Painless mammography—a causal analysis based on patient’s feedback.

Poster No.: C-1046
Congress: ECR 2012
Type: Educational Exhibit
Authors: B. Raghavan, G. Sivaramalingam, M. Selvakumar;
1 CHENNAI, TA/IN, 2 CHENNAI, tamilnadu/IN, 3 Chennai/IN
Keywords: Epidemiology, Technical aspects, Mammography, Breast
DOI: 10.1594/ecr2012/C-1046

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Learning objectives

1. To compare patient’s comfort during mammography after the installation of the new Full Field Digital System with 3D Tomosynthesis vis-a-vis the Older Analogue System based on patient’s feedback.

2. To analyze the causal factors for patient comfort in terms of technology and technique in the Combined view of tomosynthesis.

Background

In India here is no official screening program. All screening is opportunistic, self-initiated and self-funded. Women in the higher socioeconomic group utilise private or corporate Health-care providers. In this milieu patients do defer or delay coming for screening mammography, more so if their prior experience has been painful.

Advanced mammographic systems (Full Field Digital with Tomosynthesis) come with a cost to the Health-Care provider and there is a need to justify of the same, if women have to participate in screening mammograms for early detection of breast cancer.

Whilst the superior diagnostic capabilities of Tomosynthesis have been reported in literature, it is an additional view/procedure with incremental dosage. 3D Tomosynthesis setting is usually done separately after the 2D mammogram. The Combo view however includes the 3D Tomosynthesis in the same CC or MLO position with the same compression as the 2D view in quick succession eliminating the need to re-position the breast but there is an additional time under compression during the acquisition of the 3D images. It is also well documented in literature (2) that discomfort and pain is known to be an important factor for reduced compliance to mammography.

In May 2011 we migrated from an Analogue mammogram with a dedicated mammogram CR system to a Full Field Digital System with 3D Tomosynthesis. We wanted to assess it from the patient’s perspective.

The sources of pain in the descending order (1) were pain in the breast during compression; pain in the ribs or other bones from pressing against the plate; pain when raising the arm; pain when the skin was pulled during placement of the breast on the
plate. Pain caused while raising the arm was due to individual disabilities like frozen shoulder or lack of technician training. The other three could be addressed by modifying the technology.

The various factors contributing to pain during mammography were

1. Due to positioning
2. Due to compression
3. Due to duration of the procedure.

**Imaging findings OR Procedure details**

**Procedure Details:**

Combo view (2D and 3D Tomosynthesis in CC and MLO views) was offered to all patients undergoing a diagnostic mammogram or who were in the high risk category and informed consent was obtained for the same after explaining the details of the procedure including the incremental dosage during the Tomosynthesis as opposed to a simple 2-view mammogram for each breast. Of these 100 patients (Fig 2) who fulfilled the above criteria were serially included in the study if they had a previous mammogram in our facility in the last 2 years.

After obtaining verbal informed consent, as approved by the institutional review board, forms were given to these 100 patients. The staff member asked the women about the scale of pain they experienced during the earlier mammographic procedure on a 0-to-10 numeric analog scale (fig 1).

These women then went in for Combo view mammogram in CC and MLO. All the patients were provided with breast cushions and retractable face shield with FAST paddle systems as opposed to the earlier examination (Fig 3) with regular paddle, face shield without breast cushion.

1. Comfort of positioning
The retractable face shield (Fig.5 and 6) offers varied settings so the chin or shoulder is not within the area of exposure and can be adjusted to suit larger and smaller breasts as opposed to the smaller face shield.

2. Comfort of compression

The major source of pain has been attributed to actual compression of the breast during the procedure.

Pain during compression is decreased due to the breast cushion (Fig 7) that was provided. It is adhesive-backed open cell foam cushion which is radiolucent and artifact-free on mammographic X-ray.

Prior to a mammogram, the cushion is placed on the surface of the compression plates to provide a soft, warm cushion for the breast, while also easing discomfort caused by the pulling of breast skin during the procedure. The adhesive-backed, single-use cushion can be used on all standard mammography equipment for screening and/or diagnostic breast imaging. The technologist ensured that women cleaned their breasts thoroughly with soap and water and disinfected with a hospital disinfecting solution thoroughly before positioning. The breast cushions were changed on a daily basis or after 5 patients whichever was lesser. It was also changed if used for patients with an open wound or abrasion or skin infections.

The FAST (Fully Automated Self-adjusting Tilt) paddle setting (Fig 9) of the paddle system is useful as compression device because the flexibility of the paddle enabled differential compression at the chest wall and at the free end of the breast.

3. Comfort of duration of procedure

With the installation of the Full field digital system the time taken during the mammogram is considerably shortened as we do not have to wait for the film and the technologist can view the film on the console soon after exposure whilst in film based system one has to wait for the hard copy. In CR systems one has to insert the cassette into the reader to get the image in the work station. The FFD acquisition work station helps the technologist to see the quality and decide if it is optimum and repeat it immediately if there are any positional or exposure errors.

The study patients were then asked to rate their recent experience vis a vis their previous experience on a 0-to-10 numeric analog scale for pain during compression and positioning.
The data was categorized on a 3-point scale worse, same and better for assessing the following parameters.

1. Pain during positioning
2. Pain during Compression
3. Duration of Procedure

On analysis (Fig 4) majority of the patients rated their experience as better when compared to the previous examination. No patient rated their experience as worse than the previous mammogram.

However there is limitation in the study data, as the patient’s remote (3) memory regarding the previous experience was assessed.

Images for this section:

**Fig. 1:** Numeric analog pain scale. This shows a scale representing pain, where 0 denotes absolutely no pain; 10 is the worst pain you have ever experienced and 5 is about average, for example a mild headache or shoes that are a little too tight(1).
Fig. 2: The age distribution of the women in our study group.
**Fig. 3:** Standard face shield which is smaller with no breast cushion and with a standard paddle.
Fig. 4: Statistical data of the parameters assessed.
Conclusion

The various factors contributing to Comfort during Mammography were attributed to 3 distinct categories which are offered in the higher-end mammographic units.

1. Comfort of positioning

Increasing the size of the face shield with adjustability enabled quicker and more efficient positioning (Fig 4,5,6).

2. Comfort of compression

The major source of pain has been attributed to actual compression of the breast during the procedure (Fig 7).

The breast cushion reduces the compression without altering image quality. However the care cushion comes at a cost of approx. 25 USD (approx Rs.1000, versus a mammogram cost of Rs.2500). We need to look at locally available alternate solutions which can be cleaned with mild soap, water and disinfected with a hospital disinfecting solution without compromising image clarity.

The FAST (Fully Automated Self-adjusting Tilt) paddle setting (Fig 8,9) of the paddle system is useful as compression device and this gives better uniform compression without causing pain to the patient as the flexibility of the paddle enabled differential compression at the chest wall and at the free end of the breast.

3. Comfort of duration of procedure

In combo view the total duration of the study in our machine was 20 seconds; this includes both 2D and 3D acquisitions. Time duration for individual 2D and 3D acquisitions were 15 seconds each, besides if they were not taken in combination, the repositioning of the patient will lead to time delay as well as anxiety. Since the compression and positioning will be different for each, reviewing of the images as one study will not be possible and it also leads to slight positional variation of the lesions.
The Full field digital system with Tomosynthesis view decreases the need for spot magnified views because it resolves problems due to overlap of tissues.

There is minimal increased radiation dose in combo view (2.5 to 2.8mSv) in comparison to the 2D mammogram (less than 2mSv) however most of the spot magnification views and recalls were avoided due to better delineation of lesions in combo view.

The present Combo mode involves acquisition of the Tomosynthesis followed by the 2D view and the images seen on the acquisition console is in that order. If the 2D view was displayed first in the acquisition console and the technologist (who can be trained) can have the option of turning on the Tomosynthesis or aborting the same depending on the type of breast in the Combo mode, it would save lot of time and avoid radiation in fatty breasts.

Alternatively the performance of a synthesized 2D image from the Tomosynthesis has to be compared with the performance of the true 2D image, which is being explored.

Comfort during mammography plays a key role in patient compliance. Digital acquisition with the paddle, face shield modification and cushion definitely have a role in improving patient comfort and acceptability. The Combined view is acceptable to the patient despite the longer time duration and dosage issues.

Images for this section:
Fig. 4: Statistical data of the parameters assessed.
Fig. 5: Fig 5 and 6 - Retractable face shield in two positions.
**Fig. 6:** Fig 5 and 6 - Retractable face shield in two positions.
Fig. 7: Breast Cushion.
Fig. 8: The compression paddle in the normal mode.
Fig. 9: The FAST mode of the paddle in figure allows differential flexibility of paddle compression which is achieved by pulling the purple button.
References

3. NHSBSP Equipment Report 0603 May 2006. Published by NHS Cancer Screening Programmes.