

Hong Kong College of Radiologists Mammography Statement

The Hong Kong College of Radiologists would like to give the following comments concerning mammography.

◆ Mammography screening:

- Breast cancer is the leading cancer in Hong Kong women since 1994.
- Diagnosis and treatment of breast cancer at its earliest detectable stage results in dramatic improvement in outcome of the patient. Mammography is the only modality which has been proven by randomized control trials to be effective as a screening tool for early detection of breast cancer and to reduce mortality.
- Randomized controlled trials had shown that mammographic screening in Western population can reduce mortality in breast cancer particularly in women 50 years or older. In Hong Kong, the incidence of breast cancer is less than that of the Westerns and this would somewhat limit the benefit of screening while increasing its risks.
- There is so far, no population screening of breast cancer in Hong Kong. However, screening by self initiation or referral from clinicians (opportunistic screening) has becoming more popular. With opportunistic screening, advises from clinicians and shared decision making with the women are important. Benefits and risks of screening should be discussed between the women and the clinician. The conclusion of “to screen or not” should be decided together according to the woman's values.
- Evidence supporting the usefulness of mammographic screening is strongest for women between 50 and 69 years of age. The benefit of screening is smaller and the risks associated with it are greater for women 40 to 49 years of age. Without strong family histories mammography screening should not start before 40.
- It is most important that the mammography service is of good quality in order to maximize its benefit and to reduce the risk.

◆ Standards in mammography:

- Every effort has to be paid to ensure a high standard of practice in mammography, both for diagnostic and for screening purposes. The clinician in charge of the mammographic service should be responsible for the overall standard of the mammography service

- Mammography should be performed with a dedicated mammography machine, operated by a radiographer and reported by a radiologist. The following standard of mammography service is recommended by the College:
- The Equipment
 - Only dedicated, purpose-designed mammographic apparatus should be used. The apparatus should be capable of being set at least as low as 24 kVp and should be adjustable in 1-kVp increments.
 - X-ray tubes with tungsten targets and aluminium filtration should not be used for mammographic purposes. X-ray tubes with molybdenum or rhodium targets and filters should be the combination of choice for mammography. Other target and filter element combinations in the atomic number range 41–47 (Nb, Ru, Pd, Ag) may also be used.
 - The following image quality is recommended (film / screen mammography only, excludes digital mammography):
 - High contrast spatial resolution ≥ 11 lp/mm for line-pair bars perpendicular to anode-cathode axis and ≥ 13 lp/mm for line-pair bars parallel to anode-cathode axis.
 - Minimal detectable contrast (approximately)
 - $\leq 1.2\%$ on 5-6mm details
 - $\leq 5\%$ on 0.5mm details
 - $\leq 8\%$ on 0.25mm details
 - Film density between 1.5 – 1.9
 - The following radiation dose is recommended
 - Mean Glandular Dose (MGD) per film ≤ 3 mGy when using grid for a 5cm 50/50 (50% adipose, 50% glandular) breast (preferably ≤ 2 mGy for a 4.2cm 50/50 breast). Where a contact non-grid technique is used, the mean glandular dose must not exceed 1.0 mGy.
 - Digital systems should meet the same dose standard as film – screen systems.
- A quality assurance programme for equipment should be in place. A suggested programme is listed below:

Mammographic Machine:

Frequency	Test	Purpose
Daily	4cm Perspex block test using chest wall AEC. The mAs value must fall within +/- 5 mAs of the value set by Medical Applications.	Ensure machine's consistency, reliability and reproducibility.
	Visual check on electrical and mechanical moving parts	Ensure mechanical and electrical safety to both patient and staff.
Weekly	Optical density test using different perspex thickness and Kvp.	Reproducibility and consistency of machine

Monthly	Phantom test on both large and small focus – evaluate visibility of test objects inside; image density and contrast. System’s resolution shall be measured. Minimum requirements: ≥ 11 lp/mm for line-pair bars perpendicular to anode-cathode axis and ≥ 13 lp/mm for line-pair bars parallel to anode-cathode axis. Image quality scoring method can be used depending on the number of calcifications, fibres, masses details seen unambiguously with good definition and measure the contrast of the phantom image.	Evaluate system’s film quality (any degradation), uniformity and resolution - both spatial and contrast (assessed for high-contrast resolution and low-density contrast).
	Repeat analysis due to machine	Check machine’s reliability.
Half yearly	Preventive maintenance	Check accordance to manufacture’s specification. Calibration when necessary.
	Film-screen contact test	Check presence of artifacts or halo - affect image quality.
	Compression force – both powered and manual	Adequate in manual and powered and ensure the force indication is exact and within range.
Annually	Service engineer carried out test on focal spot, half value layer, dose calculation, Kvp interlock, light/X-ray field alignment, compression device, output reproducibility, output linearity, timer accuracy, timer reproducibility, Kvp accuracy, Kvp reproducibility.	Ensure safety, reliability, consistency of machine according to manufacture’s specification.
	Medical physicist performs check on electrical and radiation safety for equipment and exam room according to code of practice. Mean Glandular Dose (MGD) ≤ 3 mGy when using grid for a 5cm 50/50breast (preferably ≤ 2 mGy for a 4.2cm 50/50breast). MGD ≤ 1 mGy when a grid is not used.	Ensure safety to all personnel. Minimize radiation dosage to patient.

Accuracy of biopsy unit should be tested and calibrated every time before start of examination.

Cassettes should be cleaned and inspect daily to avoid presence of artifacts and possibility of film fog.

Darkroom safe light fog test should be carried out half yearly if darkroom is used.

Processor:

Frequency	Action	Purpose
Daily	Sensitometry test	Ensure consistency before start.
	Developer temperature check.	
	Clean crossover roller rack after work	Avoid artifact due to chemical deposits
Weekly	Perform daily clean up process	
	Check chemicals' specific gravity.	Ensure chemicals properties.
	Remove and clean all deep tank roller racks. Avoid contamination of developer by fixer.	
Monthly	Drain all the chemicals and wash the tanks thoroughly.	Ensure optimal image quality.
	Refill all tanks after cleaned. Remember to add starter to the developer tank.	
	Check chemicals' replenishment rate.	
	Process at least 15 films using serial unloading	
	Perform sensitometry test	Check new chemicals' performance.
Quarterly	Preventive maintenance	Calibration when necessary.
Annually	Medical physicist conducts test on electrical safety	Ensure safety to all personnel.

NB:

- For CR machine, regular preventive maintenances should be arranged. These include CR cassettes and the computer systems (stability and reliability).
- An error and fault record on equipments should be kept to look for trends of machine performance and degradation.
- Quality assurance process should be regularly reviewed.

■ The Radiographer

The following are the minimum requirement and quality assurance programme for mammographers:

Mammographers' requirements:

1. At least one mammographer operating the machine has acquired international recognized qualification in mammography.
2. Minimum standard of each mammographer is to take mammograms of at least

- 500 women a year preceding being a qualified mammographer in clinical setting.
3. Regular update of knowledge, technique and new trends (equipments, new scientific approach.) – At least 25 hours over 5 years of continue professional development (can be seminars or conferences attendance).
 4. Clinical involvement in breast imaging for an average of 150 hours per year.

Quality assurance programme for mammographers:

1. Regular repeat and reject analysis of every mammographer; technical repeats <3% of total film used.
2. Film Rating of every mammographer. Criteria include
 - >75% should be in perfect or good group in PGMI rating system.
 - >97% should be in P, G, M groups.
 - <3% in inadequate group.

■ The Radiologist

For imaging of symptomatic women:

1. Radiologists should be competent in reporting mammograms, performing and interpreting breast ultrasound and in supervising specialist mammography techniques. The radiologist should acquire the skill in performing image-guided biopsy and localization of impalpable breast lesions.
2. Recognized and recommended descriptive terms should be used in the reporting of mammogram and breast ultrasound. Details of site, imaging size and nature of any abnormality should be reported. When available, the present examination should be compared to previous studies and this should be indicated in the report. The overall impression should include the likely diagnoses, the assessment category and recommendations for any further diagnostic procedure or intervention.
3. They should participate in personal breast imaging audits and multidisciplinary breast service audits.
4. Radiologists involved in breast imaging should have completed at least a 3 months training in breast radiology during their higher training period or had attended 30 hours of continuing medical education in breast imaging in the previous 3 years
5. The radiologist should read at least 300 symptomatic mammograms annually.
6. They should have regular update of knowledge in breast radiology with at least 25 hours over 5 years of CME activity with breast imaging content

For involvement in screening mammography.

In addition to the above

1. The radiologist should have 15 hours of continuing medical education at a breast screening course in the previous 3 years
2. For initial qualification, the interpreting radiologist should have interpreted or multi-read 500 mammograms within the 12-months period immediately prior to the date for interpreting screening mammogram.
3. They should be involved in assessment, multidisciplinary meetings & review of

interval cancers.

4. They should participate in audits and quality assurance review rounds.
5. The radiologist should read at least 500 screening mammograms annually.

■ Performance standards for a mammography screening centre

A quality control program should be in place which include the following:

- (a) Technologist's checks & equipment check as above
- (b) Professional quality improvement program which should include system for reviewing outcome data from mammography screening, and audit of biopsies.
- (c) Note that separate audit statistics should be maintained for screening and diagnostic examinations, as many of the audit data (e.g., cancer detection rate) are significantly different for screening and diagnostic examinations.

There have not been any objective standards for breast screening for Asians, but the desirable goals recommended in UK & USA can be used as a reference^{1,2}

By comparing one's practice outcomes with the desirable goal, and to compare one's own performance over time, one can provide quantifiable evidence in pursuit of the goals of screening mammography. The following are the audit data suggested for collection:

- Cancer detection rate - to maximise the number of cancers detected.
- Recall rate, positive predictive value based on abnormal findings, recommendation for biopsy & biopsy yield of malignancy - to minimize cost and morbidity.
- Minimal cancer detection rate, axillary lymph node negativity - to maximize the number of small and node-negative cancers detected, which are important for patient outcome.

References:

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3. Radiation Guideline 6, Registration requirements & industry best practice for ionising radiation apparatus used in diagnostic imaging. Part 1 Mammography. NSW Environment Protection Authority. Second edition March 2004
4. Board of the Faculty of Clinical Radiology .The Royal College of Radiologists (2003) Guidance on Screening and Symptomatic Breast Imaging.
5. ACR Practice Guideline For The Performance of Diagnostic Mammography 2002

6. ACR Practice Guideline For The Performance of Screening Mammography 2004
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