Impact of screening on breast cancer detection. Retrospective comparative study of two periods ten years apart

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Summary

Objective: The aim of this study was to evaluate changes in the mode of discovery of breast cancer in the last 15 years. We compared two periods separated by a 10-year interval, during which a mass mammographic screening programme was established in our department.

Materials and Method: We made a retrospective comparison of the records of female patients with breast cancer diagnosed in our hospital over the period 1986-1989 (first period) and 1997-1999 (second period). The mass screening programme for breast cancer began in 1995.

Results: We collected 372 patients in the first period and 341 in the second. We found a significant change in the mode of the discovery of breast cancer between the two periods: 80.2% versus 51.9%, respectively, of the cases of breast cancer were discovered by breast self-examination, 10.2% versus 13.7% were discovered by a physician, and 4.8% versus 29.1% were discovered by routine mammography as part of an individual or mass screening programme. The mean size of the tumours decreased significantly (2.6 cm versus 2.3 cm: $p = 0.019$), and the number of tumours with initial metastases or lymph node involvement decreased, almost attaining the level of significance ($p = 0.06$). It is difficult to compare the survival and disease-free survival curves because of the short follow-up in the second period (median follow-up = 10 months). However, a marked difference appears to be developing ($p < 0.0001$): patients diagnosed by mammography are showing better survival and disease-free survival compared with the others.

Discussion: We observed that more widespread use of mammography screening for breast cancer led to smaller tumours being discovered during the second period, with less lymph node involvement and less initial metastasis.

Breast cancer screening is one of the most intensively evaluated health care practices with eight completed randomized trials [1] yet its net benefit has remained controversial [2]. It has been shown that, at least for patients aged 50 to 70, properly organized mass screening for breast cancer led to a reduction in mortality rate [3-5]. However, individual breast self-exam, physician and mammographic screening can interfere with assessment of mass screening programmes in terms of individual benefit. In addition, introducing a mass screening programme may induce opportunistic screening in non-invited age groups and influence health behaviour in the target and non target populations.

A retrospective study was performed to evaluate the mode of discovery, the diagnostic presentation, and prognostic factors in breast cancer in a French department before and after initiation of a mass-screening programme (MSP).

Key words: Breast cancer; Screening; Mammography.

Materials and Methods

We conducted a retrospective study, analysing the records of all patients who had been treated for primary breast cancer in the oncology unit of our hospital. A MSP was set up in our department in 1995.We focussed on two periods, one before the MSP including patients whose diagnosis of breast cancer was made between 1986 and 1989 (group 1), and the other after the beginning of the MSP including patients diagnosed between 1997 and 1998 (group 2). Group 1 included patients collected over four years versus a two-year period for group 2 in order to have an equivalent number of cases in each period. All the patients included in the study had the following initial studies: liver ultrasound, chest X ray, and bone scan.

All patients included in the study had a primary uni- or bilateral breast cancer. The patients with metastatic tumour to the breast or local recurrence of a previously diagnosed breast cancer were excluded.

Patient characteristics, presented in Table 1, were collected from each patient's chart.

Clinical data such as tumour size (T) and clinical lymph node status were poorly documented within group 1 patient charts, therefore pathological data (pT and pN) were used for the two groups. We could not include any assay of tumour hormone receptors since the assay was not sufficiently performed in group 1.

The data were collected and analysed with a computer database (Medlog®). Qualitative comparisons were made using the Chi^2 test, and quantitative data were compared using the Student's t test. All p values were two-tailed and considered significant when less than 0.05. Overall survival and disease-free survival (DFS) were calculated using the Kaplan-Meier method together with 95% confidence intervals (CI). Group comparisons were made using the Mantel-Haenszel log-rank test. Overall survival was calculated from the date of diagnosis to death. DFS was calculated from the date of diagnosis to time of first relapse or to last follow-up.

Results

Three hundred and seventy-two patients were included in group 1 and 341 in group 2. Median age was 60 years and 9 months in group 1 and 61 years and 3 months in group 2, with no statistical difference. The only significant

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Table 1. — *Data collected from patient records.*

Patient characteristics
- Age
- Personal history of breast disease
- Family history of breast cancer
- Parity
- Menopausal status

Clinical presentation
- Breast self examination: lump in the breast, cutaneous inflammation, retraction of skin, mastodynia, nipple discharge, Paget's disease, cutaneous ulcer etc.
- Discovered by a physician during a routine physical examination or during assessment of a metastasis, axillary adenopathy or another sign.
- Discovered by mammography for individual or mass screening

Tumour characteristics
- Clinical lesions
- Non clinical lesions (absence of any clinical sign of a tumour)
- Inflammatory lesions

Pathological characteristics
- Histologic type
- Size of lesion (pT)
- Number of lymph nodes removed during axillary dissection
- Number of lymph nodes involved (pN)
- SBR grading

Treatment
- None
- Surgery
- Radiotherapy
- Chemotherapy
- Hormonal therapy

Status at last visit
- Alive, without cancer
- Alive, with cancer (local recurrence or metastasis)
- Dead, due to cancer
- Dead, due to another cause
- Lost to follow-up

difference noted for the patients' characteristics was in the frequency of a family history of breast cancer, which was higher in group 2 (26% vs 17%; p = 0.011).

Table 2 shows the various modes of breast cancer presentation in the two groups. There was a significant difference in the mode of detection during the two periods. During the first period, less than one cancer in 20 was detected by mammography versus one in four during the second period. Breast self-examination was the most frequent detection mode of breast cancer in both periods, however this mode was less frequent in the second period (80.2% vs 51.9%; $p < 10^{-16}$).

Non-clinical tumors (T0) were less frequent in the first group (5.7% vs 27.7%; $p < 10^{-12}$). Clinical cancers were lower in the second group (73.4% vs 92.2%; $p < 10^{-10}$). There was no significant variation in the incidence of inflammatory cancer (2.1% in group 1 and 0.9% in group 2).

Table 3 shows the cancer histologic types. In situ and micro-invasive lesions were rarer in group 1 but the difference was not statistically significant.

Pathological data are summarized in Table 4. There was a significant difference in the size of the lesions found in the two groups, with more lesions less than 2 cm in group 2. There were significantly more pT3 tumours and fewer pT1 tumours in group 1. There was no significant difference in the incidence of pT2 tumours. More lymph nodes were removed during lymphadenectomy in the second group (11.1 vs 9.3; $p < 0.001$). Fewer patients had lymph node involvement in group 2; the difference was close to statistical significance (p = 0.06). The difference of grade 2 Scarf Bloom Richardson (SBR) lesions was significant, with fewer such lesions in group 2. Lastly, fewer metastases were initially diagnosed in group 2; the difference was close to statistical significance (p = 0.06).

Table 2. — *Mode of discovery of breast cancers in the two groups.*

Diagnosis mode	Group 1 (n = 372)		Group 2 (n = 341)		p
Discovered by the patient					
Self-palpation of a lump	n = 274 (73.7%)		n = 153 (44.6%)		
Cutaneous ulcer	n = 0		n = 2 (0.6%)		
Cutaneous inflammation	n = 2 (0.5%)	80.2%	n = 3 (0.9%)	51.9%	$< 10^{-16}$
Skin or nipple retraction	n = 7 (1.9%)		n = 2 (0.6%)		
Mastodynia	n = 13 (3.5%)		n = 12 (3.5%)		
Nipple discharge	n = 2 (0.5%)		n = 4 (1.2%)		
Discovered by a physician					
Physician examination	n = 13 (3.5%)		n = 12 (3.5%)		
Gynaecologist examination	n = 10 (2.7%)		n = 19 (5.54%)		
Hospital physical examination	n = 6 (1.6%)	10.2%	n = 9 (2.62%)	13.7%	NS
Assessment of metastasis	n = 5 (1.3%)		n = 6 (1.75%)		0.14
Assessment of axillary nodes	n = 4 (1.1%)		n = 1 (0.29)		
Discovered by mammography					
Individual screening	n = 18 (4.8%)	4.8%	n = 67 (19.5%)	29.1%	$< 10^{-18}$
Mass screening	n = 0		n = 33 (9.62%)		
Unknown					
Missing data	n = 18 (4.8%)	4.8%	n = 18 (5.25%)	5.25%	NS

Table 3. — *Histologic type of breast tumors in the two groups.*

Carcinoma	Group 1		Group 2		p
Infiltrative duct	295 (84.8%)		264 (80%)		
Infiltrative lobular	27 (7.8%)		35 (10.6%)		
Infiltrative duct and lobular	3 (0.9%)		3 (0.9%)		
Gelatiniform	5 (1.4%)		3 (0.9%)		
Encephaloid	4 (1.1%)	341	3 (0.9%)	314	
Tubular	1 (0.3%)	98%	4 (1.2%)	95.8%	
Undifferentiated	4 (1.1%)		1 (0.3%)		NS
Scirrhous	2 (0.6%)		0		p = 0.09
Lymphoma	0		1 (0.3%)		
In situ duct carcinoma	7 (2%)	7	11 (3.3%)	14	
In situ tubular carcinoma	0	2%	1 (0.3%)	4.2%	
Micro invasive duct carcinoma	0		2 (0.6%)		
Data missing from records	24 (6.4%)		13 (3.8%)		NS

Tumor differences among the mode of discovery are summarized in Table 6. Cancers discovered by mammography were smaller, with fewer nodes and less metastatic involvement.

Table 4. — *Pathological characteristics of the two groups.*

	Group 1	Group 2	p
Size of tumour (SD)	2.6 cm (1.7)	2.3 cm (1.6)	p = 0.019
pT1	115 (38.3%)	138 (46.6%)	p = 0.044
1a and b (< 1 cm)	20 (19%)	35 (25.4%)	
1c (from 1 to 2 cm)	95 (81%)	103 (74.6%)	
pT2	151 (50.5%)	141 (47.6%)	NS
Between 2 and 3 cm	84 (55.6%)	93 (66%)	
Between 3 and 5 cm	67 (44.4%)	48 (33%)	
pT3	33 (11%)	17 (5.7%)	p = 0.014
Lymph node involvement			
pN0	145 (46.9%)	165 (54.5%)	NS
pN1	164 (53.1%)	138 (45.5%)	(p = 0.06)
SBR grade			
SBR 1	38 (14.2%)	56 (20.8%)	
SBR 2	188 (71.1%)	150 (55.8%)	0.0026
SBR 3	42 (15.7%)	63 (23.4%)	
Metastases at time of diagnosis			
M0	294 (87%)	230 (92.4%)	NS
M1	28 (8.3%)	15 (6%)	(p = 0.06)
Mx	16 (4.7%)	4 (1.6%)	

Table 5. — *Treatments used in the two groups.*

	Group 1	Group 2
No treatment	3 (0.9%)	1 (0.3%)
Surgery	323 (86%)	316 (92.7%)
– conservative	133 (41.2%)	161 (50.9%)
– radical	190 (58.8%)	155 (49.1%)
Radiotherapy	199 (57%)	199 (61.4%)
Chemotherapy	46 (13.2%)	116 (35.8%)
Hormonal therapy	127 (36.4%)	116 (35.8%)

Table 6. — *Tumour size, lymph node involvement and metastases, and mode of discovery (Groups 1 and 2 together)*

	Tumour size (mean ± SD)	Lymph node involvement	Metastases at diagnosis
Breast self examination	2.7 ± 1.7	39.4%	10.1%
Discovered by a physician	2.2 ± 1.6	42.2%	24.3%
Discovered by mammography	1.8 ± 1.2	26%	3.4%
p	< 0.001	0.027	0.0036

Table 5 shows treatments administered to the patients. It can be seen that there was a marked change in the therapeutic habits with a very notable increase in the use of chemotherapy. Surgical treatment became more and more conservative.

A comparison of survival and DFS in the two groups (Figures 1 and 2) was limited by the fact that the follow-up period for the second group was very short (median follow-up = 10 months). A comparison was made of the survival and the DFS as a function of the detection mode (Figures 3 and 4). Survival and DFS were better for patients whose tumor was discovered by mammography than by other modes; the difference reached significance for survival by mammographic versus physician exam detection (p = 0.0015) and for DFS for mammographic versus breast self-examination (p = 0.0064).

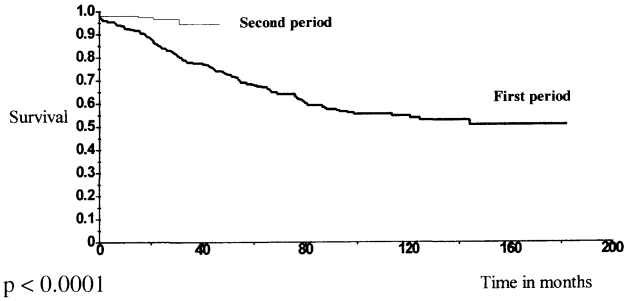

Figure 1. — Overall survival for the two periods.

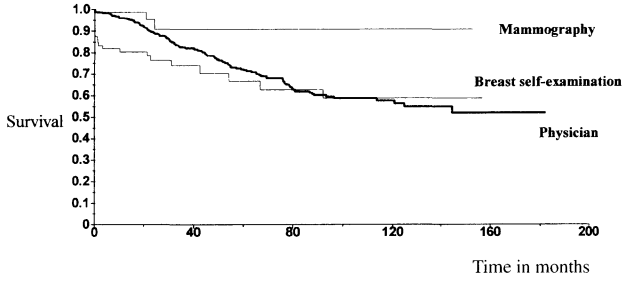

Figure 2. — Overall survival for the three modes of discovery.
Mammography versus breast self-examination: p = 0.1293.
Mammography versus physician: p = 0.0015.
Physician versus breast self-examination: p = 0.0862.

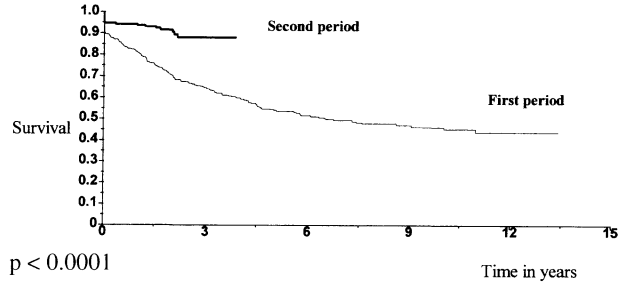

Figure 3. — Disease-free survival for the two periods.

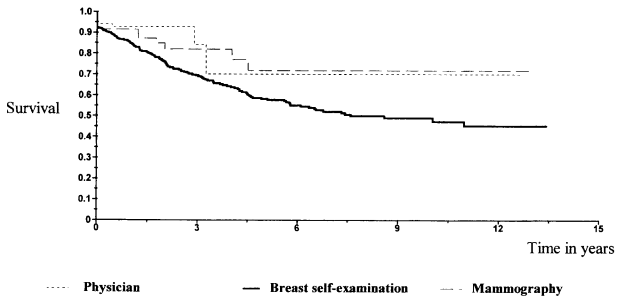

Figure 4. — Disease-free survival for the three modes of discovery.
Mammography versus breast self-examination: p = 0.0064.
Mammography versus physician: p = 0.4468.
Physician versus breast self-examination: p = 0.037.

Discussion

A study comparing the mode of detection of breast cancer retrospectively during two periods sustains some bias. The main bias is the difference in data collection and practices during the two periods. This discrepancy was limited to some extent by conducting the study in a single center. A comparison of the two population's characteristics did not reveal any difference other than with respect to family history of breast cancer. Such a difference might seem surprising, but could be due to a gradual increase in the incidence of breast cancer in our country [6]. It is also possible that this information was collected more assiduously in the second period than in the first. By studying the circumstances surrounding the discovery of breast cancer we found that, even nowadays, more than half the cases of breast cancer have been identified by the patients themselves: this agrees with the figures reported by other authors [7, 8]. Breast self-examination plays a predominant role, although, numerous studies have stressed that self-examination is neither very sensitive nor specific [9]. Breast self-examination has proven incapable of reducing the mortality rate due to breast cancer [10, 11], probably since it only allows the detection of tumours of an already appreciable size (2.7 cm in our study) which, in many cases, have already metastasized and spread to the lymph nodes. In the case of our study, this is illustrated in Table 6. All the tumours discovered by mammography had criteria that indicated a more favourable prognosis: they were smaller [12, 13] and had less lymph node involvement and/or metastasis.

Currently, one cancer in four is today discovered at a nonclinical stage whereas the corresponding figure was one in 20 ten years ago. By definition, nonclinical cancers are not discovered by the patient or physician (or accidentally) – they are identified by mammography screening programmes. This is very likely the most positive effect of introducing mammography into screening for breast cancer. Even though the impact of changes in the mode of breast cancer discovery on the mortality related to this disease and the DFS could not be well evaluated in our study because of the lack of adequate follow-up after the second period, it can be assumed that the increase in T0 cancer and decrease in mean tumour size at the time of diagnosis will subsequently confirm the improved survival of patients in the second period. The increase in T0 cancer cases was accompanied by a tendency to discover more in situ or micro-invasive lesions, although the difference was not statistically significant. The reduction in N+ and M+ tumours in the second period was not significant but almost attained the level of significance for both items (p = 0.06): this trend also indicates a better prognosis for tumours diagnosed nowadays.

The number of lymph nodes removed during axillary lymphadenectomy was higher in group 2. It has been shown that the greater the number of lymph nodes removed, the greater the axillary invasion [14, 15]. This may have led us to underestimate the amount of lymph node involvement during the first period. We note, therefore, that our lymphadenectomies were increasingly complete and less and less positive, thereby producing a greater reduction in the number of N+ patients during the second period.

There is a bias in the comparison of the SBR grades between the two groups as pathologists have modified the grading evaluation during these 15 years.

The trend in surgical treatment towards more conservative interventions is related to two points. Firstly tumours diagnosed today are often smaller, warranting more conservative surgery. Secondly, it is now established that conservative surgery associated with radiotherapy does as well as mastectomy for small tumours in terms of survival and local control [16].

Because there have been significant changes in the method of breast cancer treatment these past 15 years, it would not be accurate to attempt a comparison of the impact of the mode of discovery on survival between the two periods.

In conclusion, this study confirmed that changes in health care attitude with a more widespread use of mammography in individual or mass screening programmes for breast cancer is having its expected effect. The tumours discovered today are smaller and tend to have fewer metastases and less lymph node involvement at the time of diagnosis. However the majority of breast cancers in our country are still discovered by breast self-examination. Thus the patient's role in detection remains very important and must lead us to envisage new strategies for breast cancer screening, involving patients to a greater degree.

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