



The Art of Mammography With Respect to Positioning and Compression—A Swedish Perspective



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A B S T R A C T

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In 2014, 8,023 women were diagnosed with breast cancer in Sweden. Screening mammography has been shown to reduce mortality in Sweden by 25%. Studies show that mammography examinations vary both in terms of positioning and compression affecting the image quality and the patient's experience of pain. Pain can affect participation in mammography screening. This study aims to describe how radiographers perceive the examination method used in mammography. The study was conducted using qualitative methods. Individual semistructured interviews were made with 13 radiographers working in six different mammography units. The material was analyzed by inductive manifest content analysis. Three main categories were identified: positioning of the patient, positioning of the detector, and compression. A fourth category, compliance, also emerged during the analysis work and was identified by the radiographers as being an important factor to be able to succeed with positioning and compression. The differences in the radiographer's methodology show that more research in technology relating to positioning and compression is needed for evidence-based guidelines.

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Background

Mammography is a radiological examination of the breasts using ionizing radiation. The examination is fast, inexpensive, and reliable. Tumors as small as a few millimeters in diameter can be detected (Aspelin & Pettersson, 2008).

The aim of the examination is to project a high-quality image of the breast, including as much of the breast tissue as possible in the image (Kopans, 2007). There are several factors that affect image quality, such as positioning and compression, but also noise, contrast, exposure, and sharpness. With today's digital technology, most of the hardware and software factors in the device are handled automatically, but positioning and compression still depend on the radiographer's perception of how the steps are performed (Eklund, Cardenosa, & Parsons, 1994).

Positioning involves physically placing the breast in the mammography apparatus to create an image. Correct positioning of the patient of the radiographer during imaging is very important for creating a standardized image that the radiologist can read (Bassett,

Hirbawi, DeBruhl, & Hayes, 1993). In a study carried out in 2015, Henderson et al. described the radiologist's accuracy in the diagnosis of breast cancer as influenced by the work of the radiographer conducting the examination. There is also a correlation between poorly positioned mammography images and the occurrence of interval cancer, that is, breast cancer that occurs between two screening events (Taplin et al., 2002). The literature includes guidelines for positioning (Hogg, Kelly, & Mercer, 2015). Despite this, the positioning and thus the final image can vary among different radiographers (Henderson et al., 2015). Criteria for the various projections are documented in the literature (Hogg et al., 2015; Perry et al., 2008). However, for a study from 2006 showed that the radiographers (Cardenosa, 2006) successfully achieved only 30% to 40% of craniocaudal (CC) images. Compression of the breast in mammographic examinations is carried out to reduce the radiation dose, increase the contrast when dispersed radiation decreases, and minimize overlapping of structures and blur (Perry et al., 2008). There is no exact measure of optimal compression in mammography studies, but Perry et al. (2008) described in their report that the compression should be substantial but bearable. Compression in mammography studies varies widely between different clinics, and within clinics, which causes a large variation between examinations (Branderhorst et al., 2015; Mercer, Hogg, Lawson, Diffey, & Denton, 2013; Mercer et al., 2014). Mercer et al.

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(2013) could not find any statistical relationship with the choice of compression. Branderhorst et al. (2015) defines a need for standardization of compression to make the performance and results equal between different patients; avoid unnecessary pain; avoid insufficient compression that causes increased radiation dosage and impaired image quality; as well as to improve quality control of compression.

Mammographic examinations can be divided into screening and diagnostic images. During screening, two projections per breast are taken, one CC and one mediolateral oblique (MLO) (Aspelin & Petterson, 2008).

A Swedish study on breast cancer screening showed that in the group of women taking part in the screening program, mortality could decrease by 45% (The Swedish Organized Service Screening Evaluation Group, 2006). In Sweden, all women between 40 and 74 years are invited to mammography screening at intervals of between 18 and 24 months (Socialstyrelsen, 2015a, 2015b). The participation rate in mammography screening is approximately 80% across the country but with great variation between different geographical areas (Socialstyrelsen, 2015a, 2015b). A literature review from 2013 on how pain affects women's participation in mammography shows that 46% of women who do not choose to participate in mammography screening indicate the pain of the examination as the reason (Whelehan, Evans, Wells, & MacGillivray, 2013). The fear of pain and discomfort as a factor that causes women not to participate in mammography screening is also supported by several other studies (Andrews, 2001; Förnvik et al., 2010; Hogg et al., 2015; Whelehan et al., 2013). There are also other factors that affect the number of women taking part in mammography screening. A study conducted in Sweden showed that socio-demographic factors influence participation in the screening program. Women without children and women who have immigrated to Sweden from non-Nordic countries were found to have a lower participation rate (Lagerlund et al., 2002).

Aim

The aim of the study is to investigate how Swedish radiographers perceive the examination methodology in mammographic examinations.

Method

Design

Because the aim was to investigate how radiographers in Sweden perceive the investigation methodology in mammographic examinations, the study was conducted using a qualitative method. Individual semistructured interviews were chosen as the way in

which data would be collected. Qualitative content analysis was used to analyze the data collected. Because the focus of this study was to describe perceptions of examination methodology and not to describe the underlying message found between the lines, the material was analyzed manifestly rather than latently.

Selection of Interviewees

The selection criteria for participation in the study were radiographers employed in mammography centers with at least 1 year of experience. A total of 13 radiographers from six different mammography centers were interviewed.

Implementation

The informants were asked three questions during the interview:

1. How do you perceive that you should perform the positioning of the patients for the CC projection?
2. How do you perceive that you should perform the positioning of the patient for the MLO projection?
3. How do you perceive that you should perform the compression?

Supplementary questions were used to enhance the information provided by the informants, where necessary. The interviews were recorded and later transcribed.

Analysis

The recorded material was transcribed and printed. Analysis was then carried out by reading through the entire material first to create an overview, then re-read and with the help of a marker pen, meaning units were identified. According to the method of qualitative content analysis, condensed sentences were then created to facilitate a clear overview of what was being expressed in the interviews. Subsequently, the condensed units were given a code that clarified what element of the examination time the informants were speaking of. Using the codes, seven categories were then created by separating the encoded units into groups with similar content (Figure 1).

Ethical Aspects

To be able to give consent to participation in the study, it was important for the informants to be made aware of the purpose and method (Malterud, 2011) of the study. For this reason, the informants were informed when invited to the interview and verbally at the interviews. The informants were told that they could choose

Analysis Unit	Domain	Meaning unit	Condensed meaning unit	Code	Categories	Theme
Transcribed material	Perceptions at the time of positioning of the CC projection	"It feels like ... the detector should be a bit above the IMF but you know when it's right"	The detector a little over the inframammary fold, knows when it is positioned correctly -	Placement of the detector	Positioning	Knowing when it is correct

Figure 1. Example of key concepts in qualitative content analysis. CC = carniocaudal; IMF = inframammary fold.

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