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Short Communication

'Dosimetric Breast Size': A New and Useful Parameter for the Prediction of Local Recurrence after Breast Conservative Treatment

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To evaluate the risk of local recurrence following breast-conserving therapy for breast cancer, we measured the distance between each entry point of the irradiation on the surface of the breast in line with the axis of the external and internal tangential fields (dosimetric breast size). 652 breast cancer patients were retrospectively analysed, with a median age of 51 years and a median follow-up of 99 months (range 84–192). There were 50 local recurrences, 44 isolated and 6 associated with nodal recurrence or metastases. The global rates of local recurrence at 5 and 10 years were 5.3% and 9%, respectively (Kaplan–Meier analysis). Following a Cox's multivariate analysis, the only significant and independent parameters related to local recurrence were quality of excision, age at diagnosis and dosimetric breast size. For a small dosimetric breast size (≤ 10 cm), the rate of local recurrence was 14.1 compared with 11.8 for medium dosimetric breast size (> 10 cm– ≤ 12 cm) and 5.2 for large dosimetric breast size (> 12 cm). If the analysis was restricted to only those with complete excision, then the relative risk for a patient with a small dosimetric breast size was three times that for a large breast size. © 1997 Elsevier Science Ltd.

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INTRODUCTION

THE RADIOSURGICAL conservative management of small breast cancers is now well established, both by randomised studies and retrospective series [1–4]. However, the risk factors of local recurrence are not yet completely defined [5–8]; this situation is problematic, since in the latest reports, local recurrence seems to be correlated with an increased risk of metastases and finally an unfavourable long-term prognosis [4, 6–9].

To evaluate the risk of local recurrence we propose a new and practical useful definition of the breast size, based on a dosimetric criterion. For each patient we used the central axis slide (of the breast contour) in the irradiation position. We measured the distance ' d ' (Figure 1) between each entry point on the surface of the breast in line with the axis of the external and internal tangential fields, and defined three categories of dosimetric breast size: small ($d \leq 10$ cm), medium ($10 < d \leq 12$ cm) and large ($d > 12$ cm).

PATIENTS AND METHODS

This new parameter was studied in a retrospective analysis of 652 breast tumours ($T_0T_1T_2 < 3$ cm, N_0N_1) consecutively treated by breast conservative therapy at the Paul Strauss Cancer Centre and at the University Hospital in Strasbourg from January 1980 to December 1988.

The median age of the patients was 51 years with 16.4% younger than 40 years, 56.1% and 27.5% of the patients, respectively, aged 40–60 years and older than 60 years. Non-palpable tumours (T_0 = mammographically screened) represented 14.3% of cases. T_1 and $T_2 < 3$ cm represented, respectively, 42.9 and 35.4% of cases. In 7.4% of cases, the size was not exactly measured. Using the above defined dosimetric breast size we found, respectively, 12.2%, 45.5% and 42.3% of small, medium and large breasts.

Treatment included quadrantectomy (24.7%) or lumpectomy (75.3%), with axillary dissection in 95% of the cases. Histological subtypes were ductal and lobular infiltrating carcinomas in 78.1% and 8.6% of the cases, respectively. Ductal carcinoma *in situ* and other types represented 7.2% and 6.1% of the cases, respectively.

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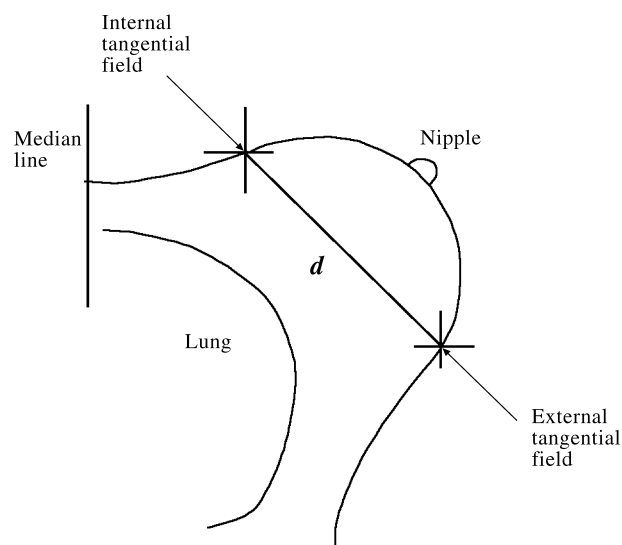


Figure 1. Dosimetric breast size. Small: $d \leq 10$ cm. Medium: $10 < d \leq 12$ cm. Large: $d > 12$.

Excision was complete, incomplete or doubtful and non-specified in 90.2%, 7% and 2.8% of cases, respectively. An associated *in situ* component (adjacent or at distance) was present in 35% of the cases. 25% of the cases had axillary nodal histological involvement.

The whole breast received a median dose of 48 Gy (by cobalt photons), with a 10 Gy boost by a direct electrons field in 98% of the cases.

Adjuvant chemotherapy and/or hormonal treatment was performed in 24.8% and 64% of cases, respectively.

RESULTS

With a median follow-up of 99 months (range 84–192), we observed 50 (7.7%) local recurrence: 44 isolated (6.7%), 6 associated with nodal recurrence or metastases. The global rates of local recurrence at 5 and 10 years were 5.3% and 9.0%, respectively (Kaplan–Meier analysis). Altogether 18 of these 50 women developed metastases (36%). The crude survival rates after local recurrence were 65% and 43% at 5 and 10 years, respectively.

In agreement with other reports [6–9], we analysed clinical, histological and therapeutic factors to predict local recurrence, with the added use of dosimetric breast size.

Table 1. Significant predictive parameters of local recurrence

Parameter	Local recurrence %*	P†
Excision quality		
Complete	7.1	$P < 0.0001$
Incomplete/doubtful	34.0	
Age at diagnosis		
< 40 years	19.4	$P < 0.0001$
40–60 years	8.8	
≥ 60 years	3.8	
Dosimetric breast size		
Small	14.1	$P < 0.01$
Medium	11.8	
Large	5.2	

*Estimated recurrence rate at 10 years. †Log-rank test.

Table 2. Relative risk of local recurrence in women with complete excision, according to age and dosimetric breast size

	Dosimetric breast size		
	Large	Median	Small
Age			
< 40 years	6.7	18.4	20.2
40–60 years	3.5	9.7	10.7
≥ 60 years	1	2.8	3

After a univariate analysis, we concluded that menopausal status, clinical size (*T*), histological subtype, ductal *in situ* associated component, histological grade, multifocality, axillary involvement, type of surgery, total irradiation dose and use of adjuvant treatments do not contribute significantly to local recurrence risk.

After a Cox's multivariate analysis allowing for interactions, the only significant and independent parameters related to local recurrence were: quality of excision, age and dosimetric/breast size (Table 1). The relative risk of local recurrence for each category could thus be estimated. In Table 2 we illustrate these relative risks concerning only the cases with complete excision (more than 90% of cases). We note especially that for a small breast size, the risk of local recurrence is three times the risk for a large breast size.

DISCUSSION

This preliminary report confirms the poor prognosis of local recurrence after breast-conserving therapy [4, 7]. The use of a parameter which improves the prediction of local recurrence is thus of importance as it enables a subset of patients with a high risk of local recurrence to be distinguished. This should have as a consequence the adoption of more aggressive initial therapy (local or systemic treatment) and a closer follow-up (clinical and especially mammographic) to try to discover local recurrence as early as possible, ultimately at the '*in situ*' stage, for these patients.

To our knowledge, until now, only one other study [10] has shown an inverse and significant relation between breast size and risk of local recurrence without, however, any objective and reproducible criteria to define the breast size. This parameter is not only correlated with the quality of excision, but it is plausible that small breast size is an independent risk factor for the development of cancer [11, 12], and also for local recurrence after breast-conserving therapy [10]. This fact may be due to intrinsic features of the tissue of these breasts [11], with a particularly high rate of periductal connective tissue and vessels, unlike large breasts which are principally made up of fat and probably less sensitive to hormonal influences.

In conclusion, we suggest the inclusion of the dosimetric breast size in further studies concerning the precise identification of local recurrence risk after breast-conserving therapy.

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