/GPG) and 2) a tumour with diameter of 20 mm or less. Late detection of breast cancer was correlated to 3) the NPI Poor Prognostic Group (PPG) and 4) not having an operation. Outcomes 1−3 (as defined above) were analysed with the following factors: age group by decade from ≤39 to 80+ years, ethnic group, deprivation quintile, comorbidity as assessed by the Charlson Comorbidity Index,[7] screening status and surgical treatment. Outcome 4 was analysed by age group by decade, ethnic group, deprivation quintile, comorbidity as assessed by the Charlson Comorbidity Index, screening status, tumour size, tumour grade and nodal status. These factors were included as potential explanatory variables in the regression models. To calculate Charlson Co-morbidity Index scores, individual patients were matched to HES data to identify episodes of treatment for comorbid conditions in the 30 months prior to and 3 months post cancer diagnosis. The scores associated with each comorbid[7] condition were then summed to provide an overall score for each patient. Where a patient had similar conditions recorded (e.g. liver disease and severe liver disease) the condition with the highest score was retained. The index cancer and all other cancer diagnoses were removed from the calculation so that a comorbidity score in the absence of cancer was derived.

Charlson comorbidity scores were not obtained for 3996 patients (11%) who could not be matched to a HES record. The proportion of patients without a HES match varied from 8% in the 0−39 age group to 10% in those aged 70−79 and 22% in those aged 80 and above.

Statistical analysis

A number of binary variables were generated based upon tumour characteristics (NPI, grade, nodal status and tumour size), and the presence/absence of surgical treatment in order to distinguish between Early/Not Early and Late/Not Late diagnosis. The likelihood of presenting with early or late presentation breast cancer was investigated using multivariate logistic regression models. The effects of ethnicity, age at diagnosis, surgical treatment, deprivation, co-morbidity, tumour characteristics and method of presentation were included as independent categorical variables in each logistic regression model. The results are presented as adjusted odds ratios. The following were used as the base level for the multivariate comparisons of likelihood, 1−3: age group - 50−59 years; deprivation quintile − average deprivation (quintile 3); ethnicity - white; screening status - symptomatic; Charlson Comorbidity Index score = 0 and surgical treatment − surgery. Early or Late presentation was the dependent variable throughout. For the multivariate analysis of the likelihood of not having surgery (4) the following additional base levels were used: tumour size - ≤20 mm; tumour grade − grade 1; nodal status − node negative. The proportion of patients not having an operation was assessed and a chi-squared test for trend was performed in order to identify any statistical significance.

To account for missing data in the tumour grade, size and nodal status variables, an extra category was coded within that variable. The reasons for this were twofold: a) omitting these from the analysis would have removed valuable data from the regression model and b) the missing data were likely to be of direct interest to the outcome variable, those patients who did not have an operation. The fact that the data were missing might be due to the inappropriateness of collecting that data item (for example if tumour size is mainly assessed following surgery, any patient who does not undergo surgery may by default have an unknown tumour size). Where tumour size was recorded as not assessable this was scored as size unknown.

All analyses were conducted in Stata 11.2 (*StataCorp LP, College Station, Texas USA*). *p*-Values <0.05 were considered statistically significant.

Results

In 2007, 37 113 women in England presented with primary invasive breast cancer, of whom 30 318 (81.7%) had their first surgical treatment within 6 months of their diagnosis recorded in the NCDR. A further 351 women (1%) had their first surgical treatment within 6 months of their diagnosis recorded on HES and 135 women had their first surgery between 6 months and two years after their diagnosis (0.4%).

The proportion of women aged 35−69 not having surgery was 7−10%. From age 70, this rate rose by an average of 3.1% per year of age to reach 82% ($p < 0.0001$) in those aged 90 or over (Fig. 1). A Charlson Comorbidity Index (CCI) score could be derived for 91% of women aged under 80, but in those aged 80 years and over, a CCI score was available for only 78% of cases. In women aged under 70, where the CCI was available, a score of greater than 2 was recorded for 0.73% of cases, rising to 3.0% in those aged 70−79 and 5.5% in those aged 80 and over ($p < 0.001$). For women aged 0−69, the proportion of cases recorded with a CCI score of 0 was 86% decreasing from 94% (age 0−39) to 82% (age 60−69). Even in those women aged 70 or over, 72% had no recorded comorbidity (CCI score = 0) (Fig. 1). However, the availability of HES data