Declining Use of Mastectomy for Invasive Breast Cancer in Canada, 1981-2000

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ABSTRACT

Objective: To evaluate the rate and magnitude of change in surgical practice for breast cancer in Canada in relation to publication dates of clinical trials and consensus conferences.

Methods: Hospital separations with a diagnosis of invasive breast cancer were extracted from the Hospital Morbidity File from 1981 to 2000. Age-standardized rates of in-patient procedures for breast-conserving surgery and mastectomy were analyzed by province and age group and by geographic region.

Results: In Canada, mastectomy rates decreased from 62.2 to 37.9 per 100,000 between 1981 and 2000; declines were largest between 1984 and 1985, following publication of the NSABP B-06 clinical trial in March 1985, and between 1991 and 1993, after the US NIH Consensus Conference in February 1991. Mastectomy rates plateaued between 1985 and 1991, and from 1993 to 2000; the transitory peak in 1988 corresponded to publicity surrounding Nancy Reagan's choice of mastectomy in 1987. Regional variations from the main pattern led to increasingly divergent mastectomy rates over time. Women aged 80+ were less likely to be treated by any surgery.

Interpretation: Publication of clinical trial results and consensus conferences were associated with changes in surgical treatment for breast cancer in Canada. However, divergent mastectomy rates among Canadian regions point to inconsistent adoption of less invasive therapy despite a publicly-funded health care system and national consensus guidelines.

La traduction du résumé se trouve à la fin de l'article.

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Surgical treatment of breast cancer in North America changed dramatically in the past two decades as breast-conserving therapy (BCS) replaced the more ablative mastectomy.¹⁻⁶ Randomized clinical trials demonstrate that women with stage I or II cancer treated either with modified radical mastectomy or BCS followed by radiation therapy have equivalent rates of survival and recurrence.⁷⁻⁹ A systematic review of publications with 10-20 years follow-up confirms these results.¹⁰⁻¹⁹ Despite this scientific evidence, the adoption of BCS varies by geographic region in both the US and Canada.^{1,20-22} In the US, BCS increased steadily in the early 1980s, reached a plateau in 1985, and increased again in the early 1990s.^{1-3,5,23} Canadian studies examining BCS utilization were limited by time period or geographic area.^{6,24-26} This study is the first in Canada to examine long-term population-based trends in mastectomy and BCS by geography and age. Observed changes are discussed in relation to clinical trial results, consensus statements, participation in clinical research, patient and surgeon preferences.

METHODS

Data sources

The Hospital Morbidity File (HMF) contains all in-patient separations occurring in Canada. The data are organized by fiscal years which will be referred to here as single years, e.g., 1981 instead of 1981/82. Separations were included if all three of the following criteria were present: the years 1981-2000; a diagnosis of invasive female breast cancer (ICD-9 code = 174) among the first five diagnoses; breast surgery codes for either mastectomy (CCP codes = 97.12-97.19) or BCS (CCP codes = 97.11, 97.27, 97.28) among the first four procedures. If both BCS and mastectomy were recorded for the same visit, mastectomy took precedence. Other variables used for this study were age, sex, and province of residence. More information on the HMF is found elsewhere.^{27,28}

Data validation

Completeness of data was assessed by comparing hospital separations for any breast cancer surgery to newly diagnosed cases of invasive breast cancer in the Canadian Cancer Registry for 4-year time periods from 1981-1984 through 1997-2000.²⁹ During 1981-1992, the difference between

total breast cancer surgeries performed and total invasive cancers diagnosed averaged 7.8%. After 1992, this difference increased due to increasing numbers of BCS performed as day surgery. To estimate the percentage of BCS performed as day surgery, we subtracted the actual percentage in-patient surgeries from the estimated total surgical rate of 92.2% (equal to the average total rate from 1985-1992).

The HMF has one record per hospital visit, and some patients may have multiple visits for breast cancer surgery. To assess the proportion of patients with multiple visits, another hospital dataset (available only since 1994) permitted us to select records of women with mastectomy or BCS between July to December, 1995 and to link these records to additional hospital visits by the same person within 3-9 months. The proportion of women receiving both BCS and mastectomy within this time period was less than 5%.

Statistical analysis

Age-standardized separation rates (ASSR) were standardized to the 1991 Canadian population and calculated per 100,000 population. Trends were examined in four-year time periods by province and age group, and per fiscal year by region. Because the numbers used in this analysis were generally very large, e.g., in excess of 250,000 over the time of the study, the CI are very small. An exception were small numbers for some provinces, such as Prince Edward Island, and thus the annual data were presented by region.

Figure 1. Age-standardized separation rates of surgical procedures for invasive breast cancer, Canada, 1981-2000

Notes: The average percent of all newly diagnosed female breast cancer that received surgical treatment during 1985-92 from hospital morbidity data was used to estimate the rates for BCS after 1992. Rates were standardized to the 1991 Canadian population. Source: Hospital Morbidity Database, for fiscal years 1981/82 to 1999/2000

RESULTS

ASSR for mastectomy declined from 62.2 to 37.9 per 100,000 in four distinct phases (Figure 1): 1) a decrease from 1981 to 1985 with the largest drop between 1984 and 1985; 2) a plateau from 1986 to 1991 with a small peak in 1988; 3) a drop between 1991 and 1993; and 4) another plateau from 1995 to 2000. ASSR for BCS mirrored those for mastectomy, rising rapidly until 1986, then almost levels until 1988, increasing again from 1989 to 1992; the combined in-patient and estimated day surgery ASSR for BCS increased slowly from 1993 onwards.

ASSR for mastectomy and BCS varied by province (Table I). The lowest provincial mastectomy rates and the highest BCS rates occurred in Quebec in all time periods. Prince Edward Island and Newfoundland and Labrador showed an opposite pattern, while intermediate surgical practice patterns occurred in the western provinces and Ontario.

Trends in mastectomy ASSR by region diverged over time so that by the late 1990s, ASSR showed greater disparity than in the early 1980s (Figure 2). Mastectomy rates in Quebec declined the most rapidly of all until 1991, and then leveled off. Elsewhere, mastectomy rates also declined sharply until 1985, but then plateaued

TABLE I

Age-standardized* In-patient Hospital Separation Rates per 100,000 for Breast Cancer Surgery by Canada and Provinces, 1981-84 to 1997-2000

Province	Mastectomy					Breast-conserving Surgery				
	1981-84	1985-88	1989-92	1993-96	1997-2000	1981-84	1985-88	1989-92	1993-96†	1997-2000†
Rate per 100,000										
Canada	61.0	49.4	46.0	38.9	38.2	20.4	37.1	43.6	41.7	38.2
BC	69.1	59.7	58.6	47.0	44.6	12.9	29.1	32.6	38.2	40.1
AB	55.7	50.5	50.4	41.7	46.1	14.8	26.5	35.1	34.1	38.6
SK	70.1	55.7	58.0	48.9	59.1	10.3	29.1	44.7	37.2	31.9
MB	78.4	65.1	66.9	55.7	48.7	5.5	12.1	17.6	21.9	29.7
ON	61.9	49.6	46.1	37.3	35.1	24.8	44.3	49.3	44.1	34.8
QC	52.5	37.9	28.9	24.8	24.9	26.1	44.4	52.4	49.9	47.3
NB	65.4	58.8	64.3	63.2	53.4	8.3	15.0	24.7	31.6	36.3
NS	71.2	55.6	54.6	63.2	67.3	14.6	28.3	35.1	33.2	27.9
PE	38.5	71.4	71.2	69.3	75.4	22.2	19.7	27.7	24.5	30.0
NL	55.0	56.0	65.0	65.9	66.7	6.2	10.8	16.4	15.7	20.4

* Rates are age-standardized to the 1991 Canadian population.

† Rates for breast-conserving surgery for 1993-96 and 1997-2000 are underestimates in most provinces as day surgeries are not included. Total surgery rates generally compare well with the proportion of newly diagnosed cancers, especially in earlier years, but may vary according to the amount of BCS performed as day surgery.

Source: Hospital Morbidity Database, fiscal years 1981/82 to 2000/01

Figure 2. Age-standardized in-patient hospital separation rates for mastectomy for invasive breast cancer by region, Canada, 1981-2000

Notes: Rates are age-standardized to the 1991 Canadian population. The vertical lines designate March 1985, February 1991, and October 1998, and refer to the respective publication dates for the NSABP B-06 trial results, the NIH consensus recommendations, and Canadian clinical practice guidelines for the care and treatment of breast cancer.

Source: Hospital Morbidity File, for fiscal years 1981/82 to 2000/01

Figure 3. Mastectomy as a rate per 100 of all newly diagnosed breast cancer by age group in Canada, 1981-2000

Source: Hospital Morbidity File and Canadian Cancer Registry

between 1985 and 1991 with a transient peak occurring in 1988. Unlike other regions, in Atlantic Canada mastectomy rates increased from 1994 until 1997, and then dropped to 1990 levels by 2000.

Figure 3 shows the ratio of hospital separations with mastectomy to new cancer cases, showing a decline in proportion of mastectomies in all age groups, with the greatest changes occurring in 1985-1988. For women aged 80 years and older, the decrease in mastectomy rates was less pronounced, mostly because they started lower in 1980.

DISCUSSION

Influence of publicity around significant events

In Canada, as well as in the US, a large decline in mastectomy rates occurred just after the March 1985 publication of the National Surgical Adjuvant Breast and Bowel Project (NSABP) Protocol B-06.^{1,2,4,6,9} Prior to 1985, Canada (Figure 2) and elsewhere, e.g., The Netherlands,³⁰ already experienced declining mastectomy and increasing BCS, which may have been associated with factors such as the publication of an Italian trial in 1981,⁷ discussion of the B-06 study at scientific meetings before formal publication, or a gradual acceptance of BCS while clinical trials were ongoing.

Between 1985 and 1991, all regions except Quebec show relatively stable mastectomy ASSR, including a transient peak in 1988. US studies also found this peak and associated it with publicity surrounding Nancy Reagan's choice of a modified radical mastectomy in 1987.^{3,4} The absence of this peak in Quebec may indicate a difference in dissemination of this event through the francophone media or in its perceived relevance to Quebec women.

A second large decline in mastectomy rates that occurred in all regions, except the Atlantic region (Figure 2), and also in the US followed the 1991 publication of the National Institute of Health (NIH) Consensus Conference recommendations.^{1,4} This conference supported breast-conservation therapy as the preferred treatment for stage I and II breast cancers, as it was considered to confer equivalent survival while conserving the breast.³¹ In February 1998, a steering committee convened by Health Canada published national, evidence-based clinical practice guidelines for the treatment of early

stage breast cancer for Canadian women. The recommendations regarding choice of lumpectomy or mastectomy were similar to the NIH recommendations.^{19,32} The slight declines in mastectomy rates in the Atlantic provinces from 1998 and in British Columbia from 2000 may partially reflect the impact of these guidelines.

Despite these well-publicized events, women with early stage breast cancer did not have equal chances of receiving BCS by geographic area in Canada. The pattern of increasingly divergent trends in mastectomy rates across Canada (Figure 2) suggests that treatment decisions may be influenced by factors other than publicity.

Surgeon and patient knowledge and preferences

While 75% of women diagnosed with early stage breast cancer may meet the diagnostic criteria for BCS,^{19,33,34} many factors may influence whether BCS is actually performed.³⁵ General surgeons who were not convinced that BCS and modified radical mastectomies had equivalent survival rates had higher mastectomy rates.³⁴ In Quebec and Ontario, mastectomy rates may have dropped sooner and remained lower because surgeons may have been more knowledgeable about BCS after participation in the NSABP B-06 trial. Hospitals in Ontario and Quebec that participated in multi-centre clinical trials had higher rates of BCS.^{22,26} In Quebec, without a provincial cancer control program establishing cancer care guidelines, surgeons may have had a greater influence on breast cancer treatment patterns. That the very low mastectomy rate in Quebec did not decline further after 1991 indicates that a lower limit may have been reached.

Women's knowledge and preferences also determine treatment. Quebec women may have placed greater priority on breast conservation. Among Ontario women with early stage breast cancer who were informed of the benefits and limitations of treatment options using a formal clinician-administered decision-aid, the rate of BCS decreased from 88% to 73%.³⁶ Another study found that fear of cancer was the most influential factor that led women to have a mammogram,³³ and such fear may lead women to opt for more radical surgery in spite of the equal effectiveness of BCS.

Patient and tumour characteristics

Choice of BCS is influenced by many factors, e.g., stage at diagnosis,^{1,2,5,21,37,38} tumour location,³⁸ proximity to radiotherapy facilities,^{2,38} level of education,^{2,5,35} income,² race/ethnicity,^{1,2,5,39} and age.^{1,2,5,19,38,40,41} Regarding stage at diagnosis, mammography screening in Canada resulted in detection of smaller, earlier-staged breast tumours, more amenable to BCS. However, differences in mammography screening participation across Canada are unlikely to result in sufficiently large differences in the stage distribution of tumours to account for the nearly three-fold differences in provincial mastectomy rates.⁴²

Treatment may also be influenced by age. Women aged 80 years and older were considerably less likely to receive mastectomies in Canada (Figure 3) and elsewhere.^{41,43-45} Rather than a higher rate of BCS, elderly women were the most likely to receive no surgical treatment.⁴⁶ This may be because elderly women are assumed to be too frail to withstand surgery, to have a more indolent tumour growth controllable by tamoxifen, or to have a greater likelihood of death from competing causes.⁴² These assumptions may not be true. One Canadian study found that older women who received less complete local therapy had a lower breast cancer-specific survival rates than women treated with standard local therapy.⁴³

Organization of care

National clinical guidelines recommend radiotherapy after BCS.⁴⁷ As a result, access to radiotherapy services may well influence choice of surgery.⁴⁵ Women may prefer a mastectomy over longer treatment times, longer waiting times or any increased travel required for radiotherapy. One worries that BCS may be performed in some provinces without the radiotherapy necessary to achieve equivalent survival to mastectomy.^{21,38,48,49} Women with node-negative breast cancer in 1991 in Ontario were more likely to undergo BCS than in British Columbia, but BC women treated with BCS were more likely to receive post-operative radiation therapy as recommended.²¹ Surgeons living at a distance from a radiotherapy centre may be less likely to refer patients and thus recommend mastectomy.⁵⁰ Access to radiotherapy difficulties may have contributed to the small increase in mastectomy in the Prairies and Quebec in the last few years of this study.

CONCLUSION

This study is the first to examine long-term population-based trends in surgical treatment of breast cancer in Canada and each province. The publication of key clinical trials in 1981 and 1985, the publication of the 1991 NIH consensus statement, and Nancy Reagan's 1987 choice of mastectomy were associated with changes in trends for surgical therapy for invasive breast cancer in Canada. The results also demonstrate that implementation of BCS has occurred unevenly across Canada, despite the existence of a national health care system and consensus guidelines in our country. Some of these diverging patterns may relate to surgeon or patient preference, or to variations in access or referral to radiotherapy. As population-based data are not available on the use of post-operative radiation therapy across Canada, the completeness of local therapy for breast cancer could not be assessed. To determine the extent to which this inequality of care may also be occurring with other treatment advances, a greater effort to monitor treatment patterns across Canada and provide feedback to clinicians and the public is needed.

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RÉSUMÉ

Objectif : Évaluer le taux et l'ampleur du changement que connaît la pratique chirurgicale relativement au traitement du cancer du sein au Canada par rapport aux dates de publication des essais cliniques et de celles des conférences de concertation.

Méthodes : Les diagnostics-congés liés à un diagnostic de cancer du sein envahissant ont été extraits de la base de données sur la morbidité hospitalière de 1981 à 2000. Les taux standardisés selon l'âge relatifs aux procédures d'hospitalisation pour la chirurgie mammaire conservatrice et la mastectomie ont été analysés par province, par groupe d'âge et par région géographique.

Résultats : Au Canada, les taux de mastectomie ont diminué, passant de 62,2 à 37,9 pour 100 000 de 1981 à 2000; les baisses ont été les plus importantes entre 1984 et 1985, à la suite de la publication de l'essai clinique NSABP B-06 en mars 1985 et, de 1991 à 1993, à la suite de la conférence de concertation des National Institutes of Health (NIH) des États-Unis en février 1991. Les taux de mastectomie ont atteint des plateaux de 1985 à 1991 et de 1993 à 2000; le point culminant de la transition en 1988 a coïncidé avec la publicité entourant le choix de Mme Nancy Reagan de subir une mastectomie en 1987. Des variations régionales par rapport à la tendance principale ont mené à des taux de mastectomie de plus en plus divergents au fil du temps. Les femmes de plus de 80 ans étaient moins susceptibles de subir un traitement chirurgical.

Interprétation : La publication des résultats relatifs aux essais cliniques et aux conférences de concertation a été rattachée à des changements dans le traitement chirurgical relatif au cancer du sein au Canada. Cependant, des taux de mastectomie divergents selon les régions canadiennes indiquent que l'adoption d'une thérapie moins envahissante fluctue, et ce, malgré un système de santé public et des lignes directrices nationales de consensus.