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# Single-view Screening Mammography: Psychological, Endocrine and Immunological Effects of Recalling for a Complete Three-view Examination

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To investigate influences of a recall due to inconclusive findings on screening mammography, 45 women were examined with psychological ('mood' and 'coping'), endocrine and immunological tests immediately after complete mammography (first interview), 2-3 days after the initial screening mammography, and 3 weeks after the women had been informed of normal findings (second interview). The mood score in the first interview was significantly lower than in the second. No differences were found in the endocrine and immunological tests. The recall for complete mammography provoked a significant short-term emotional reaction not reflected in changes in the endocrine and immune functions.

**Key words:** breast neoplasms, mass screening, mammography, false-positive, anxiety, psychological  
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## INTRODUCTION

ALTHOUGH THE benefits of screening mammography in reducing mortality are well documented [1, 2], little is known about the psychological, endocrine and/or immunological effects of the diagnostic procedure. This is particularly the case in women who have been recalled for complete mammography because of inconclusive screening results, but who will finally be declared healthy, i.e. the false positives.

One goal of the present study was to investigate psychological impact as well as eventual immunological and physiological effects of false-positive mammograms. High results would be an incentive to alter the current practices of routine screening of the female population. Another goal was to discover a possible subset of women more likely to react in a more deleterious way to a false-positive mammogram, and describe such a profile, if found.

## PATIENTS AND METHODS

Out of a total of 49 women, 45-69 years of age, who were recalled for a complete three-view mammographic examination, 48 (98%) volunteered to participate in the study. Three women in whom breast cancer was diagnosed were excluded. Thirty-six of the women were informed about the normal finding 1 h after the complete mammography, and the other nine were told that

they had benign findings (mostly cysts) after biopsy, 1 week later.

The first psychological tests and blood samplings were carried out immediately after the three-view mammography, while the women were waiting to hear the result (occasion one). The second examination was performed 3 weeks after they were declared free of breast cancer (occasion two). Occasion two has been treated as a physiological baseline in this study, since we had no possibility of examining these women before the screening mammography. Long-term follow-up (6 and 12 months) with the same immunological and endocrinological tests was available on 10 randomly chosen women.

### Clinical assessment

The women were divided into three groups according to their spontaneous comments: extremely anxious, moderately distressed and calm.

### Psychological methods

An abbreviated version [3] of the 'coping' test [4] was used to measure how the women coped with being recalled for three-view mammography. The questionnaire consists of items describing coping strategies which individuals might use in stressful episodes. The items are classified into two indices: the P-index includes items describing cognitive problem-solving efforts for managing the stressful situation; the E-index includes items which describe defensive efforts directed at reducing emotional distress. If the mean value of P-items is higher than that of E-items, the person is presumed to be a problem-focused coper and if E is higher than P, an emotionally focused coper. The mood test MACL [5] was used to measure change of mood between occasions one and two.

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Table 1. Correlation between clinical assessment and coping type and mean mood point

	Coping type		Mean mood point	Cortisol		Spontaneous comments
	Problem focused (n = 8)	Emotion focused (n = 37)		>550 (n = 19)	≤550 (n = 26)	
Extremely nervous (n = 18)	3	15	2.0	9	9	Completely desperate, my whole week has been destroyed, I can't think, I haven't slept at all, my heart has gone to pieces, enormously frightened, my heart has been rushing, I have completely lost my mind, deeply shocked, I had to leave my work, I can't think of anything else
Moderately distressed (n = 22)	3	19	2.4	7	15	
Calm stoic (n = 5)	2	3	2.9	3	2	It is good to discover things in time, I feel calm, I feel secure
Mean mood point	2.6	2.3				

### Endocrine parameters

Blood levels of cortisol and prolactin were measured at both occasions by a radioimmunoassay kit (Diagnostic Products Corporation).

### Immunological tests

Mitogen stimulation tests with phytohaemagglutinin, pokeweed mitogen and concanavalin A were performed on occasions one and two [6].

### Statistical methods

The significance of differences in hormone levels, lymphocytic stimulation and mood score between the two occasions was assessed by two-sample *t*-tests on logarithmically transformed data (endocrine and immune data) and linear data (mood). Correlation analyses were carried out using the Pearson product-moment correlation coefficient.

## RESULTS

The mean mood score at the first occasion was significantly lower than at the second ( $2.3 \pm 0.4$  versus  $3.4 \pm 0.3$ ;  $P < 0.05$ ). No differences were seen in the endocrine and immunological tests between the first and second occasions or the long-term follow-up. The clinical assessment correlated well with the mood points but not to cortisol and prolactin levels or any coping group (Table 1). The levels of cortisol but not prolactin were significantly higher in E than in P copers (570 versus 443 nmol/l;  $P < 0.01$ ). No differences in cortisol levels were seen between the nine women who underwent biopsy and the others.

## DISCUSSION

Among the women with false-positive mammographic findings in the present study, no differences were found in endocrine and immune parameters between the three-view mammography and 3 weeks later, although the mood test showed a significant difference between the two occasions. Occasion two, being 3 weeks after the women learned that their mammograms and/or cytology did not show cancer, was considered as the physiological baseline, assuming that the psychological status had returned to

normal at that time. The long-term follow-up further confirms that occasion two can be treated as baseline.

We found no differences in immune response between the various coping groups. However, the E-focused copers had significantly higher cortisol levels than the P-focused copers, indicating a higher stress level, but this did not appear to be strong enough to affect immune parameters.

The mood scores and the clinical assessment clearly indicated that the studied women experienced distress in response to the three-view mammography procedure. Yet no significant difference could be found between the two occasions as regards the endocrine and immunological data. Women using E-focused coping strategies seemed more vulnerable according to their higher cortisol values. It is possible that the short waiting period in our study attenuated the potential negative consequences of being recalled because of suspicious mammogram. Whether or not a longer period of exposure to this type of stressor may have an impact on the endocrine or immunological systems remains to be established. One can speculate that if the repeated diagnostic examinations were spread over a long period with subsequent extended periods of uncertainty, the risk of a negative influence on the psychological and possibly on endocrine and immunological functions could be substantial.

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