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MAMMOGRAPHIC TECHNIQUE FOR THE LOCALIZATION OF STRUCTURES IN SMALL ANIMALS

by

JOSEPH TASHJIAN

Department of Radiology
University of Minnesota Hospital and Clinic
Minneapolis, Minnesota

and

FREDERICK J. JANNETT, JR.

Department of Biology
The Science Museum of Minnesota

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ABSTRACT

Localization and identification of anatomic structures and pathologic conditions in small animals is difficult. Mammographic equipment with high resolution, good contrast, and magnification possibilities permits accurate assessment of various structures and disease states. A technique is described to obtain high quality radiographs.

KEY WORDS: Small animal radiography, magnification radiology, mammography

INTRODUCTION

Localization and identification of anatomical structures and pathological conditions on small animals can be facilitated with radiography. For example, Vrtis (1930) located the cutaneous scent-producing flank gland organs of the water rat, *Arvicola scherman* (= *A. terrestris*) with respect to the vertebrae. However, traditional medical radiography is designed for imaging humans, and even premature infants are larger than most small mammals and other animals. In addition, the need to limit the amount of radiation to humans precludes the detail necessary to evaluate small structures with standard equipment. On the other hand, we have found mammographic equipment to be ideally suited for imaging small organs with both high spatial resolution and contrast. To localize the scent glands on voles (Rodentia: Muridae), radiographs were obtained on mammographic equipment as described below.

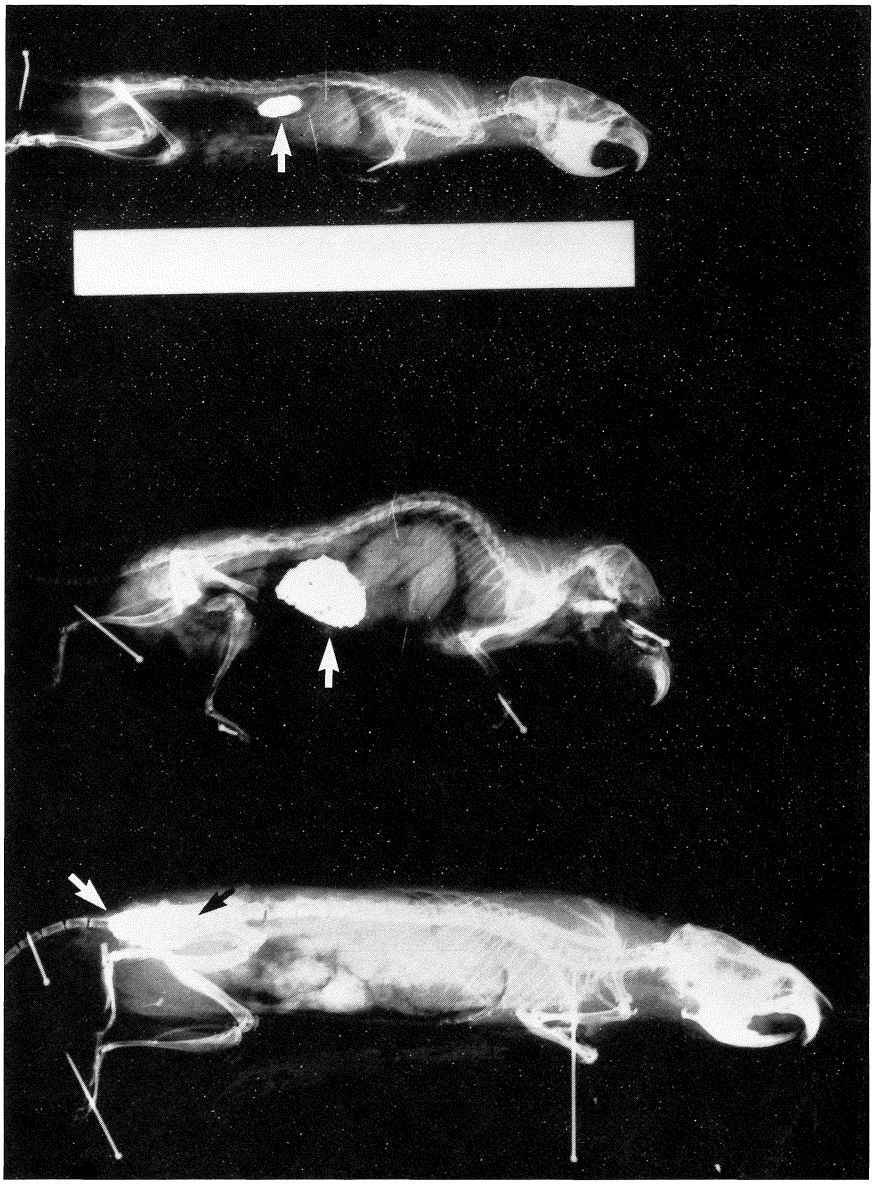

FIGURE 1: Lateral non-magnified view of three voles with the scent glands marked with barium paste (arrows). The upper animal is *Clethrionomys rufocanus* (Z84:20:1), the middle *Microtus gregalis* (Z84:21:2), the lower *M. evoronensis* Z84:22:11). The white bar is a 10 cm. marker. Note the variation in position of the scent glands.

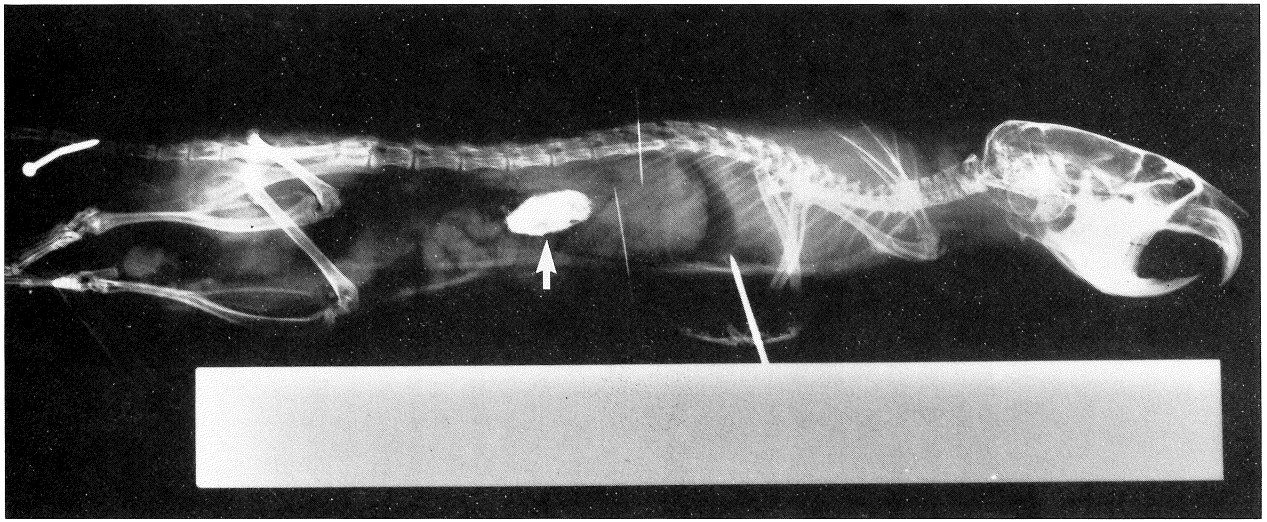

FIGURE 2: Two-to-one magnified view of *Clethrionomys rufocanus* (Z84:20:1). The white bar is 10 cm. The vertebral bodies are easily identified, as are ribs, extremities, skull and some internal organs. Barium paste (arrow) identifies the scent gland.

METHOD

Localization of one of the bilateral scent glands on each of several voles was done by local dissection, because the boundaries of the glands are generally less distinct externally than internally. The skin was cut anterior to one gland from the mid-ventral to the mid-dorsal line. A second cut was made from the dorsal end of the first cut, along the mid-dorsal line to the base of the tail. The skin was then folded down and the inner surface blotted dry. A paste made of barium sulfate powder, which is radiopaque, was applied to the inner area of the gland with a small brush. When this was almost dry, the skin was returned to its normal position and secured in place with an insect pin (minutian) in the dorsal anterior corner. The animals were then placed on the mammographic table (CGR) and radiographed in a lateral projection. Exposure factors were 24 kilovoltage potential (kVp) and 40 milliampere-seconds (mAs) for a non-magnified view (Fig. 1) with 24 kVp and 160 mAs for a two-to-one magnified view (Fig. 2). Images were recorded on Kodak OM-1 mammographic film with processing performed in an automated rapid processor (Kodak) dedicated for mammographic film. Z numbers in the legends of Figs. 1 and 2 are catalog numbers at The Science Museum of Minnesota.

DISCUSSION

Mammographic equipment is designed to image the breast where high resolution and high contrast are mandatory to differentiate breast pathology. Typical spatial resolution is 15 cycles per millimeter (Rossman, 1964), surpassing other commonly used techniques in medicine. In addition, many machines are capable of doing magnification work at two to three times life size, with increase in resolution and image size (Haus, et al., 1979).

Radiographic contrast is enhanced by a low kilovoltage technique. In mammography it is important to identify small microcalcifications and, therefore, mammographic equipment is designed to image at low kVp's. The high resolution and high contrast can be particularly useful in identifying and counting vertebrae, ribs, or other small structures that might otherwise be obscured.

Finally, the widespread availability of mammographic equipment in the medical community allows for relatively easy access. Development is quick, and study specimens can be repositioned and re-radiographed if necessary. This should assist researchers in obtaining high quality images to evaluate the problem at hand.

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