

The Screen-Film Contact Test for Mammography

Background

The contact between the intensifying screen and x-ray film when performing mammography has a significant influence on image sharpness. Since mammographic screen-film systems have a much higher resolution than conventional general radiographic systems (16 to 20 cycles / millimeter for mammography, as opposed to 4 to 8 cycles/millimeter for conventional systems), intimacy of contact is critical in order to produce optimum quality images.

Screen-Film Contact Test Tool

Screen-film contact for mammography cassettes may be evaluated by performing a screen-film contact test. The procedure requires the use of a special test tool, which consists of a fine wire mesh made of copper, with 40 wires per inch, mounted between two thin acrylic sheets.

Note: Screen-film contact test tools are commercially available from several sources. Tools with or without a one-centimeter hole are acceptable. The tool should be stored flat to prevent bowing.

Test Procedure

1. Clean all screens and cassettes to be evaluated. Screens and cassettes must first be thoroughly cleaned since foreign matter as small as 20 micrometer will affect test results. A human hair is approximately 70 micrometer. Each cassette should have a unique identification number that will be visible on the contact radiograph. Use the following cleaning procedure:
 - a. Choose a clean location to clean screens and cassettes. If working on a countertop in the darkroom used for processing mammography film, wipe the outside of cassettes and clean the countertop prior to cleaning the screens.
 - b. Use a KODAK Screen Cleaner Wipe (or moisten a second lint-free wipe with a small amount of KODAK Screen Cleaner Solution). Clean and dry the screen. Any time 70% isopropyl alcohol is used on the screen a KODAK Screen Cleaner Wipe or KODAK Screen Cleaner must be used afterwards. Avoid excessive rubbing, abrasive wipes such as surgical gauze pads, pouring of any solutions directly onto the screens or into the cassettes, or using an excessive amount of any solution. **Do not clean the screen with water.**
 - c. Clean the inside plastic cover of the cassette (tube side panel) using a lint-free wipe that has been moistened with water. Dry the cover.
 - d. Inspect the screen and cassette cover for any stray particles of dust. An ultraviolet light is helpful in determining if screens and cassettes are dust free. Observe all safety precautions recommended by the ultraviolet light manufacturer, i.e., do not look directly at the light; limit the length of exposure, etc.
 - e. Load the cassette with film.
2. Prior to performing the test **wait 5 minutes** after loading to allow entrapped air to dissipate from MIN-R 2 cassettes.

3. Place each cassette on top of the image receptor (bucky with grid) or in the non-grid cassette holder with the test tool directly on top of the cassette.
4. Move the compression device close to the x-ray tube. Additional acrylic sheets may be placed on top of the compression device to achieve minimum exposure time and the required optical density.
5. Select a manual technique in order to produce an optical density between 0.70 to 0.80, measured with a spot reading densitometer over the wire mesh. The densitometer must have an aperture 2 millimeters or greater in diameter. Use 25 to 28 kVp and a reasonable exposure time. A reasonable exposure time is suggested (0.5 second, for example) to ensure a reproducible optical density on all contact radiographs. Extremely short exposure times should be avoided. Measure an area of the film near the chest wall which represents good contact (does not show increased density).
6. View the radiographs on a viewbox from a distance of at least three feet.

Evaluating Your Contact Radiographs

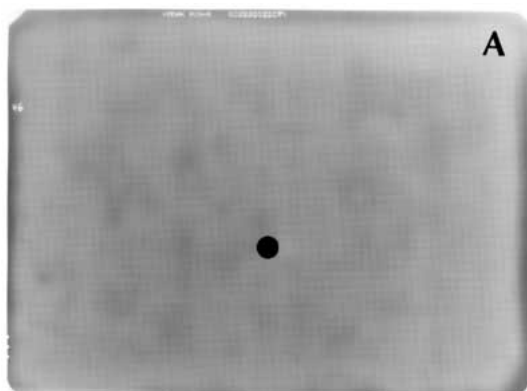
If any of your screen-film contact radiographs show areas of increased density, repeat the test after cleaning the cassettes in question a second time and waiting at least fifteen minutes after loading with film. Make sure the optical density of all contact radiographs is within the 0.70 to 0.80 range measured near the chest wall. Compare the radiographs. Cassettes with persistent large areas of increased density (greater than 1 centimeter and in the same location) should be replaced.

Contact radiographs which show multiple random areas of increased density, but all areas are less than 1 centimeter in diameter, should also be returned to service. Small areas of increased density are usually caused by minute dirt particles and will not occur in the same exact areas in comparing the first and second radiographs of a particular cassette. The use of an ultraviolet light is suggested on the insides of these cassettes after unloading to highlight any small dirt particles.

Any cassette and screen with questionable results should be cleaned and re-tested several times following the proper procedure, and the radiographs compared. Areas of increased density which shift to a different location or disappear are probably due to foreign matter or entrapped air interfering with the contact. Screens and cassettes should always be handled with reasonable care to ensure optimal mammographic image quality.

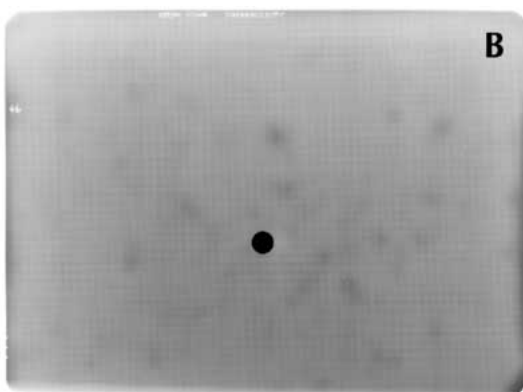
Examples

The accompanying photographs represent typical screen-film contact radiographs to assist you in evaluating your own contact radiographs. The letters "A" through "D" on the photographs denote the right hand corner of the non-chest wall side of the radiographs.



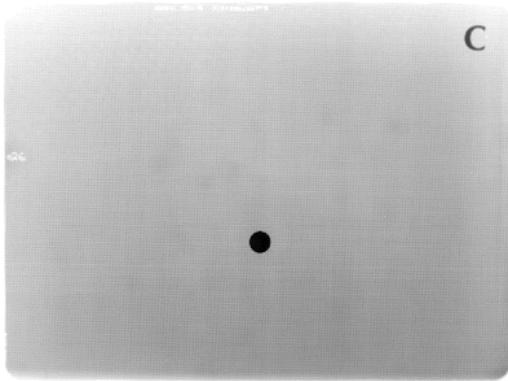
Photograph A demonstrates a diffuse increased density pattern throughout the entire image. This is representative of air trapped between the intensifying screen and film emulsion and may occur if the screen-film contact test radiograph is taken too soon after loading the cassette. The test should be repeated after waiting at least 15 minutes to obtain results that are more accurate.

Photograph A also demonstrates that it is critically important to manage your Mammography cassettes during clinical use so that they have been loaded at least 15 minutes prior to patient exposure. If using improved KODAK MIN-R 2 Cassettes, exposures may be taken after waiting 5 minutes.

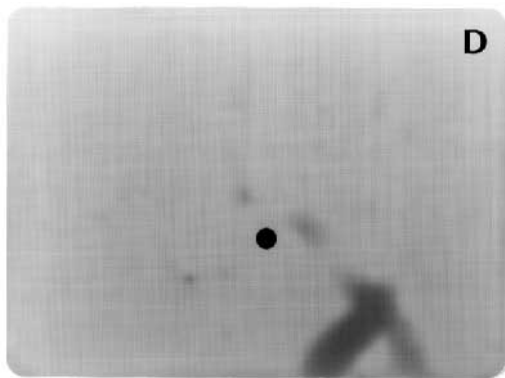


Photograph B corresponds to a radiograph taken after the cassette has been loaded for at least 15 minutes and shows multiple small areas of increased density. The cassette, however, was not cleaned first. Small dust specks have caused some of the areas of increased density, particularly those located to the right and slightly below the circular cut-out area.

The screen and cassette should be thoroughly cleaned and then re-tested after the proper waiting period. If the contact radiographs from a cassette that has been cleaned several times still look like Photograph B, however, the cassette passes since all areas of increased density are less than 1 centimeter in diameter.



Photograph C represents the good screen-film contact test results that are possible when cassettes and the darkroom environment are very clean. In addition, the Relative Humidity of the darkroom has been controlled at approximately 45% year-round.



Photograph D represents a cassette that fails the screen-film contact test due to the areas of increased density greater than 1 centimeter in diameter, particularly at the chest wall. Cassettes that clearly fail should be replaced.