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Factors predictive of immediate breast reconstruction following mastectomy for invasive breast cancer in Australia

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ABSTRACT

Purpose: To investigate person, cancer and treatment determinants of immediate breast reconstruction (IBR) in Australia.
Methods: Bi-variable and multi-variable analyses of the Quality Audit database.
Results: Of 12,707 invasive cancers treated by mastectomy circa 1998–2010, 8% had IBR. This proportion increased over time and reduced from 29% in women below 30 years to approximately 1% in those aged 70 years or more. Multiple regression indicated that other IBR predictors included: high socio-economic status; private health insurance; being asymptomatic; a metropolitan rather than inner regional treatment centre; higher surgeon case load; small tumour size; negative nodal status, positive progesterone receptor status; more cancer foci; multiple affected breast quadrants; synchronous bilateral cancer; not having neo-adjuvant chemotherapy, adjuvant radiotherapy or adjuvant hormone therapy; and receiving ovarian ablation.
Conclusions: Variations in access to specialty services and other possible causes of variations in IBR rates need further investigation.

Introduction

Improving cosmetic outcomes of breast cancer surgery has long been a priority in clinical practice [1,2]. This is reflected in the increase in breast conserving surgery following the 1990 Consensus Statement from the U.S. National Institutes of Health that equivalent survivals occur from early breast cancer irrespective of whether treated by mastectomy or breast conserving surgery and radiotherapy [3]. Australian clinical practice guidelines for the management of early breast cancer, released in 1995 and 2001, were consistent with this Statement and indicated the importance of women having a choice between breast conserving surgery and mastectomy [4].

The U.S. Statement and associated trial evidence were followed by increases in breast conserving surgery rates in the U.S., Canada, and some European countries [5–10]. Australian data also showed a trend away from mastectomy towards breast conserving surgery, both nationally and in some jurisdictions [11–17]. Today around 60% of early breast cancers are treated by breast conserving surgery in Australia and the U.S. to improve cosmetic outcomes [7,17].

Mastectomy is still the preferred surgical option for many early breast cancers, including large cancers relative to breast size and cancers in difficult locations where cosmetic outcomes would be difficult to achieve with breast conservation [18]. On other occasions, patient choice is a determining factor because of fear of incomplete excision, increased likelihood of multiple operations and concerns of an increase in risk of recurrence following breast conserving surgery [19,20]. A number of studies have indicated that clinician choice may also be important [19–22]. In a previous

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analysis of the Quality Audit database of the Society of Breast Surgeons of Australia and New Zealand, mastectomy was found to be more common in women with large cancers, those living in locations remote from major city centres, and those treated by surgeons with low case volumes [23]. North American data indicate that U.S. surgeons trained prior to the 1980s and male surgeons in particular were more likely to use mastectomy than breast conserving surgery [19,22]. In addition, access to specialists in breast reconstruction may be another important factor when women consider their surgical options [24].

For women treated by mastectomy, immediate or delayed-immediate breast reconstruction is often used to improve cosmetic outcomes [25]. Innovations in surgical technique in the 1990s have led to skin sparing surgery that facilitated IBR [26], and reportedly had psychological benefits for many women with a heightened fear of breast loss and disfigurement [27,28], In addition, IBR with autogenous tissue transplantation rather than silicone implants became more common, leading to more natural breast texture and potential psychological benefits [27,28].

Despite these advances, IBR is still used for only a minority of mastectomy patients [17,24–29]. One reason may be women's preferences to avoid major surgical procedures and concern that complications of IBR might delay adjuvant therapy. Not being given the option of IBR and/or a lack of available surgical expertise in smaller centres may be other reasons. There may also be differences in demand by age and other socio-demographic characteristics and perhaps barriers from concerns that implants might compromise detection of local cancer recurrences and lead to poorer survival outcomes, despite research evidence to the contrary [30–34]. There is also concern that where post-mastectomy radiotherapy is given for improved cancer control and survival, this may detract from IBR healing and cosmetic outcomes [35–39] or that the IBR may impede radiotherapy effectiveness [36–38].

Studies in some populations have found breast reconstruction rates to vary by geographic area of residence; age of patient, race, income status, and private health insurance status; availability of breast reconstruction specialists; general health status; and tumour characteristics such as size, nodal status, number of tumour foci, and whether the cancer is bilateral or unilateral [24,31,40]. Availability of multidisciplinary team treatment planning is another factor that may affect reconstruction rates and coordination of reconstruction services.

In this study we investigate IBR rates following mastectomy for early invasive breast cancer in women treated by Australian breast surgeons participating in the Quality Audit [41]. Although these cancers were not selected to be representative of all early breast cancers in Australia, they comprise the majority and appear to be broadly representative in their survival outcomes [41–44]. Also differences in survival from these cancers by conventional risk factors, such as tumour size, grade, nodal status and oestrogen receptor status, have accorded with differences observed in population-based studies, indicating that these data may be a credible basis for population inference [41]. Research and health service implications of differences in IBR rates by socio-demographic and tumour characteristic are explored.

Methods

Patients

We analysed data for early invasive breast cancers treated by mastectomy by surgeons participating in the Quality Audit circa 1998–2010. DCIS cases were excluded. The number of patients covered by the Audit has increased progressively and represents about 60% of women with early breast cancer in Australia [41–44]. The Audit did not record residential postcode as part of its minimum data set throughout the study period. We analyse data for 12,707 early invasive breast cancers diagnosed in Australian women and treated by mastectomy where residential postcodes were recorded. This enabled analyses of IBR by remoteness and socio-economic status of residential area, which were factors of central interest [42,45]. IBR was recorded for 958 invasive cases.

Statistical analysis

Variables analysed as candidate predictors of IBR included all person, provider, cancer and treatment characteristics recorded on the database. This breadth of analysis was undertaken because other studies indicated associations of a wide range of characteristics with breast reconstruction rates [24,31,40]. Variables analysed included:

- Age at diagnosis (<30, 30–39, 40–49, 50–59, 60–69, 70–79, 80+ years)
- Place of residence (major city, inner regional, and more remote) [42]
- Private health insurance status

Table 1
Relative rates [95% confidence limits] of immediate breast reconstruction [IBR] following mastectomy; Australia Breast Cancer Audit, circa 1998–2010[a] {By socio-demographic and provider characteristics}.

Characteristic	Numbers [%]			
	IBR	No IBR	Relative rates	*p* Values[b]
Age at diagnosis (yrs.):				
Under 30	9 [29.0]	22 [71.0]	1.00	$\chi^2_{(6)}$ $p < 0.001$
30–39	82 [18.7]	356 [81.3]	0.64 [0.36, 1.16]	MW $p < 0.001$
40–49	320 [16.8]	1583 [83.2]	0.58 [0.33, 1.01]	
50–59	324 [11.0]	2630 [89.0]	0.38 [0.22, 0.66]	
60–69	186 [5.8]	2998 [94.2]	0.20 [0.11, 0.36]	
70–79	29 [1.3]	2288 [98.7]	0.04 [0.02, 0.08]	
80+	8 [0.4]	1872 [99.6]	0.01 [0.01, 0.04]	
Residential location:				
Major city	695 [7.9]	8157 [92.1]	1.00	$\chi^2_{(1)}$ $p = 0.043$
Other	263 [6.8]	3592 [93.2]	0.87 [0.76, 1.00]	
Socio-economic quintile:				
1 (low)	158 [6.3]	2343 [93.7]	1.00	$\chi^2_{(4)}$ $p < 0.001$
2	169 [6.9]	2263 [93.1]	1.10 [0.89, 1.36]	MW $p < 0.001$
3	174 [7.0]	2322 [93.0]	1.10 [0.90, 1.36]	
4	175 [6.7]	2425 [93.3]	1.07 [0.87, 1.31]	
5 (high)	282 [10.5]	2396 [89.5]	1.67 [1.38, 2.01]	
Private health insurance:				
No	234 [4.8]	4644 [95.2]	1.00	$\chi^2_{(1)}$ $p < 0.001$
Yes	691 [11.2]	5487 [88.8]	2.33 [2.02, 2.69]	
Diagnostic epoch:				
<2000	1[0.2]	484 [99.8]	1.00	$\chi^2_{(3)}$ $p < 0.001$
2000–2002	21 [2.0]	1016 [98.0]	9.82 [1.32, 72.81]	MW $p < 0.001$
2003–2005	103 [4.7]	2066 [95.3]	23.03 [3.22, 164.66]	
2006+	833 [9.2]	8183 [90.8]	44.81 [6.32, 317.82]	
Referral source:				
Symptomatic	568 [7.2]	7327 [92.8]	1.00	$\chi^2_{(2)}$ $p < 0.001$
BreastScreen	180 [7.6]	2191 [92.4]	1.06 [0.90, 1.24]	
Other	127 [10.9]	1043 [89.1]	1.51 [1.26, 1.81]	
Treatment centre location:				
Major city	774 [8.9]	7885 [91.1]	1.00	$\chi^2_{(2)}$ $p < 0.001$
Inner regional	120 [3.9]	2942 [96.1]	0.44 [0.36, 0.53]	MW $p < 0.001$
More remote	64 [6.5]	922 [93.5]	0.73 [0.57, 0.93]	
Surgeon annual case load:				
≤10	29 [2.2]	1265 [97.8]	1.00	$\chi^2_{(3)}$ $p < 0.001$
11–30	155 [5.3]	2760 [94.7]	2.37 [1.60, 3.51]	MW $p < 0.001$
31–100	523 [7.7]	6235 [92.3]	3.45 [2.39, 5.00]	
101+	251 [14.4]	1489 [85.6]	6.44 [4.41, 9.39]	

[a] Invasive cancers treated by Australian breast surgeons (see text).
[b] $\chi^2_{(df)}$ = Pearson chi-square (degrees of freedom); MW = Mann Whitney *U* test.