Breast Pain and Service Satisfaction during Digital Mammography

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Objectives: *To determine the frequency and predisposing factors of breast pain felt during digital mammography, and factors associated with service satisfaction.*
Material and Method: *A questionnaire was distributed to 1250 women immediately after their mammography. The outcomes assessed were a five-point scale of breast pain and rating of the satisfaction with the mammography service. Several factors potentially associated with breast pain and satisfaction were obtained from the questionnaire and analyzed. Multiple cumulative logit regression was used to identify independent, significant factors.*
Results: *Breast pain was found to be absent in 22% of patients, slight in 50%, moderate in 23% and substantial or severe in only 4%. Significant factors associated with breast pain during mammography included higher educational level, having no children, having had prior mammography, impolite and rough radiographer and poorly performed mammography. Factors associated with satisfaction with the mammography service included older age, polite and gentle radiographer and well-performed mammography.*
Conclusion: *Radiographer delivery of the mammography service seemed to be the most important, modifiable reason for breast pain during mammography and dissatisfaction with the mammography service.*

Keywords: *Digital mammography, Breast pain, Breast discomfort, Service satisfaction*

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Mammography is the principle investigation tool for the detection of breast cancer in both screening and diagnostic purposes. Screening mammography significantly reduces breast cancer mortality in women aged 40-69 years[1]. Breast compression is necessary during the performance of mammography. Reasons for compression include the following (1) to reduce blur due to motion artifact; (2) to reduce thickness through which the beam passes, thus reducing scattered radiation and improving contrast of the images; (3) to improve visualization of breast masses by spreading the overlapping breast tissue and (4) to permit a significant reduction in radiation dosage[2,3].

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Various degrees of discomfort and pain are reported from several previous studies on screening mammography[4-15]. Verbal and anecdotal reports through the mass media of severe physical discomfort during mammography have become a source of anxiety and concern for some women who are considering screening mammography[12,15]. Such anxiety or actual experience of painful mammography may discourage patients from undergoing current or future mammography[6,9]. Knowledge regarding the determining factors of mammography-related breast pain may help reduce the pain and dissatisfaction with the mammography service. Such studies have never been done in the authors' institution.

Digital mammography is currently being introduced as a replacement of screen-film mammography. Advantages of digital mammography include

higher image quality, potential for image manipulation, remote display of images and the ability to combine this technique with other new technologies such as tomosynthesis[16,17]. Information from the manufacturer has also claimed that reduction of breast compression is possible due to the high quantum efficiency of selenium second-generation detectors, in conjunction with increased x-ray energies[18].

The objective of the present study was to examine the frequency and level of breast pain in women undergoing digital mammography at our breast diagnostic center, as well as to determine factors associated with breast pain. In addition, factors associated with satisfaction with the mammography service were also examined.

Material and Method

Subjects and measurements

A questionnaire was distributed to patients who underwent either screening or diagnostic mammography of both breasts at the breast diagnostic center, Faculty of Medicine, Ramathibodi Hospital from February to June 2005. The Hospital's Ethics Review Committee approved the study. Women who underwent mammography for only one breast and who had breast implants or had undergone breast intervention or surgical procedure within 3 months were excluded. One thousand two hundred and fifty women answered the questionnaire. All women gave informed consent after the details of the study were explained to them by the researchers. These women were asked to complete the questionnaire immediately after having undergone mammography. The questionnaire was divided into two parts. The first part was to be completed by the patient. The 14 items of this part were (1) age, (2) occupation, (3) educational level, (4) family income, (5) marital status, (6) number of children, (7) menstruation status, (8) breast size according to brassiere cup, (9) number of prior mammogram (s), (10) level of pain felt during mammography, (11) politeness and care of the radiographer who performed the mammography, (12) confidence that the mammography was performed properly or competently, (13) satisfaction with the service of the breast diagnostic center and (14) intention to undergo mammography at the breast diagnostic center in the following year. The second part of the questionnaire was completed by the principal investigator after having reviewed the report of the mammograms. There were three items and included (15) breast composition, (16) presence of cysts and/or solid nodules, and (17) final assessment according to Breast Imaging Reporting and Data System (BI-RADS)[19]. The code of each radiographer who performed the mammography was recorded at the end of each questionnaire.

Level of pain was measured using an ordinal pain scale. There were five levels, beginning with no pain, slight pain, moderate pain, substantial pain, and severe pain that required cessation of compression.

Measures of service quality and patient satisfaction (items 11, 12 and 13) had five ordered categories: strongly agree, agree, neutral, disagree, and strongly disagree. For the intention item (item 14), the patient was asked to estimate the likelihood of returning to the breast diagnostic center, Ramathibodi Hospital in the following years. The levels of the likelihood provided in the questionnaire were 100% (certain to return), 50-99%, less than 50% and 0 (will definitely not return), respectively.

Breast composition was classified as either "dense breast", which includes extremely dense and heterogeneous dense breasts, or "nondense breast", which includes scattered fibroglandular densities and almost entirely fatty tissue according to BI-RADS classification.

Machine, techniques, and personnel

All patients in the present study underwent digital mammography (Lorad Selenia, Hologic, Danbury, CT, USA). Routine craniocaudal (CC) and mediolateral oblique (MLO) views were obtained for all patients. Mammography radiographers used both motorized foot plate and manual plate to achieve the optimal compression force, which was considered sufficient when the skin became taut[13]. Optimal compression was defined as that which produced the best images, and was determined partly by the mammography machine, and partly by the radiographers (i.e. subjective fine-tuning). Each patient was asked to complete the questionnaire before undergoing further mammographic studies such as spot compression magnification, and breast ultrasound. Three radiographers worked in our breast diagnostic center. Their experiences in mammography were 8 years (number 1), 11 years (number 2) and 12 years (number 3).

Statistical analysis

Data were analyzed and expressed as mean (standard deviation) or median (range) for continuous or numerical variables as appropriate. All categorical data, whether ordinal or nominal, were summarized as a percentage for each category.

Tests of association between each risk factor and the feeling of discomfort or pain during mammography were done using the likelihood ratio statistic based on the cumulative logit model for ordinal outcomes ("proportional odds" model)[20]. Each multivalued (more than two categories) risk factor was treated as either a linear or non-linear (i.e. "categorical") covariate in the model, depending on whether the factor is ordinal or nominal. However, an ordinal risk factor was declared significantly associated with the outcome only if both the linear and non-linear versions of the factor were significant in the model. Significant association was defined as a two-tailed test p-value of less than 0.05. All significant risk factors were entered simultaneously into a multivariable cumulative logit model, and a final model was obtained by retaining those factors with a Wald's test p-value of less than 0.05. Approximate tests of proportional odds were also performed using a user-written program[21]. Statistical analyses were performed with Stata version 7 statistical software (Stata Corp, College Drive, Texas, USA).

Results

One thousand two hundred and fifty patients agreed to participate in the present study. The mean age of these patients was 50 years (SD was 8.4 years, with a range from 22 to 90 years). A summary of characteristics of patients is presented in Table 1, which also includes radiological findings. Quality of service and patient satisfaction variables are summarized in Table 2. Note that a large proportion of the subjects (72%) felt no pain or only slight pain during mammography, and less than 1% experienced pain severe enough to ask for temporary cessation of the procedure (Table 1). Because the last category of pain contained a small number of patients, this was combined with the adjacent category, "substantial pain", to create a four-category "pain" variable. Note also that an overwhelming proportion of patients (greater than 90%) either strongly agreed or agreed that they were satisfied with the mammography service (Table 2). No patient strongly disagreed, and hence this last category was combined with the adjacent category creating four-category variables for all service and satisfaction-related questions.

According to Table 3, age, level of income, menstrual history, breast density, breast size, and BI-RADS category were not significantly associated with breast pain felt during mammography. Occupation, level of education, marital status, number of children, number of prior mammograms, radiographer politeness, performance of mammography, satisfaction with service and individual radiographer were, however, significantly associated with breast pain. The number of solid masses or cysts in the breast also showed a weak association.

On multivariable analysis in which the individual radiographer factor was excluded, only educational level, number of children, number of prior mammograms, radiographer politeness and performance of mammography remained significantly associated with breast pain (Table 4). That is, patients with a higher educational level, who never had children and who had prior mammography, tended to feel more pain during mammography. Similarly, patients also tended to feel more pain if radiographers were impolite and rough, or if the radiographer performed mammography incompetently.

When the effect of individual radiographer was taken into account in the multivariable model, whether as a fixed effect categorical covariate (Table 5) or as a clustering variable with robust variance estimators (similar to modeling the radiographer factor as a random effect) the politeness factor was no longer significant. This was explained by the fact that the effect of these radiographers on the patient's feelings of discomfort or pain was at least through their being polite or impolite or their roughness. The interpretation of the radiographer effect is that radiographer numbers 2 and 3 were less likely to cause pain and discomfort than radiographer number 1. Other factors in the model in Table 4 were not substantially affected by the inclusion of a radiographer factor, except perhaps the radiographers' performance (Table 5).

Factors found to be associated with patient satisfaction on multivariable analysis were age, radiographer politeness and gentleness and proper performance of mammography (Table 6). Pain felt during mammography had no significant impact on patient satisfaction after adjusting for the effects of the above factors. Thus, patients tended to feel more satisfied with the mammography service if they were older or if mammography was done competently and with gentleness by polite radiographers.

Almost all patients (98%) mentioned either a high probability (greater than 50%) or certainty of returning to our mammography service in future years. Again, in a multivariable analysis not shown here, pain during mammography was not a factor in the decision to return for future mammography. However, patients were more likely to return if they were satisfied with the service, or if radiographers were polite, gentle and able to perform mammography competently.

Table 1. Characteristics of the sample (n = 1,250)

Characteristic	Number of subjects (%)
Occupation	
Government service	582 (46.6)
Employee	175 (14)
Own business	72 (5.8)
Housewife	236 (18.9)
Merchant	74 (5.9)
Farming & Agriculture	15 (1.2)
Retired from government service	96 (7.7)
Educational status	
Higher than Bachelor degree	189 (15.1)
Bachelor degree	547 (43.8)
Certificate of proficiency	144 (11.5)
Grades 7 to 12	201 (16.1)
Grade 6 or lower	168 (13.4)
Family income per month (in Baht)*	
Above 100,000	91 (7.3)
50,000-99,999	219 (17.5)
10,000-49,999	751 (60.1)
Below 10,000	183 (14.6)
Marital status	
Married	952 (76.2)
Single	298 (23.8)
Number of children	
No children	438 (35)
One child or more	812 (65)
Menstruation status on the day performing mammography	
Menopause or surgical menopause	717 (57.4)
Having menstruation	80 (6.4)
Last menstruation date 2 weeks or less	233 (18.6)
Last menstruation longer than 2 weeks	217 (17.4)
Breast size	
Cup A	343 (27.4)
Cup B	588 (47)
Cup C	251 (20.1)
Cup D	56 (4.5)
Cup E	12 (1)
Number of prior mammography	
None	325 (26)
1-4	699 (55.9)
More than 4	226 (18.1)
Level of pain during mammography	
No pain	278 (22.2)
Mild or slight pain	628 (50.2)
Moderate pain	289 (23.1)
Substantial pain	51 (4.1)
Severe pain require cessation	4 (0.3)
Breast density	
Dense	959 (76.7)
Nondense	291 (23.3)
Number of cyst(s) and solid mass (es)	
None	598 (47.8)
1-5	499 (39.9)
More than 5	153 (12.2)
BI-RADS category	
1	307 (24.6)
2	686 (54.9)
3	202 (16.2)
4	41 (3.3)
5	14 (1.1)
Radiographer	
Number 1	461 (36.9)
Number 2	352 (28.2)
Number 3	437 (35)

Note: Numbers in parentheses are percentages; numbers in the columns for educational level; family income and menstruation status do not add to 1,250 because of missing data.
* One dollar equals approximately 40 baht

Table 2. Quality of service, satisfaction and willing ness to undergo future mammography (n = 1250)

Items	Number of subjects (%)
Radiographer is polite and gentle	
Strongly agree	771 (61.7)
Agree	445 (35.6)
Neutral	30 (2.4)
Disagree	4 (0.3)
Strongly disagree	0
Confidence that mammography was done properly	
Strongly agree	585 (46.8)
Agree	636 (50.9)
Neutral	28 (2.2)
Disagree	1 (0.1)
Strongly disagree	0
Satisfied with service	
Strongly agree	631 (50.5)
Agree	585 (46.8)
Neutral	31 (2.5)
Disagree	3 (0.2)
Strongly disagree	0
Willingness to undergo further mammography	
100% (certain to return)	1056 (84.5)
50-99%	169 (13.5)
Less than 50% chance	18 (1.4)
0% (will definitely not return)	4 (0.3)

Note: Numbers in parentheses are percentage; numbers in the column for willingness to undergo mammography do not add to 1,250 because of missing data

Table 3. Association between breast pain and potential risk factors (n = 1250)

Risk factors	Level of pain				p-value
	None n = 278 (22%)	Mild n = 628 (50%)	Moderate n = 289 (23%)	Severe n = 55 (5%)	
Age (years)[a]:	50.3 (8.9)	50.1 (8.3)	49.9 (8.1)	50.1 (7.8)	0.640[c]
Occupation[b]:					
Government service	109 (39)	300 (48)	145 (50)	28 (51)	0.010[d]
Employee	36 (13)	88 (14)	41 (14)	10 (18)	
Own business	18 (7)	36 (6)	17 (6)	1 (2)	
Housewife	67 (24)	116 (18)	46 (16)	7 (13)	
Merchant	20 (7)	39 (6)	12 (4)	3 (6)	
Farming & Agriculture	6 (2)	7 (1)	2 (0.7)	0	
Retired from government service	22 (8)	42 (7)	26 (9)	6 (11)	
Educational level:					
Higher than Bachelor degree	35 (13)	86 (14)	56 (19)	12 (22)	<0.001[c,d]
Bachelor degree	106 (38)	290 (46)	126 (44)	25 (46)	
Certificate	29 (10)	61 (10)	45 (16)	9 (16)	
Grade 7-12	67 (24)	92 (15)	36 (12)	6 (11)	
Grade 6 or lower	41 (15)	98 (16)	26 (9)	3 (6)	
Family income per month (in Baht):					
Above 100,000	18 (7)	47 (8)	24 (8)	2 (4)	0.566[d]
50,000-99,999	57 (21)	105 (17)	47 (16)	10 (18)	
10,000-49,999	157 (57)	385 (62)	172 (60)	37 (67)	
Below 10,000	45 (16)	88 (14)	44 (15)	6 (11)	
Marital status:					
Single	55 (20)	149 (24)	78 (27)	16 (29)	0.027
Married	223 (80)	479 (76)	211 (73)	39 (71)	
Number of children:					
No children	81 (29)	213 (34)	117 (40)	27 (49)	<0.001
One child or more	197 (71)	415 (66)	172 (60)	28 (51)	
Menstrual history:					
Menopause	174 (63)	350 (56)	163 (56)	30 (55)	0.539[d]
Having menstruation	18 (7)	37 (6)	21 (7)	4 (7)	
Last menstruation less than 2 weeks	47 (17)	121 (19)	56 (19)	9 (16)	
Last menstruation more than 2 weeks	39 (14)	119 (19)	47 (16)	12 (22)	
Breast size:					
A	68 (25)	186 (30)	72 (25)	17 (31)	0.365[c]
B	124 (45)	294 (47)	146 (51)	24 (44)	
C	70 (25)	115 (18)	55 (19)	11 (20)	
D	13 (5)	29 (5)	13 (5)	1 (2)	
E	3 (1)	4 (1)	3 (1)	2 (4)	
Number of prior mammograms:					
None	100 (36)	150 (24)	65 (23)	10 (18)	<0.001[c,d]
1-4	134 (48)	370 (59)	163 (56)	32 (58)	
More than 4	44 (16)	108 (17)	61 (21)	13 (24)	
Radiographer is polite & gentle:					
Strongly agree	195 (70)	403 (64)	150 (52)	23 (42)	<0.001[c,d]
Agree	76 (27)	208 (33)	130 (55)	31 (56)	
Neutral	6 (2)	15 (2)	8 (3)	1 (2)	
Disagree	1 (0.4)	2 (0.3)	1 (0.4)	0	
Strongly disagree	0	0	0	0	

Table 3. (cont.)

Risk factors	Level of pain				p-value
	None n = 278 (22%)	Mild n = 628 (50%)	Moderate n = 289 (23%)	Severe n = 55 (5%)	
Mammography performed properly:					
Strongly agree	148 (53)	313 (50)	109 (38)	15 (27)	<0.001[c,d]
Agree	125 (45)	301 (48)	173 (60)	37 (67)	
Neutral	5 (2)	14 (2)	6 (2)	3 (6)	
Disagree	0	0	1 (1)	0	
Strongly disagree	0	0	0	0	
Satisfied with service:					
Strongly agree	156 (56)	339 (54)	119 (41)	17 (31)	<0.001[c,d]
Agree	118 (42)	269 (43)	163 (56)	35 (64)	
Neutral	4 (1)	18 (3)	6 (2)	3 (6)	
Disagree	0	2 (0.3)	1 (0.4)	0	
Strongly disagree	0	0	0	0	
Willingness to undergo further mammograms:					
100% (certain to return)	239 (86)	533 (85)	240 (83)	44 (80)	0.336[c]
50-99%	33 (12)	82 (13)	45 (16)	9 (16)	
Less than 50%	4 (1)	10 (2)	2 (1)	2 (4)	
0% (will definitely not return)	1 (0.4)	2 (0.3)	1 (0.4)	0	
Breast composition:					
Dense	209 (75)	486 (77)	224 (78)	40 (73)	0.746
Not dense	69 (25)	142 (23)	65 (23)	15 (27)	
Number of cyst(s) and solid mass(es):					
None	148 (53)	303 (48)	125 (43)	22 (40)	0.030[c]
1-4	99 (36)	246 (39)	129 (45)	25 (46)	
More than 4	31 (11)	79 (13)	35 (12)	8 (15)	
BIRADS category:					
1	76 (27)	162 (26)	54 (19)	15 (27)	0.287[d]
2	147 (53)	342 (55)	173 (60)	24 (44)	
3	45 (16)	98 (16)	45 (16)	14 (25)	
4	8 (3)	19 (3)	12 (4)	2 (4)	
5	2 (0.7)	7 (1)	5 (2)	0	
Radiographer:					
Number 1	70 (25)	227 (36)	137 (47)	27 (49)	<0.001[d]
Number 2	95 (34)	188 (30)	59 (20)	10 (18)	
Number 3	113 (41)	213 (34)	93 (32)	18 (33)	

a: summarized as mean (sd); b: summarized as number (%); c: p-value based on likelihood ratio test of the cumulative logit regression model with corresponding covariate treated as linear; d: p-value based on likelihood ratio test of the cumulative logit regression model with corresponding covariate treated as categorical; note that percentages in parenthesis may add to over 100 due to rounding

Approximate tests of proportional odds for models in Tables 4, 5 and 6 did not show clear evidence of non-proportionality (analysis not shown).

Discussion

Breast pain during mammography in the present study was found to be absent in 22% of patients, slight in 50%, moderate in 23% and substantial or severe in only 4%. Thus, a high proportion of patients (72%) experienced minimal or no pain. Although one study found similar results to the present study[6], other studies found different distributions of breast pain and/or discomfort[4,5,7-15]. In some of these studies higher proportions of patients experienced

Table 4. Significant risk factors for increased breast pain on multivariable cumulative logit regression analysis (excluding the "radiographer" factor)

Risk factor	Odds Ratio (95%CI)	p-value
Higher education level	1.16 (1.07 to 1.26)[a]	0.001
No children	1.36 (1.08 to 1.70)	0.008
Higher number of prior mammograms	1.30 (1.11 to 1.54)[a]	0.001
Radiographer is impolite or not gentle	1.36 (1.09 to 1.70)[a]	0.007
Poorly performed mammography	1.33 (1.05 to 1.67)[a]	0.016

a: Odds Ratios are per one category increase

Table 5. Significant risk factors for increased breast pain on multivariable cumulative logit regression analysis including the "radiographer" factor as a fixed effect

Risk factor	Odds Ratio (95%CI)[a]	p-value
Higher education level	1.15 (1.06 to 1.25)[a]	0.001
No children	1.37 (1.09 to 1.71)	0.006
Higher number of prior mammograms	1.31 (1.11 to 1.54)[a]	<0.001
Poorly performed mammography	1.52 (1.26 to 1.85)[a]	<0.001
Radiographer no. 2	0.50 (0.38 to 0.65)[b]	<0.001
Radiographer no. 3	0.58 (0.45 to 0.74)[b]	<0.001

a: Odds Ratios are per one category increase; b: Odds Ratios are relative to Radiographer no. 1

Table 6. Significant factors associated with service satisfaction on multivariable cumulative logit regression analysis

Factor	Odds Ratio (95%CI)[a]	p-value
Radiographer is polite and gentle	8.39 (6.30 to 11.17)	<0.001
Mammography performed well	6.23 (4.66 to 8.36)	<0.001
Age	1.02 (1.00 to 1.04)	0.038

a: Odds Ratios are per one category increase or per year of age increase

moderate to severe pain or discomfort during mammography. For example, in one study the distribution of breast discomfort was 12%, 36%, 32%, 16% and 5% for no discomfort, slight discomfort, moderate discomfort, substantial discomfort and severe discomfort, respectively[5]. One reason for the higher proportions of substantial and severe categories for the discomfort measure may be due to the difference between the concepts of discomfort and pain[5]. Another reason may be related to the use of analog mammography in previously cited studies, as opposed to digital mammography in the present study. However, one study[15] using analog mammography in which discomfort and pain was measured found the responses to skew towards no discomfort or pain (49%) or mild discomfort (39%) in a much higher proportion than in the present study. Such marked differences may be due to differences in patient characteristics as much as the technique of mammography or outcome measure used[5]. Because of these reasons, it cannot be concluded that digital mammography is associated with less breast pain and/or discomfort.

Independent factors related to breast pain during mammography as identified in the present study included patient-related factors such as higher educational level, having no children, having undergone prior mammography, and radiographer-related factors such as politeness, roughness and competency in

performing mammography. These factors, appropriately interpreted, are very similar to those found in other studies[4-6,8,15].

Higher educational level has been found to be related to feelings of greater breast pain and/or discomfort [5,6,8]. This may be due to an underlying expectation of pain, a factor also previously found to be related to the same outcome[6,8,12,14,15]. This is plausible since patients with higher education tend to obtain more information on mammography and hence may have a greater expectation of pain. Similarly, prior mammography could condition patients to expect pain, which could explain why prior mammography has been found to be related to greater breast discomfort or pain[12,15], as in the present study.

Radiographers and the service provided to patients have been consistently found to be related to breast pain and discomfort during mammography[4-8,15]. The present study found a similar relationship. Individual radiographer elicited significantly different responses from patients. This difference seemed to be at least partly due to politeness and roughness of radiographers when handling patients. However, other unmeasured factors, such as force of compression, which most likely would vary among the radiographers, could also explain the difference (see below). The current data also indicated that competency in performing mammography was important. Polite and gentle radiographers could still elicit pain if the performance of mammography was perceived to be incompetent.

Interestingly, factors relating to breast anatomy and physiology were not associated with breast pain during mammography in the present study. These factors include breast density, BI-RADS category, number of breast cysts and masses, breast size and menstruation status. While previous studies found breast sensitivity and existing breast pain (prior to mammography) to be significant factors[5,6,8,15], these latter factors probably did not correlate with the aspect of physiology and anatomy examined in the current study. For example, menstruation status probably did not correlate significantly with breast sensitivity and existing breast pain as not all patients currently menstruating had those symptoms.

Pain during mammography was not related to the patient's overall satisfaction with the mammography service once the quality of the service was taken into account, or to the willingness to return to the service for future examinations. Similar results were found in other studies[5,12]. That is, pain during mammography was not a factor in feeling dissatisfied with the service unless the pain was caused by impolite, rough and incompetent radiographers. The lack of association between willingness to return and pain and discomfort during mammography has been explained as a statistical artifact (lack of power) due to lack of variability in the willingness to return variable[5]. If the willingness to return variable were dichotomized, such a lack of variability could also be seen in the present study. However, the current analysis (cumulative logit regression) should be more powerful since the variables were not dichotomized, thus allowing the analysis to make full use of all ordered categories[20]. The more plausible explanation for the lack of association was that patients were highly motivated by whatever reason to return for repeated examination despite the pain[5,14]. Nonetheless, patients were less likely to return if radiographers were impolite and rough. Older patients tended to feel more satisfied with the mammography service, perhaps because they were more tolerant with certain behaviors on the part of radiographers.

The results of the present study, along with similar published studies, can provide a guide to help improve the mammography service. Breast pain and discomfort felt during mammography can probably be decreased by attention to the radiographer's approach and handling of patients, emphasizing politeness, gentleness, and competency. The force of compression is mainly adjusted by the mammography machine in the authors' service to optimize image clarity. The technician can, however, fine-tune the compression, and using the pressure readings might use these values to minimize discomfort[10,13]. Minimizing unrealistic expectation of pain might be beneficial. Satisfaction with the service and increasing the likelihood of returning to the service can probably be improved by similarly focusing on radiographers' delivery of service. Whether digital mammography can decrease breast pain during the procedure compared with analog machines requires further study.

Data on compression force was not collected for the present study, even though compression force is known to be related to breast pain during mammography. But the routine practice for many radiographers in the authors' institution, as well as many others in Thailand, is to determine adequate compression force by observing skin changes in conjunction with any complaints made by the patient. This was based on the experience in the era of analog mammography. Compression force readings available on digital machines

were usually ignored by the radiographers. Hence, by demonstrating that radiographers vary significantly in their skills to make patients feel comfortable, standardizing and optimizing compression force based on machine readings might be more acceptable to radiographers in the future. Unless the use of compressive force did not vary among the radiographers, the availability of compressive force data would not change the authors' recommendations.

Future studies on breast pain or discomfort during the use of digital mammography may be needed to compare concurrently with the use of analog machines. This should help settle the issue of which technique is associated with least pain or discomfort. However, whether such studies will be useful or influence the tendency to employ digital mammography in the future is questionable.

Conclusion

In the present study, 72% of the patients, experienced no or minimal pain during mammography, while 28% experienced moderate to severe pain. Over 96% of patients were satisfied to some degree with the mammography service. Important factors associated with both outcomes were related to the service provided by the mammography radiographers. Whether digital mammography, as used in the present study, is superior to analog machines in terms of decreasing breast pain cannot be substantiated by the current data.

The results of the present study are in general agreement with those of previous studies, demonstrating that factors related to pain during mammography and satisfaction with service are not culture specific, although the level of pain felt may not be similar for all communities. Modifying how mammography radiographers provide their service, specifically increasing their technical competence, and showing more politeness and gentleness may significantly improve the patient's comfort and satisfaction when undergoing mammography.

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อาการเจ็บเต้านมและความพึงพอใจในการให้บริการโดยการตรวจด้วยเครื่องถ่ายภาพรังสีเต้านมระบบดิจิทัล

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การกดเต้านมระหว่างการถ่ายภาพเอกซเรย์เต้านมหรือแมมโมแกรมมีความสำคัญมาก โดยมีวัตถุประสงค์เพื่อลดการขยับระหว่างการถ่ายภาพรังสีเต้านม, ลดความหนาของเต้านม เพื่อเพิ่มคุณภาพของภาพเอกซเรย์ที่ได้, แยกเนื้อเต้านมจากก้อนและลดปริมาณรังสีที่ผู้ป่วยได้รับ แต่การกดเต้านมนี้อาจทำให้ผู้รับบริการเกิดอาการเจ็บปวดระหว่างการตรวจ

วัตถุประสงค์*: เพื่อศึกษาความถี่และปัจจัยโน้มเอียงที่เกี่ยวข้องกับอาการเจ็บเต้านมของผู้ที่รับการถ่ายภาพรังสีเต้านมระบบดิจิทัล และศึกษาปัจจัยที่มีผลต่อความพึงพอใจในการให้บริการ*

วัสดุและวิธีการ*: ศึกษาจากแบบสอบถามที่ได้จากผู้รับบริการถ่ายภาพรังสีเต้านมระบบดิจิทัลที่ศูนย์ตรวจวินิจฉัยเต้านม คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี จำนวน 1,250 ราย*

ผลการศึกษา*: ปัจจัยโน้มเอียงที่เกี่ยวข้องกับอาการเจ็บเต้านมระหว่างการตรวจด้วยเครื่องถ่ายภาพรังสีเต้านม ระบบดิจิทัลอย่างมีนัยสำคัญทางสถิติ ได้แก่ ผู้รับการตรวจมีการศึกษาสูง, ไม่มีบุตร, เคยถ่ายภาพรังสีเต้านมมาก่อน, เจ้าหน้าที่รังสีเทคนิคผู้ถ่ายภาพเอกซเรย์ไม่สุภาพ และการจัดท่าดูไม่เหมาะสม ปัจจัยที่เกี่ยวข้องกับความพึงพอใจในการให้บริการของศูนย์วินิจฉัยเต้านม ได้แก่ ผู้รับบริการมีอายุมาก, เจ้าหน้าที่รังสีเทคนิคมีความสุภาพและจัดท่าตรวจอย่างอ่อนโยน และการจัดท่าดูเหมาะสม*

สรุป*: การศึกษานี้พบว่า การปฏิบัติต่อผู้ป่วยโดยเจ้าหน้าที่รังสีเทคนิคเป็นปัจจัยโน้มเอียงที่สำคัญที่สุดที่เกี่ยวข้องกับอาการเจ็บเต้านมของผู้ป่วยระหว่างการตรวจด้วยเครื่องถ่ายภาพรังสีเต้านมระบบดิจิทัล นอกจากนี้ยังมีผลต่อความพึงพอใจในการให้บริการ*