A Simple Method for the Copying and Photographic Data Processing of Scintigrams Recorded on X-Ray Films

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X-ray films are commonly used to record scintigrams. We have constructed a simple device for producing copies of scintigram films on ordinary x-ray film. When copying a film, it is possible to achieve photographic "data processing" to compensate for overexposure and to enhance differences in contrast.

The use of x-ray films for recording gamma camera images has gained wide popularity because of convenience, low price, and high quality of the scintigrams. Another advantage is that the scintigrams may easily be copied for duplication, as well as for photographic "data processing." We describe a simple, low cost copying device that uses conventional x-ray films as opposed to the more expensive copying film used in commercial instruments.

Materials and Methods

The light source is an ultraviolet lamp (Quarzlampen GMBH, West Germany) covered with opaque material leaving an aperture 7 mm by 7 mm. A diagram of the lamp driver and exposure timer is shown (Fig. 1). The lamp driver consists of 2 transformers, T_1 and T_2. Transformer T_2 is provided with taps to select a suitable voltage for the lamp (approximately 1000 V). The exposure time is set by an electronic timer based on integrated circuit type 555. The timer setting is adjusted in accordance with the case on hand.

The scintigram and the copying x-ray film are held together in a frame at a distance of 90 cm from the light source (Fig. 2). Because the original film is produced by exposure to light, the image will be concentrated on one side of the emulsion. For best results, care must be taken that the image side is in contact with the copying film.

Results and Discussion

The simplicity and low operating cost of the device enable routine copying of scintigrams. The ability to vary the illumination gives control of the density and contrast of the film. Differences in uptake may be accentuated and

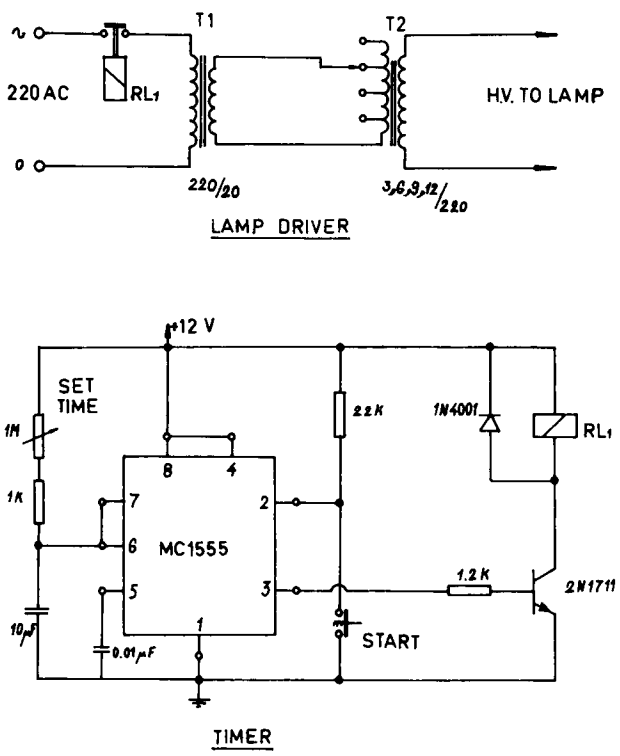

FIG. 1. Lamp driver and exposure timer.

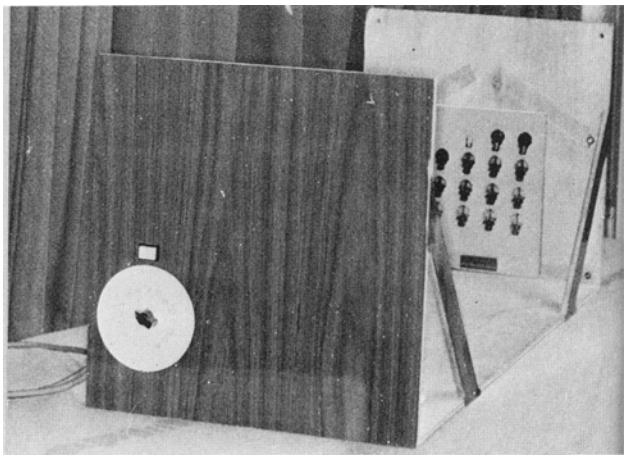

FIG. 2. General view of the film copier.

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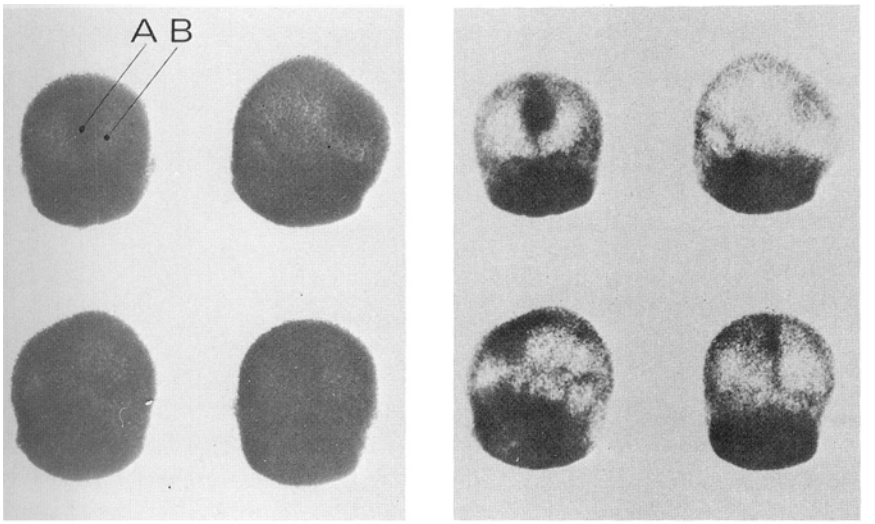

FIG. 3. Original brain scintigram (left) processed copy (right). The film density at points A and B is given in Table 1.

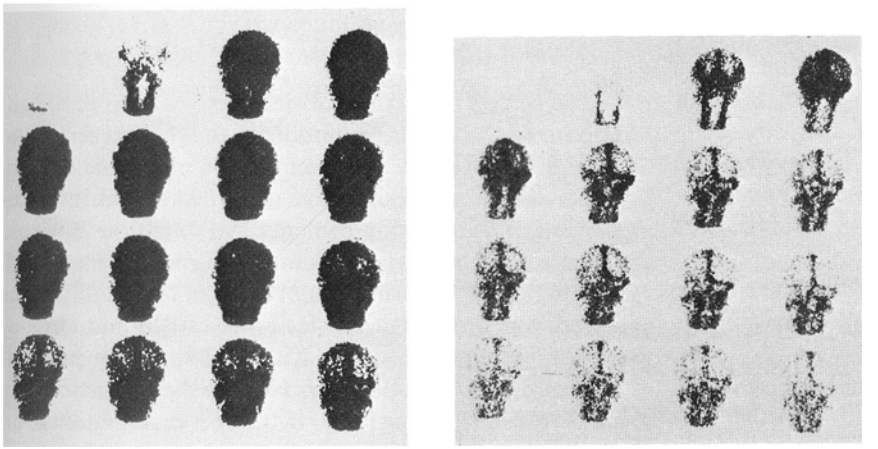

FIG. 4. Original brain dynamic study (left); processed copy (right).

overexposed images may be corrected; this is especially useful in dynamic imaging where the optimum intensity setting is difficult to determine in advance.

Figures 3 and 4 show overexposed brain scintigrams and corrected copies for a static and a dynamic study, respectively. In the original scintigrams, the contrast is poor because the density is in the shoulder region of the characteristic curve. During copying, the density was shifted to the linear part of the curve, with a corresponding increase in contrast.

To determine the degree of contrast enhancement achieved, the film density at points A and B of Fig. 3 was measured with the aid of a densitometer (Macbeth Instrument Co., Newburgh, NY); the results are shown in Table 1 where it may be seen that the relative contrast has been increased by a factor of about 10 in the copy. In these examples copying was performed twice to produce a positive image. The negative image obtained by copying once is usually sufficient.

TABLE 1. Comparison of Contrast Between Original Film and Copy

	Density at Point A (Da)	Density at Point B(Db)	Contrast (Da - Db)	Relative contrast $\frac{Da - Db}{Db}$
Original film Fig. 3 (left)	2.90	2.20	0.70	0.32
Copy Fig. 3 (right)	0.95	0.22	0.73	3.30

Conclusion

While our method of photographic data processing cannot provide information that is not present in the original image, it can often aid in the interpretation of questionable scintigrams. The film copier has been in regular use in our department for about two years for the production of duplicate scintigrams; on many occasions, its use has obviated the necessity of repeating a doubtful study. The instrument may also be used advantageously to copy diagnostic x-ray films.