



MAMMOGRAMS – DOING IT DIGITALLY FOR THE PERFECT IMAGE

Because there is little women can do to reduce their inherent risk of breast cancer, early detection remains a pivotal factor in long term survival. Early detection can mean a 30% to 45% decrease in mortality.

Breast cancer is the most common cancer amongst women in South Africa and the most common cause of cancer death. In first-world countries, the mortality rate has decreased sharply since 1995.

The decrease is a result, in part, of the earlier detection of abnormalities by mammogram, even before they have become life-threatening. It comes as no surprise then, that advances in mammography are applauded by women worldwide.

Digital mammography – a vastly superior alternative to conventional mammography – is one such innovative development in the detection of breast cancer. Digital mammograms will not prevent the estimated 1 in 8 women from developing breast cancer, but makes an important difference in survival rates by improving the detection of the cancer early.

A private breast health centre in the Northern Suburbs of Cape Town launched this latest break-through in breast imaging technology in August, showcasing the first GE Healthcare Senographe full field digital mammography system in Africa. The Senographe is the digital mammography machine used in most scientific studies and trials internationally. It is considered to be the reference system for digital mammography.

Detection of breast cancer is fairly easy if there are physical symptoms like a lump or thickening, changes in the shape of the breast, discharge from the nipple or continuous discomfort. But early cancers go undetected because there ARE no symptoms. By the time that symptoms appear, aggressive therapy is often necessary and long-term survival compromised. This is where mammograms play the role of the 'hero'. With expert mammography, experienced readers are able to detect very early lesions in the breast. Treatment at this stage changes the character of breast cancer from a life-threatening disease to a manageable condition with a survival rate approaching that of women without breast cancer.

SO, WHAT IS A MAMMOGRAM?

Mammography is a non-invasive procedure which uses a specially designed x-ray machine to produce an image of the breast, utilising low dose x-rays that can detect small cancers that otherwise cannot be detected. The breast needs to be compressed in a paddle so that all the breast tissue can be examined without high doses of radiation. X-ray machines have been specifically designed for this type of examination and since the 1960's the precision of the examination has improved continuously so that it is accurate in 90% of all cases.

HOW DOES CONVENTIONAL MAMMOGRAPHY WORK?

In conventional or standard mammography, the image is created directly on a film, exactly like the x-ray normally used to detect if a leg or arm is broken. While standard film mammography in expert hands is very good and is the most effective and most reliable method for early detection, it is less sensitive for women who have dense breasts. Prior studies have suggested that approximately 10% to 20% of breast cancers that were detected by breast self-examination, or physical examination, are not visible on film mammography. A major limitation of film mammography is the film itself. Once a film mammogram is obtained, it cannot be altered; if the film is underexposed, for example, contrast is lost and cannot be regained.

Although both digital and film mammography use x-rays to produce an image of the breast, the digital mammogram differs in that it uses a digital detector.





HOW DOES FULL FIELD DIGITAL MAMMOGRAPHY DIFFER?

It takes an electronic image of the breast and stores it directly in a computer. The Senographe DS is designed to utilise low energy x-rays to pass through the breast to produce an image which is displayed on a computer screen instead of a film. The resolution and therefore image quality is exceptionally high making it ideal for early detection of changes or abnormalities.

Digital mammography images, just like camera or cell phone digital pictures, can be manipulated i.e. contrast and brightness can be adjusted and magnification can be increased. This 'manipulation' has two intrinsic advantages: Clearer images are obtained and up to half of "second takes", to better assess areas of concern, are avoided. This makes it possible for small tumours to be more easily recognised from the surrounding breast tissue.

Digital mammography allows images to be stored, copied and transported more easily. Transmission telemammography, which facilitates electronic viewing on network for remote consultation with other skilled physicians, is also a distinct advantage over standard films.

The full field digital mammography system is also equipped with a software tool called Computer Aided Detection (CAD) where the computer highlights all the suspicious looking areas on the mammogram, acting in a similar way as a "second reader". No computerised detection system can replace the expertise of skilled readers, but it is a valuable back up or instant 'second opinion'. The system instantly flags abnormalities that might otherwise go undetected.

The shorter examination time and fewer additional views are in themselves a bonus to patients, but the clarity of the images makes this method very attractive. Although radiation received by the patient from the x-ray is negligible, for those women who feel even this level of exposure is a threat, it will be a comfort to know that the amount of x-ray received in a digital mammography is reduced by about half compared to conventional mammography.

HOW DOES IT BENEFIT THE PATIENT?

From the patients' viewpoint the main difference is that the mammographer does not have to leave the room to develop the films; the images appear almost instantly on special computer screens and the waiting period for films to be developed is a thing of the past.

Problems in the very sensitive chemical development process also do not occur, eliminating the cause for second takes.

Anyone who has ever had a stereotactic biopsy (biopsy using x-ray to guide the biopsy needle) will vouch that this is a definite plus point because conventional stereotactic biopsies can take up to an hour, where the patient's breast remains under compression in the device while the film is being developed and assessed. This results that a digital mammography is a much more comfortable experience in a much shorter time!

WILL DIGITAL MAMMOGRAPHY BENEFIT EVERYONE?

The New England Journal of Medicine, 2005 reports on one of the largest trials ever conducted on digital mammography screening, utilising the GE equipment. The Digital Mammographic Imaging Screening (DMIST) was performed to measure relatively small, but potentially clinically important, differences in diagnostic accuracy between digital and film mammography. The results of the DMIST trials showed that the women who will benefit the most from this technology are those:

- under the age of 50 no matter how dense their breast tissue is
- of any age with dense breasts
- of any age who are pre- or peri-menopausal (defined as women who had a final menstrual period within 12 months of their mammograms)





DIGITAL TECHNOLOGY HAS BEEN AROUND A LONG TIME, WHY HAS THE NEW DIGITAL MAMMOGRAPHY TAKEN SO LONG TO REACH SOUTH AFRICA?

One of the obstacles to using digital mammography on a greater scale in South Africa, is its cost. A leading full field digital system, such as the GE Healthcare Senographe DS, costs about 5 times as much as a comparable conventional system. However, Professor Justus Apffelstaedt feels that the investment is justified because of the superior quality of imaging and the resultant increase in early detection of breast cancer.

He says, "Full field digital mammography represents leading technology in breast health. We have invested in this technology of the future with confidence." Professor Justus Apffelstaedt says that combined with this digital technology, is "an assessment by a dedicated breast physician, a clinical examination and cancer risk assessment by a dedicated physician, an ultrasound plus an immediate work up of any abnormality, plus the necessary additional diagnostic procedures or treatment." Professor Justus Apffelstaedt, despite the cost of full field system, says the costs of a digital mammography will be comparable to the costs of a standard mammography so it is accessible to patients.

Patients must be aware that a mammogram, whether digital or film screen, is only as good as the person taking it: Special training and certification as a mammographer ensure that optimal positioning is obtained and virtually painless compression techniques are used. Additional training in the interpretation of digital images is undertaken by all personnel using digital mammography.

A BRIEF OVERVIEW OF THE ADVANTAGES OF FULL FIELD DIGITAL MAMMOGRAPHY:

- The resolution and image quality is exceptionally high making it ideal for early detection of changes or abnormalities.
- Radiation dosage reduced by about half versus film mammography.
- Shorter examination times (approximately half of film-based mammography).
- Fewer additional views.
- Improved contrast between dense and non-dense breast tissue.
- Adjustment of contrast, brightness and increased magnification reducing 'second takes'.
- Improved storage, copying and transport. Transmission telemammography allows for electronic viewing on a network for remote consultation with other physicians.
- Computer Aided Detection (CAD) where the computer highlights all the suspicious looking areas on the mammogram, acting in a similar way as a "second reader".
- Images can be transferred electronically to the referring doctor, or the patient is provided with a compact disc or DVD.

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