



The introduction of mammographical screening has had little effect on the trend in breast-conserving surgery: a population-based study in Southeast Netherlands

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Abstract

In addition to reducing breast cancer mortality, breast cancer screening programmes are expected to increase the proportion of patients who can undergo breast-conserving surgery. Trends in the use of breast-conserving surgery (BCS) in Southeast Netherlands between 1990 and 1998 were studied in relation to the gradual introduction of mammographical screening for women 50–69 years of age between 1992 and 1996. The characteristics of the tumours detected by the screening programme or outside of the programme were compared, to see whether this might clarify the observed trends. In the period 1990–1998, 4788 patients were diagnosed with invasive, operable breast cancer, of whom 2341 were 50–69 years of age. Although the screening programme resulted in a larger proportion of patients with small tumours and more favourable tumour characteristics, no increase was observed in the use of BCS for patients 50–69 years of age in the period 1990–1998 (64% in 1990 and 1998). Patients with a screening-detected tumour, however, were more likely to undergo breast conservation compared with those presenting clinically (68% versus 54%; $P < 0.0001$). In conclusion, no increase in the proportion of breast-conserving surgical procedures was observed in Southeast Netherlands among patients 50–69 years of age in the period 1990–1998, during the introduction of mass mammographical screening for this group. Screening, however, resulted in a larger proportion of patients with small tumours with more favourable characteristics, who are better candidates for breast conservation. © 2001 Elsevier Science Ltd. All rights reserved.

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1. Introduction

In the 1980s, randomised trials provided evidence that the majority of women with stage I or II breast carcinoma—with an adequate tumour-to-breast ratio and absence of multicentricity or diffuse microcalcifications—are eligible for breast-conserving surgery (BCS). Since the publication of these trials and subsequent

consensus development, significant increases have been observed in the use of BCS [1–7].

In Southeast Netherlands, the proportion of patients with an operable, non-metastasised breast tumour ≤ 5 cm in diameter undergoing BCS increased from 31% in 1984 to 60% in 1989 [7]. In 1990, mass mammographical screening for breast cancer was introduced for women 50–69 years of age. In addition to reducing breast cancer mortality, breast cancer screening is expected to increase the proportion of patients who can undergo BCS [8,9]. We studied the effect of mammographical screening on the use of BCS in the period 1990–1998 in women with invasive breast cancer and

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analysed and compared the characteristics of the tumours detected by the screening programme or outside of the programme, to see whether this might clarify observed trends.

2. Patients and methods

2.1. Patients

Southeast Netherlands, a region of approximately 2500 km² with a population of approximately one million inhabitants (6% of the Dutch population), is served by seven community hospitals and one department of radiotherapy. The region is covered by the population-based Eindhoven Cancer Registry, which has been collecting data on all cancer patients since 1955 according to international guidelines. Data are obtained from the clinical records and the pathology reports. Since 1984, more detailed information has been recorded for each woman diagnosed with breast carcinoma, such as type of surgery, mammographical findings and data on tumour stage. A mammographical screening programme, offering biannual screening for women 50–69 years old, was gradually introduced in Southeast Netherlands in 1990 and reached total coverage in 1996.

The regional Breast Cancer Study Group has been responsible for the development of guidelines for the management of breast cancer since 1978. In 1981, breast-conserving therapy was added to the guidelines for patients with tumours measuring ≤ 2 cm on the mammogram. In 1984, the indication was extended to those ≤ 3 cm. According to current guidelines, breast-conserving therapy should consist of wide local excision of the tumour with a tumour-free margin of at least 1 cm, axillary dissection, radiotherapy directed towards the whole breast and an additional (booster) dose to the original tumour site. For patients who did not meet the criteria for breast-conserving therapy (i.e. tumour > 3 cm, diffuse microcalcifications, multicentricity, inadequate tumour-to-breast ratio), a modified radical mastectomy was recommended.

Data from the Eindhoven Cancer Registry were used to assess changes in the choice of BCS for patients with operable, invasive breast cancer between the start of the breast cancer screening programme in 1990 and 1998. In the current study, all types of surgery aimed at preservation of the breast were considered as BCS. Between 1 January 1990, and 31 December 1998, 5409 patients with invasive breast cancer were diagnosed. The patients were staged according to the TNM system of the Union Internationale Contre le Cancer (UICC) [10]. After exclusion of 621 patients with direct extension of the tumour to the chest wall or skin, inflammatory cancer (T4 classification) and/or clinical signs of distant metastases (M1 classification), 4788 patients with clin-

ical stage I (T₁N₀M₀), stage IIA (T₁N₁M₀; T₂N₀M₀), stage IIB (T₃N₀M₀; T₂N₁M₀) or stage IIIA (T₃N₁M₀; T₁₋₃N₂M₀) remained available for analysis. The general characteristics of the patients are presented in Table 1.

2.2. Methods

The proportion of patients undergoing BCS was studied for the total group and according to age group (< 50 years, 50–69 years, ≥ 70 years) and pathological tumour size. The Chi-square test was used to detect differences in the proportion of patients receiving BCS between years of diagnosis. The Chi-square test was also used to compare the characteristics of the tumours detected by the screening programme or outside of the programme for the age group 50–69 years.

Table 1
Characteristics of patients with breast cancer, diagnosed in the period 1990–1998 ($n = 4788$)

Characteristic	<i>n</i> (%)
Age (years)	
< 50	1295 (27)
50–69	2341 (49)
≥ 70	1152 (24)
Year of diagnosis	
1990	366 (8)
1991	417 (9)
1992	439 (9)
1993	522 (11)
1994	524 (11)
1995	602 (13)
1996	643 (13)
1997	632 (13)
1998	643 (13)
Pathological tumour size, pT (cm)	
≤ 1.0	742 (15)
1.1–2.0	2003 (42)
2.1–3.0	1099 (23)
> 3.0	639 (13)
Unknown	305 (6)
Pathological nodal status, pN	
pN–	2711 (57)
pN+	1656 (35)
Unknown	421 (9)
Type of surgery	
Breast conservation	2537 (53)
Mastectomy	2157 (45)
No surgery	92 (2)
Unknown	2 (<1)
Axillary lymph node dissection	
Yes	4415 (92)
No	370 (8)
Unknown	3 (<1)
Radiotherapy	
Yes	3110 (65)
No	1660 (35)
Unknown	18 (<1)

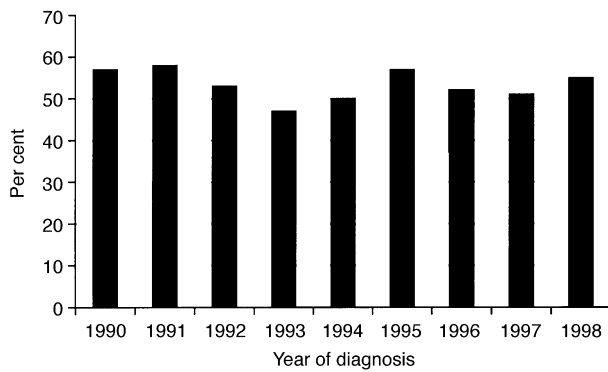


Fig. 1. Proportion of patients undergoing breast-conservative surgery, according to the year of diagnosis. Period 1990–1998 ($n=4788$).

3. Results

3.1. General characteristics

Of the patients with operable and non-metastasised invasive breast cancer diagnosed in the period 1990–1998, 53% underwent BCS, 45% a modified radical mastectomy and 2% had no surgery (Table 1).

3.2. Trends in breast-conserving surgery

The proportion of patients with invasive breast cancer undergoing BCS first decreased from 58% in 1991 to 47% in 1993 ($P=0.001$), rose again to 57% in 1995 ($P=0.002$) and varied between 51 and 55% thereafter (Fig. 1). In these years, the absolute number of patients undergoing BCS rose from 208 in 1990 to 260 in 1994, increased sharply to 341 in 1995 and remained at that level in the 3 following years.

Among patients <50 years, the proportion undergoing BCS decreased from 67% in 1990 to 52% in 1993 ($P=0.01$) and varied between 53 and 61% in the following years (Fig. 2a). The trend for the age group of 50–69 years showed a similar pattern: a decrease from 64% in 1990 to 51% in 1993 ($P=0.003$), an increase to 64% in 1995 ($P=0.002$) and a more or less stable rate around 60% thereafter (Fig. 2b). The gradual introduction of the screening programme for this age group is reflected by the increase of the proportion of screen-detected breast cancers from 4% in 1991 to 50% in 1996 (Fig. 2b). Among patients aged 70 years or older the proportion who had BCS was 45% in 1991 and 1992 and varied between 30 and 40% from 1993 until 1998 (Fig. 2c).

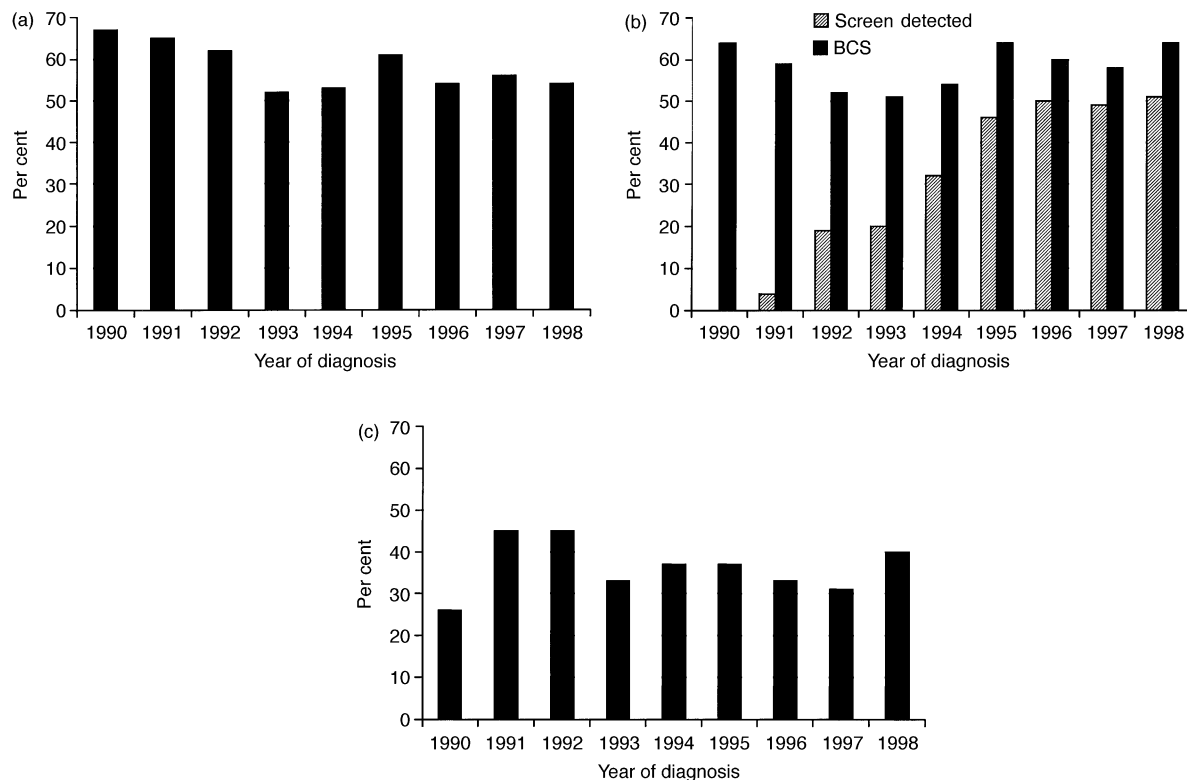


Fig. 2. (a) Proportion of patients aged <50 years undergoing breast-conservative surgery (BCS) according to the year of diagnosis. Period 1990–1998 ($n=1295$). (b) Proportion of patients aged 50–69 years with breast cancer detected by the breast cancer screening programme and the proportion undergoing BCS according to the year of diagnosis. Period 1990–1998 ($n=2341$). (c) Proportion of patients aged ≥70 years undergoing BCS, according to the year of diagnosis. Period 1990–1998 ($n=1152$).

Table 2

Characteristics of screening-detected and non-screening-detected breast cancer in patients aged 50 to 69 years, diagnosed in the period 1990–1998 ($n = 2334$)

Characteristic	Method of detection		<i>P</i> value
	Screening detected ($n = 784$)	Non-screening detected ($n = 1550$)	
	% (<i>n</i>)	% (<i>n</i>)	
Pathological tumour size, pT (cm) ^a			
≤1.0	32 (239)	14 (209)	<0.0001
1.1–2.0	50 (379)	43 (631)	
2.1–3.0	12 (91)	26 (384)	
>3.0	6 (43)	16 (240)	
Number of positive lymph nodes ^b			
0	74 (555)	60 (873)	<0.0001
1–3	19 (142)	24 (346)	
>3	6 (48)	16 (228)	
Oestrogen receptor ^c			
Positive	84 (430)	72 (854)	<0.0001
Negative	16 (84)	28 (333)	
Progesterone receptor ^d			
Positive	77 (261)	50 (524)	<0.0001
Negative	23 (76)	41 (364)	
Breast-conserving surgery ^e			
Yes	68 (531)	54 (838)	<0.0001
No	32 (253)	46 (711)	

Information on the mode of detection was missing for 7 patients.

^a 118 missing.

^b 142 missing.

^c 633 missing.

^d 1109 missing.

^e 1 missing.

3.3. Tumour characteristics

Among the patients of 50–69 years those diagnosed by the screening programme had smaller tumours ($P < 0.0001$), were less likely to have positive lymph nodes ($P < 0.0001$) and had a smaller number of involved lymph nodes when node-positive ($P < 0.0001$); they were also more likely to have oestrogen and progesterone receptor positive tumours ($P < 0.0001$) compared with the patients who had not been diagnosed by

the screening programme (Table 2). Of the patients with a screening-detected tumour, 68% had BCS, compared with 54% of those with a tumour which had been detected outside of the screening programme ($P < 0.0001$) (Table 2).

An analysis of the trend in the distribution of tumour size showed a significant increase in the proportion of tumours of 2 cm or less from 56% in 1990 to 70% in 1998 among patients aged 50–69 years (Fig. 3). Among patients <50 years of age, the proportion of tumours of 2 cm or less did not change and was 60% in 1990 and 58% in 1998.

4. Discussion

In Southeast Netherlands, the proportion of patients undergoing BCS has not changed significantly since the introduction of a breast cancer screening programme in 1990. An analysis according to age group revealed almost similar trends for patients <50 years and those 50–69 years of age.

Only a few studies have described the effect of breast cancer screening on breast-conserving therapy [3,11–15]. In the period 1996–1998, about 50% of the newly diagnosed breast cancers in Southeast Netherlands in the age group 50–69 years were screening detected. In

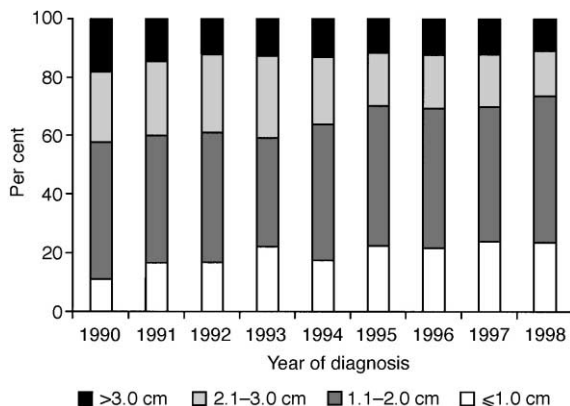


Fig. 3. Distribution of pathological tumour size in patients aged 50–69 years according to the year of diagnosis. Period 1990–1998 ($n = 2223$).

common with other studies, patients detected at screening had smaller tumours and were less likely to have axillary nodal involvement [16–21]. Cowan and colleagues concluded that breast cancers diagnosed at screening do not differ biologically from those presenting clinically, but that they are the same lesions detected at an earlier stage of their natural history [22]. In the current study, 68% of the patients with screening-detected tumours underwent BCS compared with 54% of the patients with tumours detected outside of the screening programme, indicating that the more favourable tumour stage made them better candidates for breast conservation. Despite the greater likelihood of patients with screening-detected tumours undergoing BCS, no significant increase was observed in the proportion of BCS for the group as a whole between 1990 and 1998. Apparently, the earlier detection by screening was counterbalanced by a shift towards mastectomy, following the peak of BCS in the early 1990s. The decrease in the use of BCT in the early 1990s could be explained by several factors. First, young age has been shown to be a risk factor for local recurrence after breast conservation in many studies [23–31]. Second, the identification of the *BRCA 1* and *BRCA 2* genes has led to a growing awareness among surgeons and patients of familial breast cancer, and especially younger patients are likely to be affected by one of these mutations [32,33]. Third, growing attention has been given in the literature to other risk factors for local recurrence after BCS, such as the presence of an extensive intraductal component [24,34,35].

In conclusion, no increase in the proportion of breast-conserving surgical procedures was observed in South-east Netherlands among patients 50–69 years of age in the period 1990–1998, during the introduction of mass mammographical screening for this group. Screening, however, resulted in a larger proportion of patients with small tumours with more favourable characteristics, who are better candidates for breast conservation.

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