The elastic properties of an artery provide a valuable indication of its viability. Changes in the vessel's diameter in response to fluid pressure changes, which occur during normal pulsatile blood flow, characterize such properties. Standard angiographic imaging systems which image 3 lp/mm are incapable of imaging the changes in diameter of small vessels. We have built a micro-angiographic detector, with 10-lp/mm resolution and 23-:m pixels which can detect these changes by imaging the vessel's boundary during expansion and contraction.

The detector consists of a 100-:m thick CsI(Tl) phosphor coupled to a CCD with a fiber-optic taper. A 525-line standard RS-170 video signal is digitized to form 8-bit images. Blood vessels were simulated using elastic tubing about 3 mm in diameter, filled with 300 mg/cc iodine contrast media. Variable pressure applied to the channel caused radial expansion and contraction, simulating a vessel's response to pulsatile flow.

We used the imager to acquire real-time 512x480 radiographic frames of the phantom. By digitally subtracting the images corresponding to contracted and expanded phases of the vessel, we determined the change in vessel diameter to be 14 pixels (320 :m), representing a change in diameter of 9%, which lies in the range of values for actual arteries of this size. Such measurements may give information previously unavailable about the elastic properties of small vessels, and help in evaluating vascular interventions.

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