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Factors of local recurrence rate after whole breast irradiation with and without boost radiotherapy after breast conserving surgery

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The authors analysed and evaluated 111 records of patients after breast conserving surgery (BCS) followed by radiotherapy. They found 6 factors that could be examined on a routine basis, which were grouped as "high" and "medium" risk factors. The authors consider the boost technique necessary in the presence of 1 "high" or 2 "medium" risk factors.

Key words: breast neoplasms; breast conserving surgery; radiotherapy; local recurrence; risk factors

Introduction

Breast conserving therapy (BCT) is a success story in clinical oncology, particularly with reference to radiation oncology. The idea behind BCT was to combine limited surgery for the removal of gross disease and moderate-dose radiation therapy for the eradication of residual microscopic disease. Previously, local therapy consisted of either deforming surgical resection or high-dose radiotherapy. This new concept employed surgery and radiotherapy in a way that limited the toxicities of each, but optimized local tumor control while retaining the function and cosmetic appearance of the breast. The technology behind BCT involved the use of supervoltage equipment, simulation, different boost techniques (interstitial, electron) and the beginnings of computer-based treatment planning.[1] The number of BCS is growing continuously (replacing mastectomy) and is common in most surgical wards in our country. After BCS, percutaneous irradiation of the whole breast is definitely indicated since BCS involves some risk of recurrence in the remaining tissue. However, no significant differences in overall survival at 10 years were found in patients with mastectomy vs. those with BCS plus radiotherapy (4891 women), with more extensive surgery vs. less-extensive surgery (4818 women), or with axillary clearance vs. radiotherapy as adjuncts to mastectomy (4370 women).[2] The authors are seeking answers to the following questions:

- which are the risk factors that increase the frequency of local failure, and
- in which cases and whether it is necessary to perform the "boost" supplementary irradiation to the original tumor bed?

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Patients and methods

111 BCS plus radiotherapy patient records were suitable for evaluation from Jan. 1986. till Dec. 1990. The radiotherapy consisted of 50 Gy to the whole breast tissue in 56 cases (Telecobalt or 6 MeV photon) and whole breast photon plus 12-20 Gy boost (RadioCobalt needles or HDR-Iridium-AL) in 55 cases. The patients' median age was 55.6 years vs. 48.8 years respectively, with 61.8 vs. 62.5 month median follow up. In the case of involved axillary nodes (19 pts, 1-3 lymph nodes) percutaneous photon irradiation with 46-50 Gy/5 weeks was delivered to the axillary region. All the patients had tumors which measured less than 2 cm in diameter (T1).

Results

We detected only 9 local recurrences: 6 patients received external radiotherapy alone (median time to local recurrence: 11.6 mo.), the other 3 patients received external plus interstitial boost radiotherapy (median time to local recurrence: 23.0 mo.). There was no significant difference between the median age of groups with and without recurrence (50.1 vs. 52.5 years respectively).

The local recurrence appeared in the expected percentage independently of the primary tumor size (in 7-9 %). In stage pT1a (pN0) local recurrence did not occur. We also did not find any significant difference between the premenopausal and postmenopausal groups. But: lobular and lobular plus ductal histological types of tumors were encountered with a substantially higher frequency.

In the case of endolymphatic spread of tumor cells, the occurrence of local recurrences was also higher. Of 20 patients with endolymphatic spread 19 had positive axillary nodes (see above).

Among 12 patients with histologically proven extensive intraductal component (EIC) 3 presented with recurrences (10 patients had microcalcifications on mammogram).[3]

In 6 cases the excised margins were infiltrated; despite 5 re-excisions, local recurrence occurred in half of the cases (3 patients). In one case, re-excision was not performed and the patient developed a big, infiltrating local recurrence.

In most cases (85 patients) the resection margins were free of tumor, there was only 1 local recurrence. If the excised tissue had a free margin of 5 mm or less, the local rec. occurred at 20%.

Discussion and conclusions

We examined the role of possible risk factors after BCS for T1 breast tumors treated by radiotherapy (with vs. without boost). The overall tumor recurrence rates were 6/56 (10.7 %) in the external beam group and 3/55 (5.4 %) in the external beam plus boost group. There was no significant difference in the breast relapse rate in patients receiving either interstital 192 Ir boost or 60 Co manual interstitial boost. The frequency of breast failure was not influenced by age, tumor size (all patients had less than 2 cm tumors) and menopausal stage. Local recurrences developed 2.5-3.0 times more often in the case of histologically proven endolymphatic spread, EIC positivity and close resection margins (less than 5 mm). These 3 factors were referred to as "medium risk" factors.

The recurrence became more frequent (4.0-4.5 times) if the histological report described invasive lobular or invasive ductal-lobular carcinoma. If the excised tissue margins were infiltrated, local failure occurred 8 times more often, despite of re-excision. Therefore, the latter 3 factors were referred to as "high risk" factors (Table 1)

Table 1. Probability of local failure after BCS plus radiotherapy

Tumor size	1 x
Menopausal status	1 x
Endolymphatic spread	2.5 x
EIC positivity	3 x
Histology: cc. lobulare invasivum	4 x
cc. lobulare et ductale	4.5 x
Excision margin: free margin	1 x
less than 5 mm	2.5 x
infiltrated margin	8 x

The boost therapy reduces the local failure rate, regardless whether the patients. have risk factors or not, by about 50 %. (Table 2)

Table 2. Local failure rate in patients with and without risk factors according to the type of radiotherapy

Pts. no.	Whole breast radioth.	Whole breast plus boost radioth.
Total 111 pts	6/56 (10.7 %)	3/55 (5.4 %)
Pts. with 2 moderate or 1 high risk factor (n : 29)	6/14 (42.8 %)	3/15 (20.2 %)

The effect of boost radiotherapy on the survival is under analysis now.

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