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Report

Pain experienced by women attending breast cancer screening

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Summary

The purpose of this study was to evaluate the pain experience of women during mammography for breast cancer screening. Possible associations with personal and medical history, sociodemographics and/or situational factors were studied. It was also investigated whether this pain influenced the intention to return for future breast cancer screening. In the Netherlands, women between 50–75 years are invited for screening every two years. A total of 1200 participants were asked to fill up a questionnaire. The response rate was 79.5% ($n = 954$), and 945 questionnaires contained adequate information for analyses. A total of 689 women (72.9%) described mammography as mild to severely painful. In this group, compared to the group that reported no pain, the following factors occurred significantly more often: sensitive breasts ($P = 0.001$), family history of breast diseases ($P = 0.017$), expected pain based on former mammography ($P = 0.001$), high education ($P = 0.008$), anxiety ($P = 0.001$), breast sensitivity in last three days ($P = 0.001$), insufficient attention of technologist ($P = 0.001$). Other factors like age, hormonal status, breast size and hormone use were not associated with the pain experienced. Thirty-two women (3.3%) indicated that they would not attend further screening, 25 (2.6%) reported that the pain might deter them, six women (0.6%) had other reasons, one woman (0.1%) was sure not to come because of severe pain. In conclusion, a large majority of women attending breast cancer screening describes mammography as painful (72.9%). Factors associated with pain were described. Relatively few women (2.7%) indicated that the pain might deter them from future mammography. Recommendations are given to reduce the pain experienced during screening mammography.

Introduction

Successful reduction of breast cancer mortality depends primarily on early detection, ideally while the lesion is still clinically occult [1]. Screening mammography is the most sensitive and reliable method for early detection. In order to achieve a reduction in mortality from breast cancer, it is essential that there is a high attendance rate of women in the population who are offered screening [2–6]. A certain amount of compression of the breast is necessary to improve image quality, to separate overlapping structures, to reduce motion artifact, and to decrease the radiation dose [7]. For most women, breast compression is an uncomfortable experience [8, 9]. Some women report severe pain and even consider not returning for a future screening round [8, 10]. There has been growing interest in the pain experienced by women undergoing mammography in the news media, among patient groups and in nursing journals [11, 12]. Compared to the huge amount of breast cancer literature, relatively little has been written about pain during mammography in the medical journals. As early detection proved to be important in reducing mortality due to breast cancer and women may not attend breast cancer screening because of pain, investigation of the experienced pain is desirable. This descriptive study was designed to determine the prevalence and intensity of pain experienced by women undergoing screening mammography. The presence of possible associated factors was investigated. The degree of alleged pain as a deterrent for screening mammography further also was investigated.

Patients and methods

In the Netherlands, every woman between 50 and 75 years old is invited for breast cancer screening with an interval of two years. During the months of September and October of 1998, 1200 women participating in screening mammography were asked to complete a questionnaire. This questionnaire consisted of 25 items: 22 multiple choice questions and three open questions. Information was gathered about personal and medical history factors, sociodemographics and situational factors. Personal and medical history factors measured were: age (≤ 54 years; 55–59 years; 60–64 years; 65–69 years; ≥ 70 years), hormonal status (premenopausal: periodical menstruation; menopausal: last menstruation < 1 year ago; postmenopausal: last menstruation ≥ 1 year ago; hysterectomy), breast size (small: AA–A; small-medium: B; medium: C; medium–large D; large: DD-G), Quetelet index (body mass index or weight/lenght^2), sensitive breasts (subjective recorded by 'yes', 'sometimes' or 'no'), previous breast surgery ('yes' or 'no'; if yes: reason for surgery?), hormone use ('yes' or 'no'; if yes: kind of hormone?), family history of breast diseases ('yes' or 'no'; if yes: malignant and/or benign?) and expected pain (expectation: 'no pain', 'little pain', 'moderate pain', 'severe pain'). Sociodemographic factors recorded were education (low ≤ 6 years; low–moderate 6–10 years; moderate-high 10–12 years; high > 12 years), marital status ('married', 'not married', 'divorced', 'widow') and ethnic background ('Dutch' or 'other'). Situational variables measured were anxiety (subjective recorded: 'yes' or 'no'), breast sensitivity in past three days ('yes' or 'no'), last menstruation < 7 days ago (date of last menstruation), preceding information ('former mammography', 'friends or family', 'doctor or other health worker', 'brochure', 'newspaper, journal or TV', 'other: namely . . . '), attention of technologist (subjective recorded: 'sufficient attention', 'insufficient attention' or 'don't know') and the number of images made. The finding of a suspect lesion on the mammogram was recorded. The pain experienced was rated by a four-point pain scale ('no pain', 'little pain', 'moderate pain', 'severe pain') [10, 13]. It was also asked whether the participant intended to attend further screening mammography when invited. The questionnaire ended with the possibility to write down remarks and a declaration of consent. It could be completed immediately in the screening unit or could be taken home and returned by mail.

All examinations were performed by one of the 11 female technicians who have specialized in breast imaging. The women were instructed as to the nature of the mammography prior to commencing. Mammography was performed with a Philips Mammo Diagnost BC (Philips Medical Systems, Hamburg, Germany) using Kodak Min-R2190 screens and Kodak Min-R2 films (Eastman Kodak Company, Rochester, USA).

Breast compression was achieved by the use of a motorised foot-plate, leaving the technicians' hands free for positioning the breast. The technicians compressed the breast as much as was required, and was tolerated, to obtain an optimum image. During the first screening round, oblique and craniocaudal views were obtained. During further screening rounds, which took place every two years, only oblique views were taken. Additional views were obtained if the technical adequacy of the images was not satisfactory. The mammogram was judged immediately by a radiologist and if necessary additional views were taken directly. So none of the participants had to return for additional views.

Statistical analyses were performed using the Chi-square test. P-values ≤ 0.05 were considered to be statistically significant.

Results

A total of 954 questionnaires was returned (79.5%), nine were excluded because the question about the pain experienced was not answered. Therefore, the analyses were performed on 945 questionnaires. The mean age of the participants was 59.4 years (range 49.7–75.7 years). Table 1 lists the population characteristics.

As shown in Table 2, 72.9% of the women reported experiencing pain during mammography, where 9.3% of these women reported severe pain.

Women with a medical history of sensitive breasts reported significantly more pain than women without sensitive breasts, 78.0% versus 68.7% ($P = 0.001$). The same was valid when there was a family history of breast diseases, 76.2% versus 71.7% ($P = 0.017$). Age, hormonal status, breast size, Quetelet index, breast operations and hormone use were not associated with pain. Anticipation predicted the actual experienced pain among women who previously underwent mammography. When expectations were based on other sources, there was no association

Table 1. Population characteristics of 945 women attending breast cancer screening

		n	%
Age	≤ 54	342	36.2
($n = 945$)	55–59	204	21.6
	60–64	161	17.0
	65–69	116	12.3
	≥ 70	122	12.9
Education	Low	232	25.5
($n = 909$)	Low–moderate	391	43.0
	Moderate–high	172	18.9
	High	114	12.6
Marital stage	Married	725	77.0
($n = 941$)	Not married	45	4.8
	Divorced	64	6.8
	Widow	107	11.4
Ethnic background	Dutch	913	97.0
($n = 941$)	Other	28	3.0
Hormonal status	Premenopausal	146	15.5
($n = 943$)	Menopausal	53	5.6
	Postmenopausal	584	61.9
	Hysterectomy	160	17.0
Hormone use	Yes	103	10.9
($n = 945$)	No	842	89.1
Breast size	AA or A	98	10.6
($n = 929$)	B	372	40.0
	C	266	28.6
	D	151	16.3
	DD - G	42	4.5

Table 2. Pain experienced during screening mammography ($n = 945$)

	n	%
No pain	256	27.1
Little pain	397	42.0
Moderate pain	204	21.6
Severe pain	88	9.3

between actual experienced pain and expected pain. Women with a higher education reported significantly more often painful mammography than those with a lower education ($P = 0.008$). The percentage of women with pain increased with the years of education: ≤ 6 years 62.9%, 6–10 years 72.9%, 10–12 years 74.4% and > 12 years 80.1%. Marital status and ethnic background were not associated with the reported pain. The following situational factors were significantly associated with pain: anxiety, present among 87.2% versus not present among 71.1% of the women ($P = 0.001$); breast sensitivity in the past three days, 89.8% versus 71.4% ($P = 0.001$); and insufficient attention given by technologist, 88.2% versus 72.3% ($P = 0.001$). Last menstruation < 7 days ago, preceding information, and the number of images that were made, were not related to pain. Also the presence of a suspect lesion on the mammogram was not related to pain experience. Table 3 summarizes all factors significantly related to the experienced pain. In response to the question whether the respondent would attend future screening mammography when invited, 25 (2.6%) women answered that the pain might deter them. One woman (0.1%) indicated to be sure not to attend further mammography because of severe pain. Six women (0.6%) indicated that they probably would not attend because of other reasons.

Table 3. Factors associated with the pain experienced during screening mammography

	P
Sensitive breasts	0.001
Family history of breast diseases	0.017
Expected pain (earlier mammography)	0.001
Educational level	0.008
Anxiety	0.001
Breast sensitivity during past three days	0.001
Insufficient attention of technologist	0.001

Discussion

In the literature, the percentage of women reporting any pain or discomfort during the procedure ranges widely from 0.2% to 85% [8–10, 13–15]. It is possible that much of the variability is due to the fact that both screening and clinical populations were studied. Sometimes both discomfort and pain were studied. Also there were many different pain measures used [15]. In the present study a four-point pain scale was used. A large proportion of women (72.9%) reported having pain during mammography. Most often women reported little pain (42.0%), but moderate pain was reported by 21.6%, and 9.3% of the women reported severe pain. Other authors also found a relatively small subgroup of women with severe pain

during mammography; range 0.9%–10% [8–10, 15–17]. This small group of women however, could be large enough to have implications on a population scale when they do not attend future mammography screening. It would have public health implications if the women in the general population failed to attend mammography screening because of fear for exposure to severe pain. Therefore, reports of pain should be taken seriously and, if possible, measures should be taken to prevent or to diminish experienced pain. In the present study, the pain experience of women undergoing screening mammography was assessed close to the time of the actual mammogram, and possible associated factors were investigated.

Reported pain was related to the presence of sensitive breasts ($P = 0.001$). Other authors also have found an association with 'pre-existing breast pain' or 'fibrocystic disease' [13, 18]. It is possible that a high percentage of the women who indicated that they suffer from sensitive breasts have fibrocystic breasts. Clinical signs of fibrocystic breasts are pain and nodularity. It seems logical that women with fibrocystic breasts report more pain during mammographic compression, because cyst formation is known to produce periodic breast pain with focal tenderness on cyst palpation.

Against our expectation, breast size was not related to pain during mammography. However, women with smaller breasts (size AA and A) and women with very large breasts (size > D) tended to perceive more severe pain. In these two groups of women, a percentage of 15.3% and 16.7%, respectively, reported severe pain during mammography, compared to about 8% of the women with normal sized breasts. Nielsen et al. [19] also described that women with smaller breasts had more pain. However, no explaination was given for this finding.

In accordance with the findings of Jackson et al. [8] therapeutic hormonal manipulation with oral contraceptives or hormone replacement therapy did not result in more pain during mammography. Also no relation was found with hormonal status. A relationship was found between a family history of malignant and/or benign breast diseases and mammography pain. This association was not demonstrated before [10, 19]. There was no difference between those women who had a family history of malignant breast disease as opposed to those who had a family history of benign breast conditions. The reason why the women with a family history of breast diseases reported more pain can be only speculative. However, this observation is very interesting and is worth further investigation.

The basis of the anticipation of pain was investigated: one's own experience with mammography, or information from friends or family, media or health care professionals. A limitation of this study was that the expectations were collected after, rather than before, mammography. Responders may have been biased by the experience during mammography. However, only earlier personal experience of mammography was a significant predictor of pain ($P = 0.001$).

An interesting finding was the fact that higher educated women reported more pain ($P = 0.008$). These results support previous findings of Rutter et al. [20] and Aro et al.[10] The level of education may reflect better verbal skills and a higher educated woman could possibly be more prone to give her opinion.

Nielsen et al. [19] reported a relation between the incidence of mammography pain and racial background: pain levels were higher in white as opposed to African American women. Ethnic background did not influence pain report in the present study. However, the group of women with a different ethnic background was very small, only 3%.

Compression in tender breasts is likely to produce more pain. Cockburn et al. [9] found no relationship between pain and breast tenderness in the previous three days. In the present study, we did find a significant relationship between these two variables ($P = 0.001$).

Screening related anxiety can be affected by information delivered prior to screening and by staff behaviour during the process. Both anxiety ($P = 0.001$) and insufficient attention given by the technologist ($P = 0.001$) were significantly related to the pain experienced. This can be explained by cognitive-behavioural models which view pain during mammography as a result of a continuous set of interactions between behaviour, biological and social-environmental influences. A change in one part of the system influences other parts of the system. Thus, anxiety or attention and support from the technician can feed back and affect the pain experienced [14]. Therefore, it is very important to train technicians in order to reduce anxiety in women attending screening [11].

The number of images made was not associated with the pain experienced. The same was true for the finding of a suspect lesion on the mammogram. Of course, the women did not know whether or not they had an abnormal mammogram at the time that they

responded. So, this finding was unlikely to be of any influence on the pain experienced.

The actual pressure applied via the mammographic plates was not measured. Therefore, it was not possible to obtain an objective measure to analyze a relation between compression and pain perception. This fact is considered as a limitation of the present study. Sullivan et al. [21] showed that increased force was associated with pain, however the force was also associated with breast thickness. A second limitation is that women who had severe pain during prior mammography may not have returned for a repeat exam and, therefore were not subjects in this study.

The response rate of 79.5% includes 20.5% non-responders. As this study was designed as a first inventarisation no attempt was made to get a higher response rate. This way we don't have any information about the group of non-responders. Also, the closing date was established before the study started: statistical analyses started the day after. Therefore, all questionnaires we received after this date were not included ($n = 14$).

This study and other studies conclude that pain is a common experience in women undergoing mammography. Although the pain was generally in the low to moderate range, a percentage of 9.3% of the women in this study reported severe pain. Pain caused by compression necessary for good screen-film mammography is a potential deterrent to screening mammography programs: 2.7% of the participants in the present study indicated that the pain might deter them from further examinations. As long as other, painless techniques (for example, ultrasound and Magnetic Resonance Imaging) are not suitable for mass screening, it is worth trying to prevent or minimize pain during mammography.

After studying several factors influencing pain experience, it is possible to give some recommendations in order to decrease 'pain experienced during screening mammography.' In the situation that the previous mammography was very painful, or it is known that the participant has sensitive breasts, additional care can be taken. Suggested interventions could be providing more information, or the use of analgesics during the procedure. Another option is patient control over the mammography procedure. This consists of offering women the possibility to control the pressure themselves. Kornguth et al. [22] showed that this measure is effective without compromising image quality.

If it is possible to create a friendly sceening atmosphere and to pay more attention to the participants, it may help to reduce the pain experienced during mammography. Technicians should be trained in order to achieve this atmosphere in which women are less anxious.

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