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Breast-conserving therapy in breast cancer patients – a 12-year experience

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Summary

Introduction. Twenty years ago prospective randomised controlled trials were initiated to compare conservative breast surgery plus radiation with radical mastectomy in the treatment of early-stage breast cancer. The results have shown no survival advantage for mastectomy over breast-conserving therapy (BCT). However, local recurrence of cancer after BCT has been reported to be as high as 14%, necessitating salvage mastectomy.

Methods. This retrospective study was performed on 165 breast cancer patients undergoing BCT in the 12 years up to August 2002. Resection and intraoperative cytological assessment were used to achieve clear excision margins. Adjuvant therapy (hormones, chemotherapy) was undertaken, and the incidence and times of local recurrence and distant metastases were recorded.

Results. Ninety-four per cent of patients had clear margins at the initial operation. This was achieved irrespective of ductal carcinoma in situ alone or surrounding the cancer in 62% of cases. At a median follow-up of 65 months one patient developed local recurrence (LR) in the breast synchronously with distant relapse. Two patients had non-nodal axillary recurrences but no patient suffered LR in isolation in the treated breast.

Conclusion. BCT is a safe alternative to mastectomy provided that the tumour is completely excised. The segment containing the cancer should be resected from the nipple to the periphery of the breast. Intraoperative cytological assessment helps to ensure clear margins. Re-excision is recommended for patients with close/involved margins.

In the 1970s prospective randomised controlled trials were initiated to compare conservative breast surgery plus radiation with radical mastectomy for early-stage breast cancer. The 12- and 20-year follow-up results of these studies[1,2] have shown no survival advantage for radical mastectomy over breast-conserving therapy (BCT). As such BCT is now the standard of care for the majority of patients with early-stage invasive breast cancer.

However, the rate of intrabreast tumour recurrence (IBTR) in the treated breast has varied from 7.5% to 14% of patients.[1-3] Although the impact of local recurrence (LR) after BCT may not be as serious in terms of patient survival as LR after mastectomy, it results in considerable distress to the woman who has chosen BCT and is now faced with salvage mastectomy. Additionally, long-term observational studies[4,5] have provided empirical evidence that LR can act as a nidus for distant dissemination, leading to the death of the patient. It is therefore critically important to achieve optimal local control.

In the current series the incidence of isolated IBTR was 0%. We discuss the use of resection and radiation therapy techniques to reduce the risk of IBTR.

Methods

A retrospective review was undertaken of 165 patients undergoing BCT in the 12 years up to August 2002.

Surgery consisted of segmental mastectomy. Skin flaps were raised and the segment containing the cancer was excised from the nipple to the periphery of the breast and down to the fascia over the pectoralis major muscle. The excised segment was orientated with sutures and clips, while also marking the corresponding sites in the breast in an identical fashion. Intraoperative 'scrimp' cytology[6] was performed by scraping each margin with a scalpel blade and smearing the material obtained onto a slide. The cytological assessment of each excision margin allowed feedback between pathologist and surgeon to ensure histologically clear circumferential resection margins of ≥ 1 cm. The intraoperative cytological assessment of margins was later compared with the results of histological examination of paraffin-embedded sections of the resected specimen.

Margins were assessed as 'clear' if there was ≥ 5 mm of normal breast tissue or fat between the tumour and excision margins, 'close' where the margin was less than 5 mm, or 'involved' if tumour cells were identified at the resection margin(s). The tumour bed was clipped to facilitate accurate delivery of the boost dose of radiation. Parenchymal flaps were rotated across the defect to reconstruct the breast. All patients had whole-breast irradiation to a total dose of 50 Gy using 2 tangential wedge-corrected fields and a median boost dose of 12 Gy (range 10 - 16 Gy) to the primary site.

Neoadjuvant therapy was given to 8 node-positive patients with stage 3 disease (Table I) to reduce the size of the primary tumour before BCT. Seventy-three patients received adjuvant chemotherapy; these included node-positive patients and node-negative patients with receptor-negative, poorly differentiated and/or high-grade tumours at risk of distant relapse.

Chemotherapy was administered before radiation. Adjuvant tamoxifen was given to 118 patients with oestrogen

TABLE I. CLINICAL AND PATHOLOGICAL FEATURES OF PATIENTS (N = 165)

Median age at diagnosis (yrs)	55
Age range (yrs)	28-89
Cancer stage*	
Tis	19
I	61
II A	53
II B	24
III A	3
III B	5
Pathology (N)	
Ductal carcinoma in situ (DCIS)	19
Ductal carcinoma + DCIS	78
Ductal carcinoma	40
Mixed ductal and lobular carcinoma	13
Mixed ductal and lobular carcinoma with DCIS	6
Lobular carcinoma	15

*AJCC Cancer Staging Manual, 5th ed., 1997.

receptor-positive tumours in a sequential fashion after chemotherapy and radiation.

Results

The final histological staging and pathology of the cancers is detailed in Table I. Seventy-one patients (43%) had node-positive disease. When the intraoperative 'scrimp' cytology of the margins was compared with paraffin-embedded sections, 10 patients (6%) were found to have 'close' or 'involved' margins (Table II). Each of these 10 patients had a ductal carcinoma and in 9 cases there was extensive ductal carcinoma *in situ* (DCIS) surrounding the cancer. Seven patients underwent re-excision of the primary site; clear margins were achieved in 6. Three patients elected to undergo mastectomy, including 1 in whom re-excision failed to obtain clear margins. The final patient with a focus of DCIS at 1 margin declined any further surgery and remains under surveillance.

TABLE II. EXAMINATION OF MARGINS (N)

Clear margins	
Intraoperative scrimp cytology	165
Paraffin sections	155
Involved/close margins	10
Pathology of involved/close margins	
DCIS	1
Ductal carcinoma plus DCIS	8
Ductal carcinoma	1
Management of involved/close margins	
Re-excision	7
Mastectomy	3

DCIS = ductal carcinoma in situ.

With a median follow-up of 65 months (range 12 - 144 months) 9 patients (5.5%) have suffered recurrent disease and 5 patients (3%) have died. The sites and time after surgery of recurrence are listed in Table III. No patient has developed an isolated IBTR. Two patients manifested a non-nodal recurrence in the ipsilateral axilla; 1 of these patients with the BRCA2 mutation also has involvement of occipital and mediastinal nodes. Another patient treated with neoadjuvant chemotherapy for stage 3 disease relapsed in the skin, breast and bones 1 year after surgery. Five patients presented with distant metastases (skin, bones, liver), 4 of whom have died.

TABLE III. CANCER RECURRENCE IN 8 PATIENTS (5.5%)

Site	No.	Time after operation
Local recurrence (LR)		
Breast	0	
Axilla (non-nodal)	1	1 year
LR + distant (DM)		
Skin breast bone	1	1 year
Axilla, occipital and mediastinal nodes	1	1 year
DM		
Bones, liver	5	1 - 8 years
Mortality	5	(3.0%)

Discussion

Ductal carcinoma is the most common form of malignancy in the breast. In this series 62% of patients had DCIS alone or surrounding a ductal cancer. Thomson *et al.*[7] studied the pattern of spread of DCIS. These workers showed that DCIS involves a single ductal system and that the cancer cells spread both towards the nipple and to the periphery of the segment at nearly equal rates. It is therefore recommended that the segment containing the cancer should be excised from the nipple to the periphery to remove the ductal system of that segment. This reduces the risk of residual foci of DCIS that can lead to IBTR.

The importance of achieving clear margins in all dimensions is undisputed.[8] Even a focally positive margin is associated with a 2 - 3-fold increase in the risk of local recurrence,[9] despite the addition of radiation to the breast. While quadrantectomy is too radical and disfiguring for the management of small tumours,[8] 10 mm of healthy breast tissue or fat between cancer cells and the lines of excision has been widely accepted as a safe margin.[10] The correct orientation of the specimen using sutures or metal tags together with the corresponding site in the breast is important to establish the extent of tumour clearance in relation to specific margins. Intraoperative 'scrimp' cytology allows for rapid assessment of margins, avoids freezing artefacts when frozen section is used and preserves tissue for later examination. Intraoperative 'touch preparation' cytology has proved disappointing in some series.[11] In this study, 'scrimp' cytology had a diagnostic accuracy of 94% when compared with the final examination of margins in paraffin sections.

Nine of the 10 patients with close/involved margins had an extensive intraduct component which increases the risk of IBTR.[12] Freedman *et al.*[13] showed that the risk of LR after BCT rises from 7% at 10 years in those with negative margins to 14% in patients with close margins, irrespective of whether the margin was involved by DCIS or invasive cancer. The importance of obtaining clear margins, even if this

requires further surgery, cannot be underestimated. When clear margins are achieved by re-excision the IBTR is identical to that in women in whom clear margins were obtained at the initial operation.[13] When there is feedback between the surgeon and pathologist during the operation and margins are judged clear of the cancer, only a small number (6% in the current series) will require re-excision. But all patients undergoing segmental resection should be warned of this possibility if BCT is to be free of the risk of IBTR. In a study by Kollias *et al.*,[12] young age, large tumours and extensive DCIS were associated with an increased risk of incomplete excision. Very careful attention must be given to extent of clearance in these cases to avoid the need for re-operation. In patients choosing BCT, preoperative mammographic appearance of microcalcifications will help the surgeon to estimate how much breast to excise.[12] If the volume to be resected is large the cosmetic result could be compromised in a small breast; mastectomy with breast reconstruction may be a more appropriate option.

In this series no patient suffered an isolated IBTR, but 2 patients developed non-nodal axillary recurrence (Table III). These axillary deposits may represent in-transit metastases, a phenomenon not uncommon in patients with malignant melanoma after the primary tumour and the regional lymph nodes have been removed.

There is reliable evidence that adjuvant systemic therapy provides a significant gain in survival.[8] In addition, in patients with close or positive margins adjuvant therapy will delay local relapse in the breast. But long-term follow-up has shown that systemic treatment does not eradicate the effect of a close or positive margin.[13] In BCT, omission of radiation can result in IBTR rates of 30 - 40%, which then necessitates salvage mastectomy and possible compromise on long-term survival.[14] While radiation therapy is essential, boost radiation where complete tumour excision is achieved is controversial.[15]

Although the boost dose may impair cosmetic outcome slightly,[16,17] there is evidence that it reduces the risk of LR.[18] It is important to clip the tumour bed for accurate delivery of the boost radiation as the surgical incision alone is a poor guide to the tumour bed.[19]

Conclusion

BCT is a safe alternative to mastectomy provided that the tumour is completely excised. As the majority of ductal carcinomas are associated with DCIS the segment containing the cancer should be excised from the nipple to the periphery. Intraoperative cytological assessment allows feedback between the surgeon and pathologist to help ensure clear margins at the time of surgery. Re-excision is recommended for patients with close/involved margins as local control is improved in those rendered margin-negative.

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The standard surgical management for patients with stage 1 and 2 breast cancer in the 21st century is breast conservation with radiation therapy. This dramatic and revolutionary change from mastectomy is well supported by level 1 research data showing that this method has resulted in surgery with less morbidity and no change in survival. The essence of breast conservation is a satisfactory cosmetic result, ensuring an almost normal breast appearance while adhering to standard oncological principles. Poor cosmetic results (20 - 30% of patients) are due to poor surgical technique, choice of procedure and late radiation changes. Deformed breasts are not only distressing to the patient but are difficult to assess clinically and mammographically, so recurrences cannot be detected reliably.

The prevention of local recurrence is of paramount importance in breast-conserving surgery. Local recurrence is not only demoralising for the patient but is also thought to be a marker of poor prognosis. At the time of local recurrence the patient should be completely restaged. Unfortunately 10% of women will have distant metastases at the time of local recurrence. In the prospective randomised trials conducted, 10-year local recurrence rates range from 4% to 20% with breast-conserving surgery and radiation therapy.

Recurrences usually begin to appear 2 - 3 years after treatment and continue to appear at a rate of 1% per year. Patients who have breast-conserving surgery should therefore be followed up for at least 5 - 10 years. Documenting recurrence rates shortly after surgery is not appropriate.

The suggested macroscopic margins are a 1 cm clear margin for lumpectomy, while quadrantectomy requires a 3 cm margin. Some authors have macroscopic margins between the two. The specimen should be orientated, labelled and given to the pathologist to confirm or establish the diagnosis of cancer, and to help the surgeon decide during the operation whether or not the specimen margins are 'grossly' free of tumour. If the margin is positive, additional tissue is removed from the area until there is histologically free margin. It is important to assess the margins intra-operatively with histology combined with cytology. Frozen section is accurate as a means to exclude positive margins. Small-section intra-operative histology or in its absence the use of imprint cytology or cytological scrimping techniques are the correct methods to evaluate margins.

Adhering to these principles and understanding that removing 13% of the breast tissue requires onco-reconstructive principles to fill the defect left will ensure decreased local recurrence rates and good aesthetic results.