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Original Article

Accuracy and Completeness of Pathology Reporting — Impact on Partial Breast Irradiation Eligibility

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Abstract

Aims: Accelerated partial breast irradiation (APBI) is an alternative to whole breast irradiation that is delivered over a shorter period of time with less toxicity. Appropriate patient selection is critical to its success and the American Society for Radiation Oncology (ASTRO) has published detailed selection criteria for 'suitable' patients. This study evaluated the effect of those selection criteria on APBI eligibility based on pathology reports.

Materials and methods: From March 2004 to March 2007 all patients referred to a single cancer centre for breast radiotherapy were screened for participation in a phase I/II trial of permanent breast seed implant brachytherapy. Eligible patients underwent a computed tomography simulation and those referred from an outside institution had a secondary expert breast pathology assessment. Initial and expert pathology reports were compared regarding completeness and accuracy.

Results: In total, 143 patients were eligible for the trial; 79 patients had surgery carried out outside our institution. In the initial pathology report, the most frequently missing critical information was the resection margin width (29.1%) and the presence of extensive *in situ* carcinoma (11.4%). Comparing initial and reviewed pathology, the agreement was higher than 90% for most features. The main source of disagreement was the width of the negative resection margin, with 34.4% disagreement ($P = 0.016$), although it changed eligibility in only 3.6%. There was major disagreement in the evaluation of lymphovascular invasion. Overall, pathology review changed the eligibility for a patient from 'suitable' for APBI to 'cautionary' in 18.6% of the cases.

Conclusion: Using stringent eligibility criteria has a direct effect on patient screening for APBI. The use of synoptic pathology reporting and a quality assurance programme with secondary expert assessments are recommended.

Key words: Breast radiotherapy; partial breast irradiation; secondary pathology expert review; synoptic reporting

Introduction

With the massive introduction of screening mammography, breast cancer is more frequently diagnosed at an early stage and patients are more likely to have a prolonged survival [1–3]. For those early stages the standard locoregional treatment includes breast-conserving surgery followed by adjuvant radiation therapy to the whole breast [1–4]. The efficacy of this combination in the management of early invasive breast cancer has been proven in several clinical trials and meta-analyses [4–6]. However, whole breast irradiation requires a substantial time commitment from patients extending over several weeks [7,8].

Accelerated partial breast irradiation (APBI) limits the radiation to a smaller portion of the breast and has the advantages of increased convenience because it is delivered within a much shorter period of time [9,10]. This technique has been widely reported and has results in term of locoregional control similar to whole breast radiotherapy [11]. Several authors have emphasised that proper patient selection is critical to the success of any partial breast irradiation approach in order to identify patients who are at low risk of harbouring microscopic disease beyond the tumour cavity [10–12]. In 2009, the American Society for Radiation Oncology (ASTRO) published a consensus statement from a task force presenting a recommendation for the use of APBI [13]. Three groups of patients were defined depending on age, stage and pathology features. The first

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group described 'suitable' patients of age 60 years or older, with a T1N0 stage breast cancer, with an infiltrating ductal cancer less than 2 cm in diameter and with excision margins of at least 2 mm, excluding pure ductal carcinoma *in situ*, lobular carcinoma, lymphovascular invasion, extensive *in situ* carcinoma, multicentricity or multifocality and without nodal extension. In addition, the patient should not have BRCA 1 or 2 mutations or have received neoadjuvant therapy that could downstage the cancer. The group described as 'cautionary' includes patients aged 50–59 years, with a unifocal ductal or lobular infiltrating tumour of 2.1–3 cm in diameter, close margins less than 2 mm, limited lymphovascular invasion, less than 3 cm of extensive *in situ* carcinoma, and negative hormone receptors. This category also includes pure ductal carcinoma *in situ* of less than 3 cm in diameter. The last group describes 'unsuitable' patients. It includes patients less than 50 years old, or with tumour over 3 cm in diameter, multifocal or multicentric tumours, with extensive *in situ* carcinoma or lymphovascular invasion, a T4 clinical presentation or node-positive patients.

To ensure appropriate selection of patients for partial breast irradiation, accurate reporting of the pathological features is critical. Several eligibility criteria have been reported for various trials, but the ASTRO recommendations are the most comprehensive [11,13]. It is possible that more stringent selection criteria may need more careful pathology reporting. The purpose of this work was to evaluate the completeness and the accuracy of pathology assessments in a cohort of patients who had their pathology centrally reviewed and to assess the effect of the pathology review on their eligibility for APBI.

Materials and Methods

Patients

Between March 2004 and March 2007, patients referred to the Sunnybrook Health Sciences Centre for breast irradiation were screened for eligibility for a phase I/II study of permanent breast implant. The study eligibility criteria included patient age $\geq$ 40 years old with infiltrating ductal carcinoma excluding lobular subtype, tumour size less than 3 cm, modified Bloom Richardson grade 1 or 2, no lymphovascular invasion or extensive *in situ* carcinoma, negative resection margins ($\geq$2 mm) and negative lymph nodes [14,15]. Eligible patients were booked for computed tomography simulation with contouring of the target volume. Patients failing to meet dosimetric constraints received external beam radiotherapy [14]. Those eligible for seed implant were booked for the procedure. A secondary pathology assessment by an expert breast pathologist at the Sunnybrook Health Sciences Centre was requested for those having their primary surgery carried out at an outside institution.

Pathology

The following pathology characteristics were captured and coded from the original and the secondary pathology reports: the histology of the tumour (ductal, lobular, other), the presence of lymphovascular invasion and the size of the tumour (in centimetres). The tumour grade was scored according to the modified Bloom Richardson method as low (score 3–5), intermediate (score 6–7) or high (score 8–9) [16]. The presence of an extensive *in situ* carcinoma was coded as positive when this component constituted 25% or more of the tumour mass and was present in the surrounding breast parenchyma [17]. The final resection margin status was reported as positive when the tumour was present at the edge of the specimen. The width of the negative resection margin was defined in millimetres as the closest distance of the carcinoma to the edge of the specimen. The total number of nodes resected, the total number of positive nodes involved, and the status of hormone receptors (oestrogen and progesterone) were coded. All missing information was recorded as 'not reported'.

Statistical Analysis

We assessed the completeness of the initial and reviewed pathology reports by comparing the proportion of reports missing data using Chi-squared statistics and using Yates' correction when necessary [18]. We evaluated the accuracy of pathology reports by calculating the proportion of disagreement between the initial and reviewed reports, excluding cases with missing information and calculated when feasible kappa statistics for categorical variable and Student's *t*-test using the IBM SPSS statistics software version 19.0. We also evaluated the effect of the pathology review by determining the proportion of cases where the pathology review led to a change in eligibility for partial irradiation using the ASTRO criteria, excluding again cases with missing information.

Results

Patient Characteristics

One hundred and forty-three patients were eligible for the permanent breast seed implant study at the time of first consultation. Fifty-two cases did not meet the dosimetric criteria and 12 patients had surgery at our institution. The remaining 79 patients were referred by outside institutions and had a secondary expert breast pathology assessment. Those patients were included in this cohort study. The patient and pathology characteristics are listed in Table 1. All patients were clinically T_1N_0, the median age of the cohort was 59.8 years (range 41–80 years) and the median tumour size was 1.2 cm (range 0.2–2.7 cm).

Completeness of Pathology Reports

The completeness of the initial and secondary histology reports is detailed in Table 2. In more than 97% of the cases, both pathology assessments appropriately detailed the tumour type, size, grade, the presence of lymphovascular invasion, the status of the resection margin, the nodal and