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Information

Xeromammography Versus Screen-Film Mammography

Pros and Cons of the Two Techniques

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XEROMAMMOGRAPHY and screen-film mammography are the predominant techniques being used for the radiographic detection of breast cancer.[1] Xeroradiography, a technique similar to the standard photocopying process, works on the principle that x-rays partially dissipate a uniform electrical charge applied to a selenium-alloy plate, thereby producing a latent (electrostatic) radiographic image, which is subsequently *developed* by dusting the plate with charged particles of (blue) plastic powder. The colored powder is then transferred and bonded to paper by a heat-sealing process, resulting in a blue and white image. Screen-film radiography is a more conventional technique, using regular x-ray film but coupled with a radiographic *screen,* a device that converts x-rays to visible light. The advantage of the screen is that light darkens x-ray film much more efficiently than x-rays themselves, thereby producing a properly exposed image with only a small fraction of the x-rays otherwise needed.

Several differences between xeroradiography and screen-film radiography cause important disparities in the manner in which these two techniques can be adapted to breast imaging. Screen-film techniques require both uniform-thickness breast compression and very low-energy x-ray beams (25 to 28 kVp) for diagnostically acceptable images.[2] This necessitates the use of specialized x-ray equipment designed specifically for mammographic examinations.[2] Xeroradiography techniques, on the other hand, use higher-energy x-ray beams (40 to 50 kVp), produce satisfactory mammograms without uniform-thickness breast compression and, therefore, can be used successfully with standard ceiling-mounted, general-purpose x-ray units (with few exceptions, screen-film techniques cannot). As a result, xeromammography is considerably more convenient and somewhat less expensive than screen-film techniques, especially for radiology departments or offices that do a low volume of mammography work.

There are also inherent differences in image quality between xeroradiographic and screen-film mammograms that merit discussion.[1,3] The edge-enhancement property unique to xeroradiography facilitates the imaging of tiny breast calcifications, which may be the only indication, radiographic or otherwise, that breast cancer is present. Screen-film mammograms, on the other hand, have comparatively high inherent contrast, thereby facilitating the imaging of poorly defined breast masses, which also may be the only manifestation of carcinoma. Because approximately half of mammographically detectable cancer of the breast presents with microcalcifications and the other half presents as poorly defined noncalcified masses, there is no relative advantage to either technique, nor is it possible to know a priori which technique is best for an individual patient. More important, these differences in image quality between xeromammography and screen-film mammography are quite subtle and of little clinical significance. Based on my own experience involving malignant lesions radiographed with both techniques, one technique will permit carcinoma to be diagnosed with a greater degree of confidence than the other approximately 25 percent of the time, but the circumstance in which cancer is detected by one technique but not the other occurs very infrequently.[3]

Despite the lack of a substantial difference in the quality of images between xeromammography and screen-film mammography, many radiologists express a distinct preference for one or the other technique; interestingly, these personal preferences almost always are based on extensive use of one technique and little or no familiarity with the other. There is, in fact, general agreement among experienced mammographers that either technique produces excellent results, if done by skilled personnel using proper equipment. Most unfavorable experiences with the screen-film technique reported by those favoring xeromammography result from trying to adapt to screen-film imaging

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the same general-purpose x-ray equipment that works so well for xeromammography; such an unfortunate combination of equipment and technique at best produces substandard images. Very few negative experiences with xeromammography have been reported by screen-film mammographers—they rarely consider switching to the xeroradiographic technique because (1) they already have invested in the necessary specialized mammography equipment; (2) xeromammography is a technique that uses much higher doses of radiation, and (3) very few breakdowns interrupt the day-to-day operation of screen-film mammography, whereas xeromammography is noted for considerable "downtime" because of repeated malfunctions in the image-processing apparatus.

Among the various differences between xeromammography and screen-film mammography, perhaps the most important concerns radiation dose; here, screen-film technique has the clear-cut advantage, being considerably lower in dose.[4] The most pertinent of the several dose determinations is the "average dose to mammary glandular tissue," and the dose for screen-film mammography is a fourth to a tenth that for xeromammography. Although it remains unclear whether the radiation risk of mammography is great enough to be clinically meaningful, there is general agreement that because the risk of radiation-induced cancer appears to be directly proportional to radiation dose, any reduction in dose is accompanied by a parallel decrease in risk. Over the past several years there has been considerable reduction in radiation doses for all mammography techniques, so that even the xeromammography breast tissue dose is now less than 1 rad per examination at most installations. Screen-film mammography doses are so low now that the lowest of these approaches the dose of a standard x-ray examination of the chest. The dose differential between the screen-film and xeromammography techniques is most meaningful when considering the screening of asymptomatic women. In this situation we face a relatively low yield of cancer detection and the cumulative dose of multiple mammographies; the benefits derived do not exceed the presumed risk by as great a margin as they do for diagnostic mammography (the one-time examination of women with signs or symptoms that suggest the possibility of breast cancer).

Xeromammography and screen-film mammography produce images of very similar quality, with only subtle, probably insignificant differences in informational content. The major differences between the two techniques are as follows: (1) xeroradiographic processing can be done using conventional x-ray units, whereas screen-film imaging requires specialized x-ray equipment and (2) screen-film mammography imparts a considerably lower dose of radiation than does xeromammography. The overall trend among radiologists is clearly toward screen-film imaging, but xeromammography still retains a substantial following, primarily because of economic considerations.

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Advances in Burn Care

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EACH YEAR in the United States approximately 2,000,000 people sustain burns serious enough to require seeing a physician. Of these, 50,000 people are admitted to hospital and approximately 12,000 of them die.

As late as 1960 a 30 percent total body surface area (TBSA) burn carried a mortality of 50 percent. At present, in many specialized burn centers

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