Accuracy of a multidisciplinary team-led discussion in predicting postmastectomy radiotherapy

M Wilson, M Dordea, A Light, MP Serra, SR Aspinall

Northumbria Healthcare NHS Foundation Trust, UK

ABSTRACT

INTRODUCTION Immediate breast reconstruction (IBR) is performed increasingly following mastectomy for breast cancer. The literature suggests higher reconstructive failure and poorer cosmesis in the subgroup of patients receiving postmastectomy radiotherapy (PMRT) following IBR. We set out to determine the accuracy of a multidisciplinary team (MDT) discussion in predicting PMRT.

METHODS Preoperative MDT discussions were recorded prospectively over a 12-month period (from February 2011) in a symptomatic breast unit. The estimated need for PMRT was stratified into 'PMRT not required', 'PMRT possibly required', 'PMRT probably required' and 'PMRT required' groups.

RESULTS Of 156 referrals included in the study, 76 patients (49%) underwent mastectomy: 61 simple mastectomy, 10 skin sparing mastectomy (SSM) and delayed-immediate breast reconstruction, 3 SSM and implant-based IBR, and 2 mastectomy IBR with an autologous flap. The IBR rate was therefore 19.7%. The proportion of patients who received PMRT was 14% (3/21) in the 'PMRT not required', 30% (7/23) in the 'PMRT possibly required', 65% (9/14) in the 'PMRT probably required' and 94% (17/18) in the 'PMRT required' groups. Assigning a linear numerical score (1–4) to these groups (higher score representing greater likelihood of receiving PMRT), the predicted need for PMRT correlated with the proportion of patients who ultimately received PMRT (linear regression $r^2=0.98$, $p=0.01$).

CONCLUSIONS This study has examined the factors influencing MDT discussions regarding IBR, demonstrating that the MDT is reasonably accurate at predicting need for PMRT. Whether such accuracy is clinically adequate and/or reproducible across units is debatable.

KEYWORDS

Breast cancer – Breast reconstruction – Adjuvant radiotherapy – Postmastectomy radiotherapy

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CORRESPONDENCE TO

Matei Dordea, E: matei.dordea@nhs.net

Immediate breast reconstruction (IBR) is now widely regarded as a safe and acceptable option for the management of early breast cancer, and it has been demonstrated to improve cosmesis, psychological outcome and quality of life following mastectomy.¹ In 2011 the National Mastectomy and Breast Reconstruction Audit reported that of 18,216 women who underwent mastectomy, 3,389 (21%) underwent IBR.² The National Institute for Health and Care Excellence advised that clinicians should discuss IBR with all patients undergoing mastectomy and offer it except where significant co-morbidity or adjuvant therapy may preclude this option.²

Adjuvant therapy, in particular postmastectomy radiotherapy (PMRT), in addition to co-morbidities such as obesity and smoking is seen as a limiting factor to IBR. PMRT,^{3,4} smoking,^{5,6} obesity^{5,6–8} and increased age^{5,8} have all been associated with increased complication rates and poorer cosmetic outcomes following IBR.

In view of the adverse outcome of PMRT on IBR cosmesis and reconstructive failure, estimating the need for

PMRT is an important consideration for the multidisciplinary team (MDT). Little has been published on the accuracy of predicting PMRT prior to surgery for breast cancer.

In the UK, all breast cancers are discussed preoperatively by MDTs comprising surgeons, radiologists, oncologists, pathologists and breast care nurses. This MDT then issues a recommendation for the management options available to the patient based on the clinical history and examination findings, along with the preoperative imaging and pathology. The aim of this study was to investigate the accuracy of a MDT-led discussion in predicting the need for PMRT.

Methods

Over a 12-month period (from February 2011), patients with breast cancer discussed at the Northumbria Healthcare NHS Foundation Trust preoperative MDT meeting were entered prospectively into the study. All patients were symptomatic referrals as it is not a screening unit. As

many MDT discussions as possible in the study period were captured by the authors but they were not able to record them all so this sample does not reflect all the breast cancer patients managed in the trust over the time period.

The decision whether to offer IBR, with either autologous flap [AF] or implant, or delayed-immediate breast reconstruction (DIBR) (ie skin sparing mastectomy [SSM] +DIBR) was recorded. When denied, the reason for this was documented. At the MDT meeting, a predicted need for PMRT was made on the basis of the preoperative histology, size/location of the breast primary tumour and presence of lymph node metastases (based on ultrasonography and cytological assessment of the axilla if applicable).

The guidelines for recommending PMRT in this study are set out in the North of England Cancer Network breast cancer guidelines.⁹ In this document, absolute criteria for recommending PMRT include T3 (>5cm) and T4 (invading skin or chest wall), >4 metastatic lymph nodes and margins <3mm. Relative criteria for PMRT are two or more of the following: age <40 years, grade 3 tumours, >3 metastatic lymph nodes and presence of lymphovascular invasion.

All women suitable for breast conservation surgery were offered the option of breast conserving surgery or mastectomy. Those who underwent mastectomy and were considered suitable for IBR were offered this in line with current UK guidelines.¹⁰

In our unit, we offer IBR to all women undergoing mastectomy unless there are significant co-morbidities or a risk of needing PMRT when we generally prefer SSM+DIBR. Factors precluding the suitability for SSM include invasive tumour size >5cm (although evidence for the safety of SSM in T3 tumours is not clear cut), inflammatory breast cancer and tumours with extensive skin involvement. Relative co-morbid risk factors such as smoking, obesity and diabetes mellitus need to be taken in account. Women with locally advanced/poor prognosis tumours were usually advised to undergo oncological breast surgery without IBR to minimise the risks of complications that may potentially delay adjuvant chemotherapy. The final decision with regard to treatment undertaken was made in a collaborative manner between the patient, operating surgeon and oncologist.

A proforma was used to record demographic data and information that contributed to the decisions. Patients were allocated subjectively into four groups according to the estimated need for PMRT: 'not required', 'possibly required', 'probably required' and 'required'. Information regarding the final operation undertaken and the recommendation for PMRT was obtained from postoperative MDT meetings and case notes. Statistical analysis was performed using Prism[®] version 4.0 (GraphPad Software, La Jolla, CA, US).

Results

Overall, 156 symptomatic referrals were included in the study following discussion at the preoperative MDT meeting. Five patients were excluded from the study: one died prior to surgery, one had metastatic disease and three had surgery in another hospital. A study flow diagram is shown in Figure 1.

A total of 56 patients chose to have a simple mastectomy, 7 chose SSM+DIBR, 3 chose SSM+Implant IBR, 68 chose breast conservation surgery and 22 patients opted for non-operative management. Of the breast conservation surgery patients, ten underwent revision surgery (5 simple mastectomy, 3 SSM+DIBR, 2 IBR+AF). Consequently, 76 patients underwent some form of mastectomy (61 simple mastectomy, 10 SSM+DIBR, 3 SSM+Implant IBR, and 2 IBR+AF) as either a primary or secondary procedure. Of these 76 patients, 45 were deemed suitable for some form of IBR (IBR+AF/Implant and/or SSM+DIBR) by the MDT. The reasons for denying IBR in patients undergoing mastectomy are summarised in Table 1.

Of the 31 patients who were denied IBR, the mean preoperative lesion size on imaging was 42.3mm (median: 40mm, range: 14–75mm, standard deviation [SD]: 16.2mm). Two of these patients had inflammatory breast cancer (neoadjuvant treatment), four had T4 tumours and four had multifocal tumours. The mean invasive postoperative tumour size on histopathology was slightly greater at 52.3mm (median: 50mm, range: 10–90mm, SD: 23.1mm).

Of the 45 patients who were offered IBR, the mean preoperative tumour size was 28.7mm (median: 28.7mm, range: 6–60mm, SD: 13.7mm). Six of these patients had multifocal tumours and two had Paget's disease of the nipple. The mean invasive postoperative tumour size on histopathology in this group was also larger at 38.9mm (median: 36mm, range: 7–95mm, SD: 22.9mm).

As expected, tumour size measured preoperatively on the basis of imaging and postoperatively on histopathology was significantly larger in those patients denied IBR (Table 2, Fig 2). (Ductal carcinoma in situ and diffuse/unmeasurable lesions were excluded from the calculation.)

Of the 76 patients who underwent some form of mastectomy, 40 were denied IBR+AF/Implant owing to predicted need for PMRT (Table 1). Ten of these patients were predicted incorrectly to require PMRT (ie they did not subsequently receive PMRT): five were offered SSM+DIBR and five were also denied SSM+DIBR. Overestimation of tumour size on preoperative imaging was mainly responsible for inaccurate PMRT prediction in this group.

All five patients offered SSM+DIBR but denied IBR+AF/Implant were thought at the preoperative MDT meeting to possibly require PMRT. This was based not on mean preoperative ultrasonography tumour size, which was only 24mm (median: 22mm, range: 18–24mm), but on more extensive disease on mammography (not further clarified by magnetic resonance imaging). None had positive preoperative axillary staging. Similarly, overestimation of tumour size on ultrasonography/mammography led to denial of IBR and SSM+DIBR in the remaining five patients, in whom extensive disease (>50mm, diffuse/extensive disease or involving whole quadrants) was seen on preoperative imaging. On subsequent histology, these patients were shown to have tumours 10–40mm in size and would, in fact, therefore have been suitable for IBR or SSM+DIBR.

The accuracy of the predicted need for PMRT in light of the final treatment given is shown in Table 3 and Figure 3. The proportion of patients who received PMRT was 14%

Table 1 Numbers of patients undergoing some form of mastectomy who were denied either IBR+AF/Implant, SSM+DIBR or any form of IBR as well as the reasons for denying IBR and the proportion of those denied IBR because of risk of PMRT, which they ultimately did not receive

Number denied IBR	Reasons for denying IBR	Proportion of those predicted to need PMRT who did not eventually receive PMRT
50/76 denied IBR+AF/Implant	40/50: predicted need for PMRT 10/50: co-morbidity	25% (10/40)
31/76 denied SSM+DIBR	24/31: unsuitable for SSM 7/31: co-morbidity	
31/76 denied any form of IBR	24/31: predicted need for PMRT and unsuitable for SSM 7/31: co-morbidity	21% (5/24)
IBR = immediate breast reconstruction; PMRT = postmastectomy radiotherapy; AF = autologous flap; SSM = skin sparing mastectomy; DIBR = delayed-immediate breast reconstruction		

Table 2 Imaging and postoperative invasive tumour size for patients offered or denied IBR

	Denied IBR/ SSM+DIBR	Offered IBR/ SSM+DIBR	p-value (unpaired t-test)
<i>Preoperative size</i>			
Mean	42.37mm	28.74mm	0.002
Range	14–75mm	6–60mm	
Standard deviation	16.22mm	13.78mm	
<i>Postoperative histopathological size</i>			
Mean	52.32mm	38.95mm	0.032
Range	10–90mm	7–95mm	
Standard deviation	23.16mm	22.95mm	

IBR = immediate breast reconstruction; SSM = skin sparing mastectomy; DIBR = delayed-immediate breast reconstruction

Figure 2 Tumour size on preoperative imaging (A) and postoperative histopathology (B) in patients offered or denied immediate breast reconstruction (IBR)**Table 3** Accuracy of predicted need for postmastectomy radiotherapy (PMRT)

Predicted need for PMRT	Number of patients	Actual need for PMRT	Accuracy
Not required	21	3	14%
Possibly required	23	7	30%
Probably required	14	9	65%
Required	18	17	94%

Figure 3 Percentage of patients who received postmastectomy radiotherapy (PMRT) versus need for PMRT predicted by multi-disciplinary team

(3/21) in the 'PMRT not required' group, 30% (7/23) in the 'PMRT possibly required' group, 65% (9/14) in the 'PMRT probably required' group and 94% (17/18) in the 'PMRT required' group. Assigning a linear numerical score (1–4) to these groups with a higher score for greater likelihood of receiving PMRT, the accuracy of the predicted need for PMRT correlated closely with the proportion of patients who actually received PMRT (linear regression $r^2=0.98$, $p=0.01$).

In this study, of the 45 patients offered IBR only, 15 (33.3%) accepted: 5 underwent IBR+AF/Implant and 10 had SSM+DIBR (implant). Overall, therefore, 15/76 patients underwent some form of breast reconstruction, equating to a reconstruction rate of 19.7%. The mean age of women offered IBR (53.6 years, SD: 15.4 years) did not differ significantly from that of those not offered IBR (52.4 years, SD: 15.2 years). However, the mean age of women who accepted IBR was significantly lower ($p=0.041$, Mann-Whitney U test) than that of women who declined IBR, at 46.0 years (SD: 11.7 years) and 57.2 years (SD: 12.9 years) respectively. No age discrimination was therefore observed in terms of offering IBR although age was a significant factor in determining which patients accepted IBR.

Discussion

Guidelines for oncological breast surgery are widespread, standardised and well defined. Advice and unit policies regarding IBR are subject to local variations in expertise and opinion, and are therefore less well defined. Decisions regarding suitability for IBR are made at the preoperative MDT meeting. As a result, these processes should be examined and defined so that patients can be treated equitably across breast units.

PMRT is generally considered to have an adverse effect on the cosmetic outcome of IBR+AF although this is a topic of ongoing controversy.^{8,11} Some breast units perform IBR+AF in patients who require PMRT.¹² However, this is not the policy in our unit, in accordance with other reports.¹⁵

The key determinants of suitability for implant-based IBR in our breast unit are need for PMRT, suitability for SSM and patient co-morbidity. It is generally agreed that PMRT has an adverse effect on the cosmetic outcome of implant-based breast reconstruction.^{14,15} One way of enabling IBR when the need for PMRT is unknown preoperatively is to perform SSM+DIBR. This procedure involves the placement of a temporary tissue expander in a subpectoral pocket at the time of oncological breast surgery. DIBR therefore has the purported advantage that the patient maintains some breast volume postoperatively while decisions regarding definitive reconstruction can be made once the actual need for PMRT is established.

Patients must be suitable for SSM to undergo DIBR and the most common reason to deny DIBR in this study was unsuitability for SSM. The high proportion deemed unsuitable for SSM in this study reflects the exclusive symptomatic nature of the referrals. Various surgical techniques can preserve the skin envelope and enable SSM in a higher proportion of patients.¹⁶ Evidence from non-randomised trials has shown increased failure rates as well as poorer cosmetic outcome in the PMRT subgroup¹⁷ although this has been disputed on the basis of methodological flaws in the original reports.¹⁸ Other concerns about DIBR include the impact of a prosthesis/metallic inflation port on the delivery and distribution of PMRT.^{19,20}

Few reports discuss the ability of clinical parameters to predict the need for PMRT. In a study of 167 women, Musgrave *et al* reported 'high clinical accuracy' in predicting PMRT.²¹ Relatively simple models could also be used to guide the decision making process. Tumour size as well as number and proportion of positive sentinel lymph nodes (SLNs) were shown to be independent risk factors for PMRT requirement. The model uses some parameters, such as SLN status, that are not available prior to surgery.²² This led to the suggestion of performing SLN biopsy before mastectomy/IBR in an attempt to improve prediction of the need for adjuvant systemic therapy (PMRT); this would reduce the incidence of delayed complications and improve the choice of reconstruction.²³ Although used in some units, this policy does have the disadvantage of subjecting patients to additional surgical procedures.

Prediction of PMRT relies currently on the interpretation of known preoperative data. The decision making process

is likely to benefit from improved prediction models. New gene profiling techniques may be able to indicate patients in whom PMRT will be of most benefit.²⁴ From a reconstructive perspective, accurate prediction of PMRT is not a silver bullet as PMRT is not an absolute contraindication for DIBR. In the DIBR postradiotherapy setting, other independent factors such as T4 tumour, axillary node status, surgical technique and smoking have been linked to reconstructive failure.²⁵ Furthermore, belief that good cosmetic outcome and patient satisfaction can be achieved despite radiotherapy may increase DIBR in this setting.^{18,26,27}

Decision processes are not based solely on technical feasibility or co-morbidities but also on the patient's choice in response to the panoply of oncoplastic procedures offered. In our breast unit, a high proportion of patients (30/45, 66%) who were thought to be suitable for IBR at the preoperative MDT meeting did not pursue this. Similar findings have been reported previously.²⁸ While age played a role in our cohort, multiplicities of other factors come into play and these were not looked at in this paper.

Predicting the need for PMRT is fundamental to the IBR decision making process in most breast units. The results of this study suggest that the MDT can predict the need for PMRT with reasonable accuracy as a close correlation between the predicted need for PMRT and the proportion of patients who received PMRT was found. It is notable that 3 of the 21 patients (14%) who were not thought to require PMRT actually received PMRT, emphasising the importance, when discussing IBR with patients, of warning them of the risk of receiving PMRT, even when this is not anticipated preoperatively.

Conclusions

This study has shown that the MDT is reasonably accurate at predicting need for PMRT. Whether such accuracy is clinically adequate and/or reproducible across units is debatable. Estimation of preoperative tumour size is an important source of bias. Further prospective data would be welcome to reach a consensus on the impact of PMRT on cosmesis following IBR.

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