Questionnaire Survey on Breast Diagnostic Imaging Techniques: Subjective Impression of Mammography, Conventional Ultrasonography, and Automated Breast Ultrasonography

Takanori Okamura1*, Tomoyuki Ohta2, Fumio Tsujimoto1, Masaru Sakurai1, Hiroko Okazaki3, Kyouko Okamoto3, Yoshihide Kanemaki3, Yasuo Nakajima3, Mamoru Fukuda4, Machi Suka5, Sachihiko Nobuoka1

1 Ultrasound Center, Department of Clinical Laboratory, St. Marianna University Hospital, Kawasaki, Japan, 2 Department of Radiology, Fujisawa Shounandai Hospital, Fujisawa, Japan, 3 Department of Radiology, St. Marianna University School of Medicine, Kawasaki, Japan, 4 Division of Breast and Endocrine Surgery, Department of Surgery, St. Marianna University School of Medicine, Kawasaki, Japan, and 5 Department of Preventive Medicine, St. Marianna University School of Medicine, Kawasaki, Japan.

Received 21 April 2010; accepted 20 October 2010

Introduction: In Japan, mammography (MMG) has become the common practice for breast cancer screening. However, the proportion of women who undergo breast cancer screening remains low. We hypothesized that psychological problems especially pain, are the most important factors.

Purpose: To investigate the effect of pain and other psychological factors on the willingness of women to undergo imaging examinations for breast cancer.

Patients and Methods: Between November 2007 and November 2008, we performed a questionnaire survey for women who had all undergone MMG, conventional ultrasonography (US), and automated breast ultrasonography (ABUS).

Results: Women who felt the duration of the examination was "long" comprised 20.8% for MMG, 9.7% for US, and 11.1% for ABUS. Those who experienced pain during the examinations comprised 91.7% for MMG, 22.2% for US, and 27.7% for ABUS. Those who experienced discomfort other than pain during the examinations comprised 11.1% for MMG, 8.3% for US, and 5.6% for ABUS. The discomforts experienced were the following: direct touching of the breast by the...
examiner, male examiner performing the examination, maintaining the required position during MMG, and difficulty in wiping off the cream after US and ABUS. The preferred breast cancer screening methods were MMG in 25.0%, US in 69.4%, and ABUS in 75.0%.

Conclusion: The pain experienced during an MMG examination may be related to the unwillingness to undergo future MMG examination. US is a method with less pain and also an alternative examination for women who do not accept MMG examination because of the pain.

© 2010, Elsevier Taiwan LLC and the Chinese Taipei Society of Ultrasound in Medicine.

Introduction

In Japan, breast cancer has been the most common cancer in women since 1994 [1]. According to the guidelines for cancer screening and prevention of the Health Education Department of the Ministry of Health, Labour, and Welfare [2], mammography (MMG) has become the common practice for breast cancer screening for women in Japan since 2004. In 2006, they reported that the proportion of women who underwent breast cancer screening was only 12.9%, which is lower than that of the screening for other cancers (lung cancer, 22.4%; colon cancer, 18.6%; and uterine cancer, 18.6%) [3]. In recent years, there has been a number of breast cancer campaigns, such as the Pink Ribbon campaign, a citizens’ movement that is established amid mounting societal concerns over breast cancer. However, the proportion of women who undergo breast cancer screening remains low in Japan. It is thought that the reasons for this are the cost of breast cancer screening, inaccurate medical knowledge, time constraints, and the pain caused by MMG [4].

We hypothesized that pain is the most important factor leading to the unwillingness of women to undergo imaging examinations for breast cancer. The present study is to investigate the effect of pain and other psychological factors on the willingness of Japanese women to undergo imaging examinations for breast cancer.

We performed a questionnaire survey for women who had all undergone MMG, conventional ultrasonography (US), and automated breast ultrasonography (ABUS). ABUS is considered to have advantages, being highly reproducible and less operator dependent as compared with conventional US. Therefore, we use ABUS as an additional examination for those who select it.

Purpose

The purpose of this study was to investigate the effect of pain and other psychological factors on the willingness of Japanese women to undergo imaging examinations for breast cancer.

Patients and Methods

A questionnaire survey was provided to 106 women who had all undergone MMG, conventional US, and ABUS within a 3-month period between November 2007 and November 2008. They had no previous surgery history for breast cancer. We received responses from 72 of the women, giving a response rate of 67.9%. Both ABUS (Somo VuTM U-systems, SIEMENS) and conventional US (SSA-770A, Toshiba Medical Systems, Tokyo, Japan) examinations were performed at our institution by radiological technicians or radiologists certified by the Japan Society of Ultrasonics in Medicine. MMG was conducted at our institution or at other hospitals or clinics by qualified technicians certified by the Central Committee on Quality Control of Mammography Screening in Japan.

The questionnaire was completed anonymously, and the questions concerning each examination were as follows:

1. How did you feel about the duration of the examination? The options were “short,” “adequate,” and “long.”
2. Did you experience any pain during the examination? The options were “yes” and “no.”
3. Did you experience any discomfort other than pain during the examination? The options were “yes” and “no.”
4. What was the nature of your discomfort other than pain during the examination? The subjects responded freely.
5. If you take an imaging examination for breast cancer at some point in the future, which type of examination will you choose? Multiple answers were allowed. The options were “MMG,” “US,” and “ABUS.”

The results for Questions 1–3 were analyzed using McNemar’s $\chi^2$ test. For Question 1, the answers were divided into “long” and “others,” and then significance was determined. The $\chi^2$ test was used to test for significance for Question 5. The relationship between choosing MMG as the preferred modality for detecting breast cancer and feeling pain during MMG examination was examined. The responses to Question 4 were not analyzed statistically because of the nature of the question.

Fig. 1. Durations of the three examinations. MMG = mammography, US = ultrasonography, ABUS = automated breast ultrasonography.
All statistical analyses were performed using SPSS version 11.5 (SPSS, Inc, Chicago, Illinois, USA). Significance was set at a $p$ value $< 0.05$.

Results

Question 1: Duration of the three examinations. Of the 72 women, the numbers who answered that the duration of the examination was "long" were 15 for MMG, seven for US, and eight for ABUS. There were more women who answered that the duration of MMG was longer as compared with that of US and ABUS (Fig. 1).

Question 2: Pain experienced during the three examinations. The numbers of women who experienced pain during the examinations were 66 for MMG, 16 for US, and 20 for ABUS. The number of women who experienced pain during MMG was very high as compared with that of the other examinations (Fig. 2).

Question 3: Discomfort other than pain experienced during the three examinations. The numbers of women who experienced discomfort other than pain during the examinations were eight for MMG, six for US, and four for ABUS. There was no significant difference among the three examinations in this regard (Fig. 3).

Question 4: The nature of discomfort experienced during the three examinations other than pain. Eighteen women responded to this question. Six women answered that they felt discomfort because of direct touching of their breast by the examiner. Five women felt discomfort because a male examiner performed the examination. Other problems included discomfort of maintaining the required position during MMG (4 women) and difficulty in wiping off the cream after US and ABUS (3 women) (Fig. 4).

Question 5: Preferred breast cancer detection method. The preferred breast cancer detection methods were MMG in 18, US in 50, and ABUS in 54. The number of women who chose MMG as the preferred examination was significantly lower as compared with that for US and ABUS (Fig. 5).

There was a significant difference between not choosing MMG as the preferred modality for detecting breast cancer and feeling pain during MMG examination (Fig. 6A). There were no significant differences between choice of imaging examination as the preferred modality and pain during the examination for US and ABUS (Figs. 6B and 6C).

Discussion

Significantly more women considered the MMG examination to be "long" compared with the US and ABUS examinations. However, the average duration of MMG examinations was 9.5 minutes as reported by a multicenter study in Japan [5], shorter than the average duration of conventional US examinations (14.6 minutes) and ABUS (11.4 minutes) in this study.

Most women (91.7%) experienced pain during the MMG examination. The proportion of patients who experienced pain during US (22.2%) or ABUS (27.7%) was significantly lower than that for MMG. Therefore, the pain experienced during the MMG examination might have contributed to the feeling of having undergone an excessively long examination. However, it is impossible to prove this based on the small data in this study.

A small number of patients claimed that the ABUS probe hitting the ribs or clavicle contributed to the pain experienced. In slim patients, we considered that some examiners...
pushed the ABUS probe hard against the chest wall. The probe in ABUS did not fit the chest wall properly; without pushing hard against the chest wall, ABUS image produced might become blurred. Thus, further consideration of the size and shape of ABUS probes is needed, especially for slim women to reduce pain.

Some women (MMG, 11.1%; US, 8.3%; and ABUS, 5.6%) experienced discomfort other than pain during examinations. However, we would like to discuss the answers to Question 4 regarding the discomfort experienced by some women. The most common answer, reported by six women (8.3%), was discomfort because of direct touching of their breasts by the examiner. Five patients (6.9%) felt discomfort because a male examiner performed the examination. Because most of the screened women were healthy, they should not endure circumstances of discomfort during the examinations. It would be an improvement for public health organizations to provide alternatives, e.g. US for a patient who wants to avoid the pain of MMG; a female examiner for a patient who did not want a male examiner. Other problems experienced by

Fig. 5. Preferred breast cancer screening method.

Fig. 6. (A) Relationship between the choice of MMG as the preferred breast cancer screening method and pain experienced during MMG. (B) Relationship between the choice of US as the preferred breast cancer screening method and pain experienced during US. (C) Relationship between the choice of ABUS as the preferred breast cancer screening method and pain experienced during ABUS. MMG = mammography; US = ultrasonography; ABUS = automated breast ultrasonography.
patients include discomfort of holding the required position during MMG (5.6%) and difficulty in wiping off the cream after US and ABUS (4.2%). These can be improved by speeding up the examination and using wet towels for wiping off the cream.

Most women chose US (69.4%) and ABUS (75.0%) as preferred future breast cancer screening methods, with a lower percentage of women choosing MMG (25.0%). From our results, we believed that there were many women who support the effectiveness of MMG for breast cancer screening but they wish to avoid the pain experienced during the examination. According to a previous report [6], US was not as good as MMG for detecting ductal carcinoma in situ (DCIS). US was equivalent to MMG with respect to sensitivity and specificity for breast cancer, including both invasive cancer and DCIS. Therefore, US could be an effective examination for women who do not accept MMG because of the pain.

**Conclusion**

The results of this questionnaire showed that the pain experienced during MMG examination may be related to an unwillingness to undergo future MMG examination for breast cancer screening. US is a method with less pain and also an effective examination for women who do not accept MMG examination because of the pain. ABUS may be an acceptable examination, but there is a lack of supportive data for screening at present; this remains as a future study.

**References**