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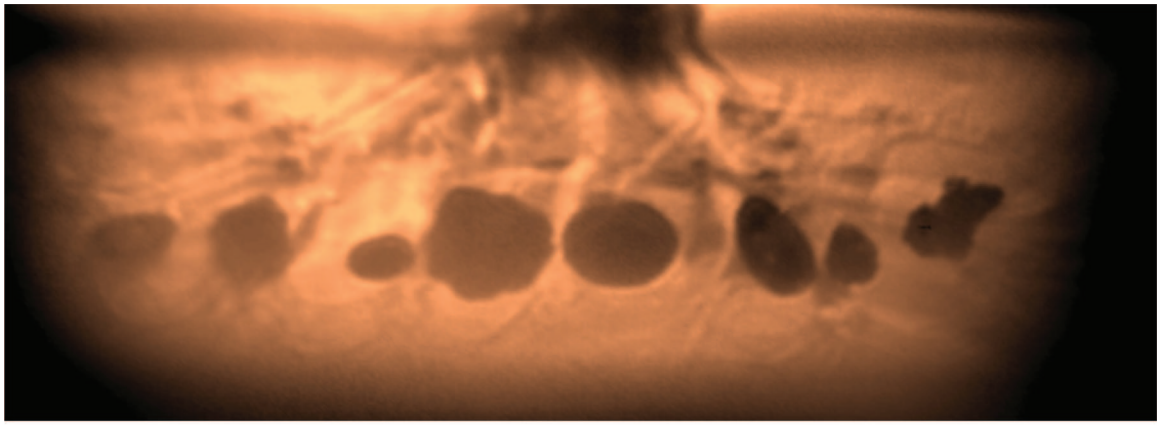
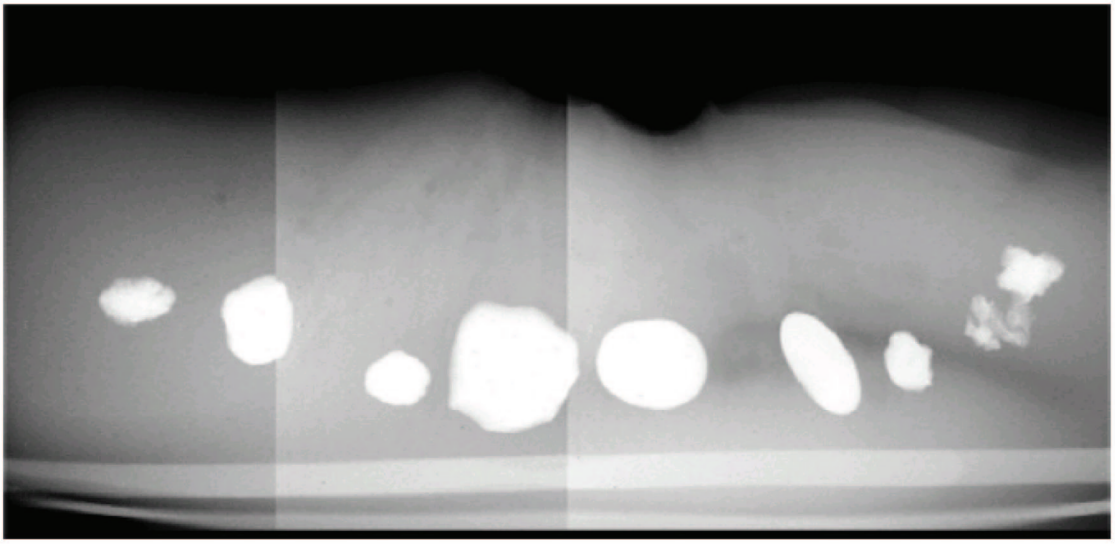


Vibroacoustographic Image



Composite X-ray Image

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Imaging Kidney Stones With Vibroacoustography

The cover shows a vibroacoustography (VA) image of stones embedded in a porcine kidney (top). The porcine kidney was cut open and nine postsurgical kidney stones, extracted from human patients by a urologic surgeon, were inserted. The stones have irregular shapes and their diameters ranged from ~4 to 10 mm. The kidney was then sutured close and secured on a metallic frame using elastic rubber bands before placing it in the water tank for VA imaging. The scanning was performed using an amplitude-modulated ultrasound beam at 50 kHz (modulation frequency). The stones inside the kidney clearly appear with a different contrast than the background tissue. In addition, anatomical features such as vessels are visible. The specimen was then scanned with X-ray imaging to obtain a gold-standard reference image (bottom). Comparison between the VA image and the X-ray fluoroscopy shows that the VA image is quite comparable with the X-ray image in terms of contrast and resolution in the detection of kidney stones. VA imaging possesses several advantages over X-ray imaging in that it uses no ionizing radiation and is lower in cost than X-ray or computed tomography imaging currently in clinical use, and the images have no speckle (unlike conventional ultrasound).

Images courtesy of F. G. Mitri, Los Alamos National Laboratory, Los Alamos, NM. For further reading, please see the accompanying article, F. G. Mitri and R. R. Kinnick, "Vibroacoustography imaging of kidney stones in vitro," *IEEE Trans. Biomed. Eng.*, vol. 59, no. 1, pp. 248–254, 2012; the bottom image appeared in this article, © IEEE.

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