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Radiation therapy after conservative surgery in the treatment of early breast cancer

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It is now generally accepted that conservative surgery combined with radiation therapy (RT) represents an appropriate alternative to mastectomy in the treatment of stages I and II breast cancer. In accordance with the development of this knowledge, an increasing number of patients have undergone breast conserving therapy (BCT). Between February 1983 and February 1995, 392 patients were treated by RT at the Dept. of Radiation Therapy in Klagenfurt, Austria. 6 MeV photon beams were applied for homogenous radiation of the entire breast, while electrons were used as standard boost technique for tumor site; 126 patients also received adjuvant chemotherapy (CMF standard) , 92 Tamoxifen and 11 both. In February 1995, 316 persons (81%) were alive without evidence of disease, 39 (10%) developed distant metastases and 18 (4.6%) local recurrences. The latter were salvaged by mastectomy, and 13 are still in a complete remission, while 5 have died of progressive tumor disease. By our preliminary estimation, no significant correlation between the proposed risk factors and the local recurrence rate could be detected. Furthermore, a slight decrease in the single daily dose seemed to have no negative impact on the local tumor control. At least the investigating surgeons have not reported any sequel caused by this boost technique up to now.

Key words: breast neoplasms; breast conserving therapy; radiotherapy; treatment outcome

Introduction

Since the opening of the Dept. of Radiation Oncology in Klagenfurt, Austria, 392 patients were treated with RT after conservative surgery up to February 1995. Thirteen departments of surgery all over Carinthia and Styria have referred their women to our institute after BCT. 69% of the patients have been treated with tumorectomy, 31% with quadrantectomy (or extended resection), both including dissection of the axillary lymph nodes. The follow-up examinations after RT are performed by the attending surgeons.

Since 5 to 6 years ago, the radiation oncologists have partly succeeded in emphasizing the importance of clip marks around the tumor bed. Today about 43% of the tumor sites are determined by clips. Altough we are aware of the possibility of geographical miss of the clips we consider this device useful for indicating the extent of the tumor bed. Nevertheless, the duration of follow-up has been too short to allow a comparison.

Up to 1990, we calculated a single dose of 2 Gy at the surrounding isodose of the breast; a maximum of 2.2 Gy was tolerated. In order to reduce acute side effects we reduced the dose per fraction to 1.8 Gy; a maximum of 2 Gy in the cross-point of the central axis (ICRU) should not be exceeded. Three years later the dose/fraction of the e-boost was decreased to 1.7 Gy.

The aim of this retrospective analysis was to prove the results in relation to international data presented. Moreover, we wanted to evaluate the influence of the changes of dose per fraction on the outcome of the patients.

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Methods

Commonly, the radiation treatment starts 3-5 weeks after surgery. In the case of combined adjuvant radio-chemotherapy the RT follows 2-3 weeks after the third cycle of chemotherapy (sandwich-regimen). 6 MeV photon beams have been generated by the same linear accelerator all over the years. From the beginning, dose calculation was done by computer, based on handgraphs and CT-scans.

Up to 1990, 50 Gy - conventionally split into 2 Gy fractions - were applied 5 days per week. This course was followed by 10 Gy e-boost. Afterwards, we introduced the ICRU-guidelines for dose-prescription and limited single dose at a maximum level of 1.8 Gy (surrounding isodose). Later the boost concept has changed too. Dose per fraction is now 1.7 Gy (85% isodose approximately 1 cm deeper than the bottom of the tumor bed). Risk factors that have been identified by other authors are associated with a significantly higher rate of local recurrences (tumor diameter, grading, extensive intraductal component, hormone receptor status, lymphangio-invasion, positive lymphnodes, resection margin). Patients with high risk parameters were treated with 14 Gy, others with 10 Gy. The boost volume plan and the choice of energy depended on clinical (scar, surgeon's report) and radiological findings. In recent years, more and more surgeons use clip marks (MRT-compatible).

Patients and results

The characteristics of our 392 patients are not different from the comparable cohorts. The distribution by histological pattern is as expected: invasive ductal carcinoma prevails with 83%, while invasive lobular breast cancer represents 7% and other subtypes 10%. Eight women (2%) were treated because of *in-situ* carcinomas; Conservative surgery was performed even in stages T3 (1) and T4 (6) disease. In the case of T4 tumors the diameter was small but infiltration of the dermis had been described. Chemotherapy according to the CMF protocol was used in 126 patients while 92 were receiving Tamoxifen 30 mg for at least 3 years.

The examinations after treatment are performed by the attending surgeons, who send their reports frequently. The median follow-up duration was 36 months (range 5 - 184 months) by February 1995. At that time 316 patients (80%) had been alive with no evidence of disease, whereas 10 (2.5%) still suffered from distant metastases; 28 (7%) had died of the disease and 4 of other causes - 34 are lost to follow-up.

Thirty-eight (10%) patients developed distant metastases and 18 (4.6%) local recurrences; 5 of these patients developed both and died of the disease in the meantime. The remaining 13 patients were in complete remission after having been salvaged with mastectomy.

A recurrence in the pre-treated breast was established in 3.7% of women with positive lymph nodes (n=135) and in 5% of those with negative lymph nodes (n=259). Fifteen patients had T1 tumors at the time of diagnosis. Almost all (17) of the local recurrences were invasive ductal carcinomas, 12 were sub-classified as grade 1 or 2. In only 1 case of relapse, tumor cells were found in the post-resection specimen. Hormone receptor status was generally not determined before 1990.

Concerning the cosmetic outcome, 2 cases of complication were reported to and investigated by us. Both patients developed a painful induration of the whole breast after RT - we were unable to detect an association with autoimmunological disorder, diabetes mellitus or others.

Conclusions

1. Referring to our results and experience, there seems to be no need to change our electron boost concept or to introduce another technique. Still, indications for and the value of the boost are uncertain. Perhaps, the on-going prospective randomized trails will be able to provide answers to some of the questions in near future.

2. Surprisingly, our findings do not sustain the conviction, that certain risk factors imply a higher rate of local recurrences.

3. A decrease of the dose per fraction appeared to improve the acute toxicity (less interruptions of the radiation course) and seems to have no influence on th patients' outcome.

4. The results of radiation therapy after breast conserving surgery at the Dept. of Radiation Oncology in Klagenfurt are similiar to those reported in the literature.

5. To-date, we have not been able to obtain all the recent data from the cooperating surgeons in time. A detailed analysis of the data will be presented at the Symposium in Ljubljana in June 1997.

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