Section 16

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

Robert J. Siegel

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

Dr Michael Fishbein, cardiovascular pathologist at Cedars-Sinai Medical Center in 1989

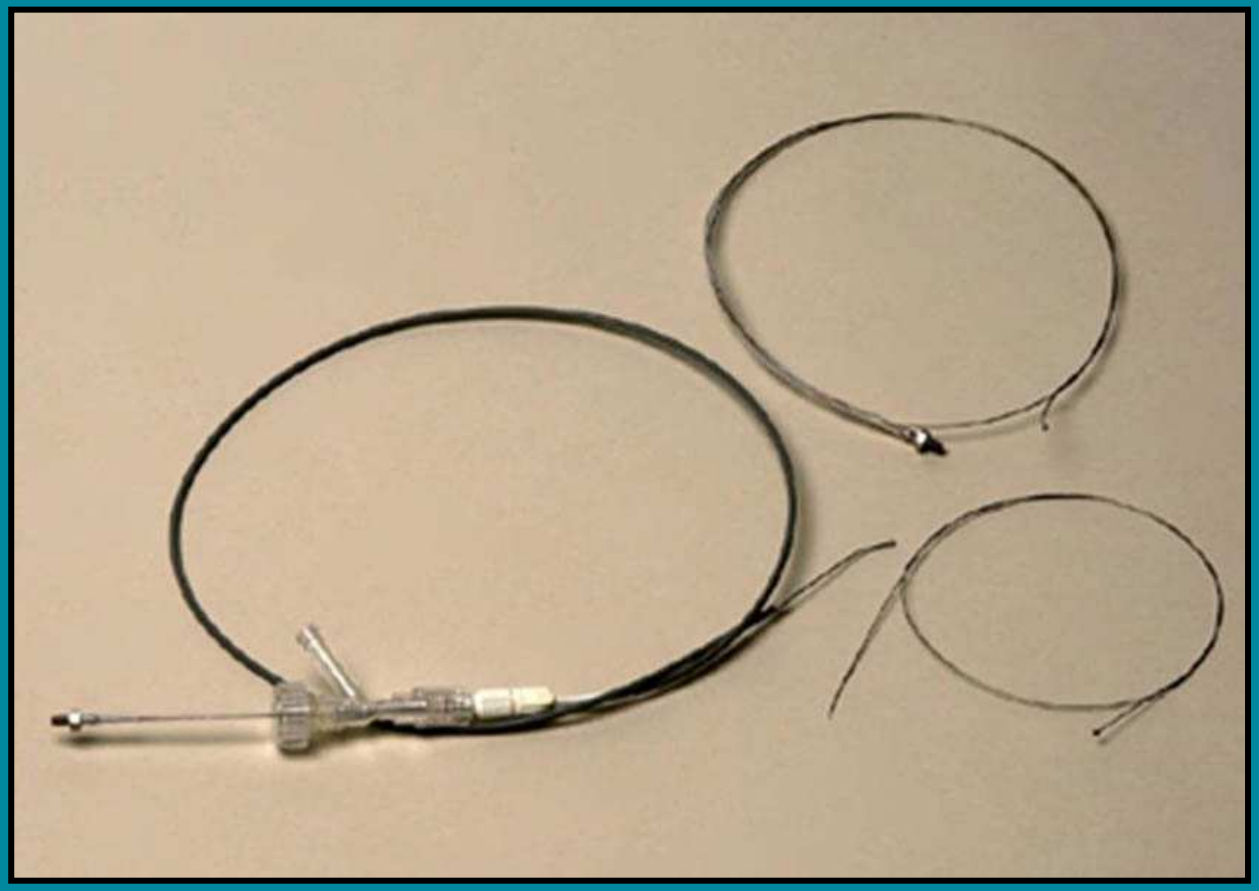
Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

Dr William Ganz (left) and Dr Jeremy Swan (right), the co-inventors of the Swan–Ganz catheter

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

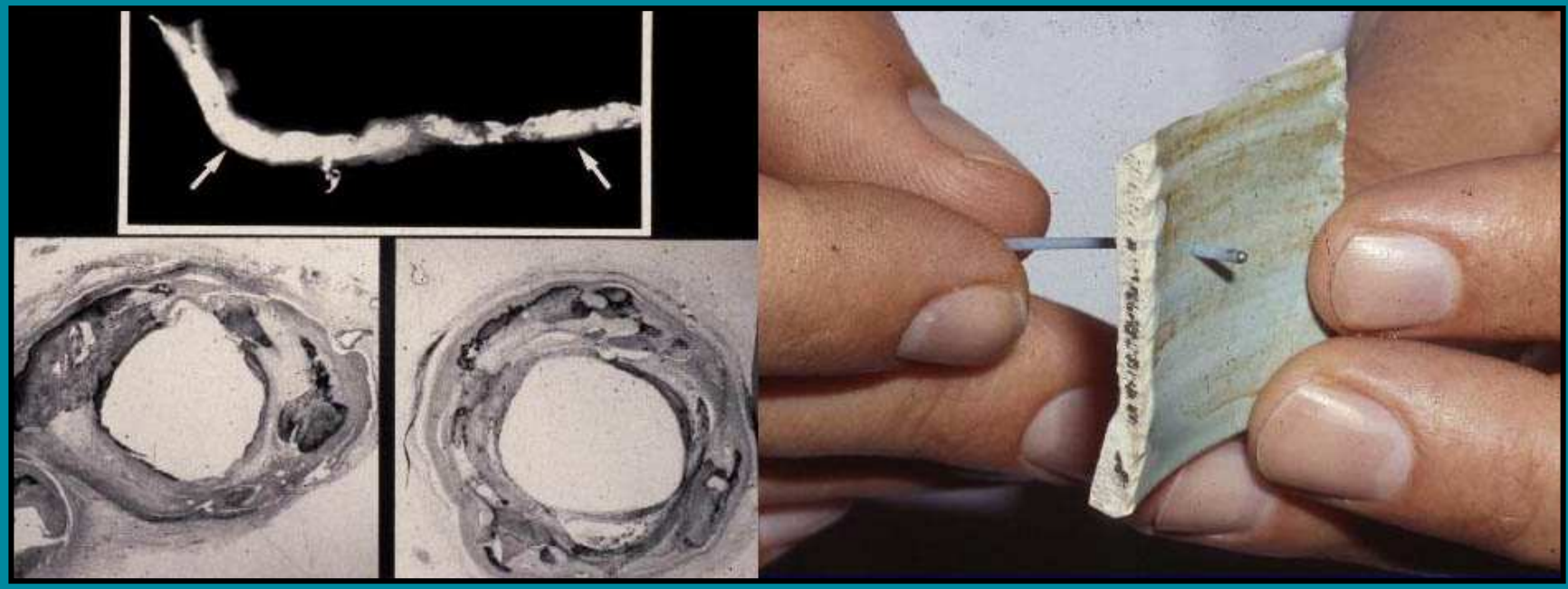
Dr Tony DonMichael, co-inventor of an ultrasound angioplasty catheter system

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease



Example of titanium ultrasound wire probes used in animal experiments. On left is a probe ensheathed in a catheter

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease



Top left shows X-ray of calcified arteries.

Bottom left shows microscopy of calcified atherosclerotic arteries after recanalization with an ultrasonic probe.

Right: a prototype coronary ultrasound catheter drills a hole through a piece of ceramic from a cup

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

From left to right, Drs Chae, Siegel, Steffen, and Luo in the ultrasound research laboratory at Cedars-Sinai Medical Center, 1992

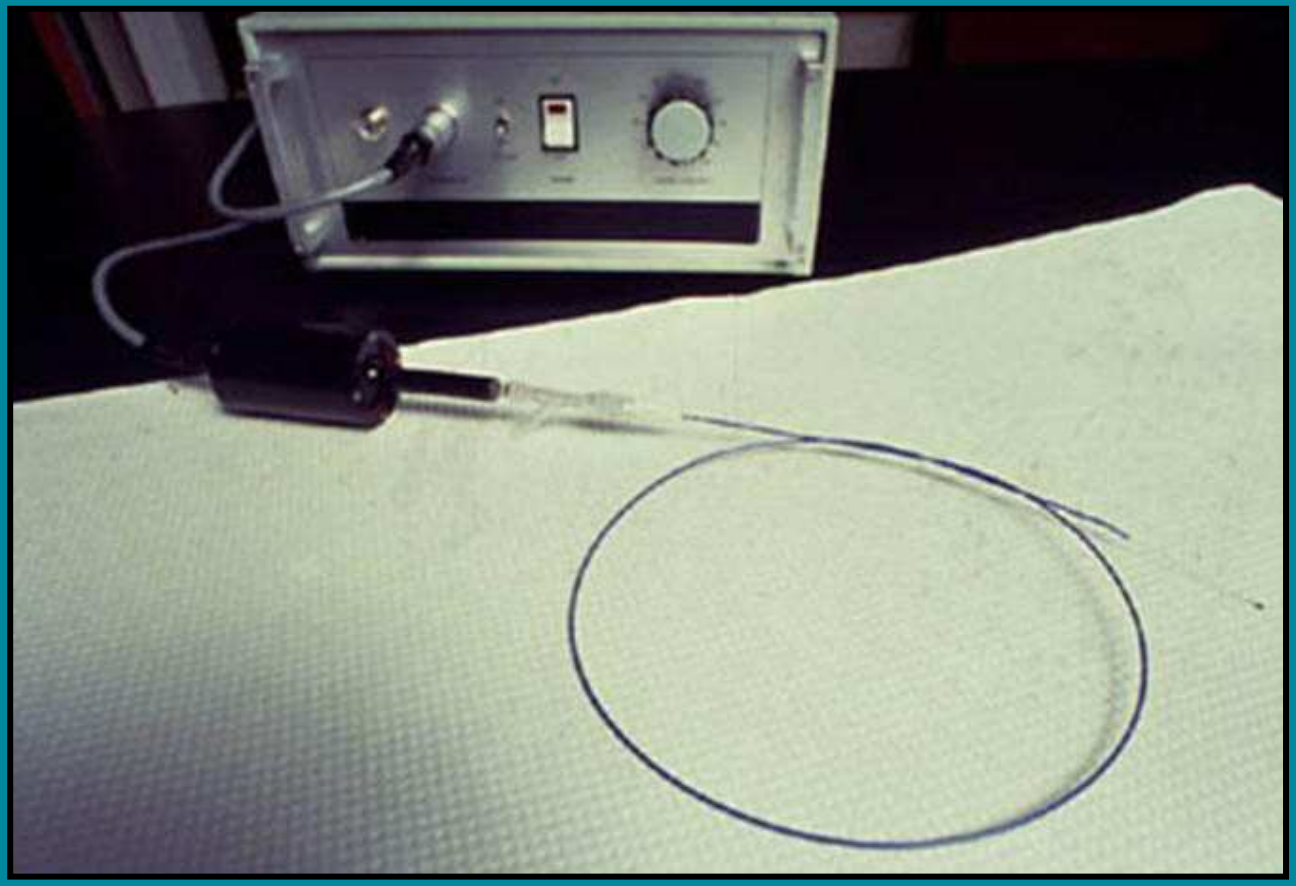
Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

Mr. Adrian Glenn, animal laboratory technician at Cedars-Sinai Medical Center, who donated his time after hours to work on the ultrasound project

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

This gross pathological specimen consists of a previously totally occluded human atherosclerotic femoral artery which was transplanted into a canine iliofemoral artery

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

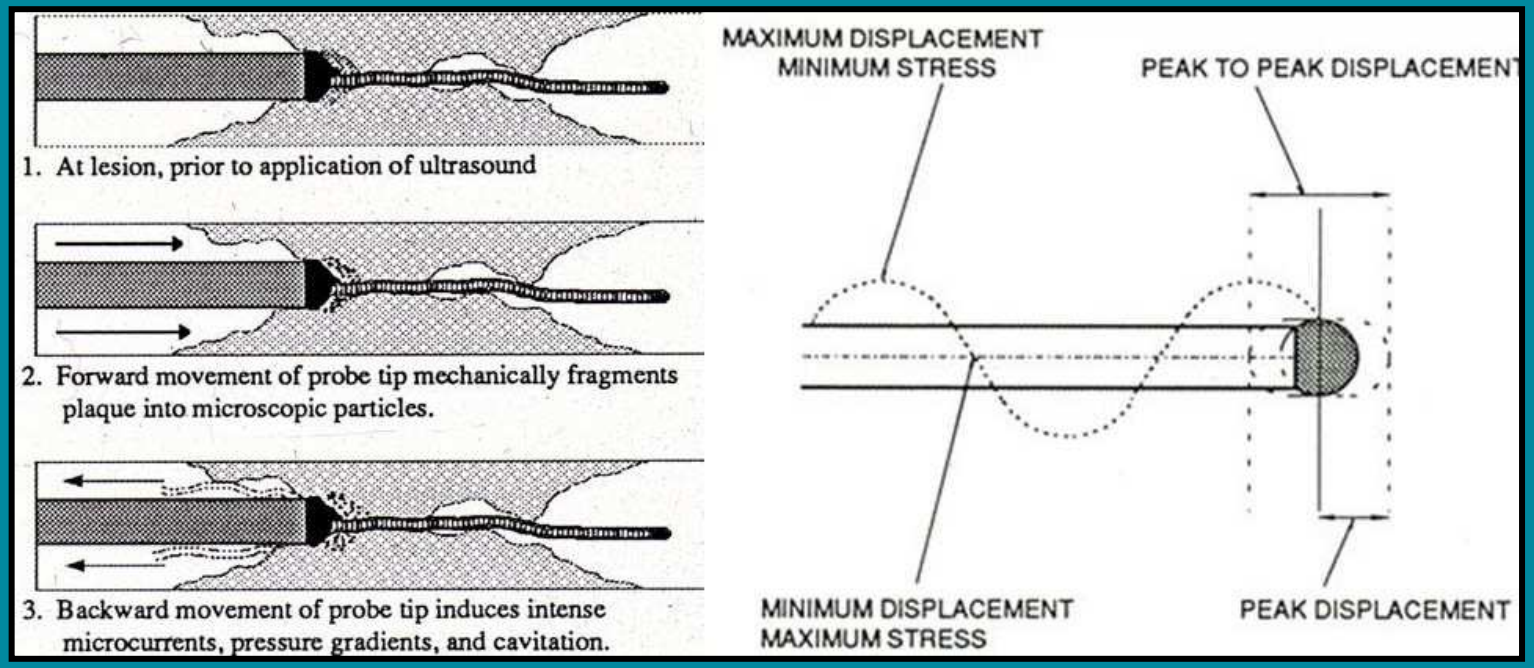


Shown here is the first version of the ultrasound system used to treat patients which includes the generator (box), transducer handle (black) and ultrasound probe ensheathed in a catheter

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

Drs David Cumberland (centre), Richard Myler (right) and Robert Siegel (left)

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease



Left: schematic of how an over-the-wire ultrasound catheter recanalizes a highly stenotic, atherosclerotic lesion

Right: schematic identifies ultrasound wire probe tip displacement and sites of stress

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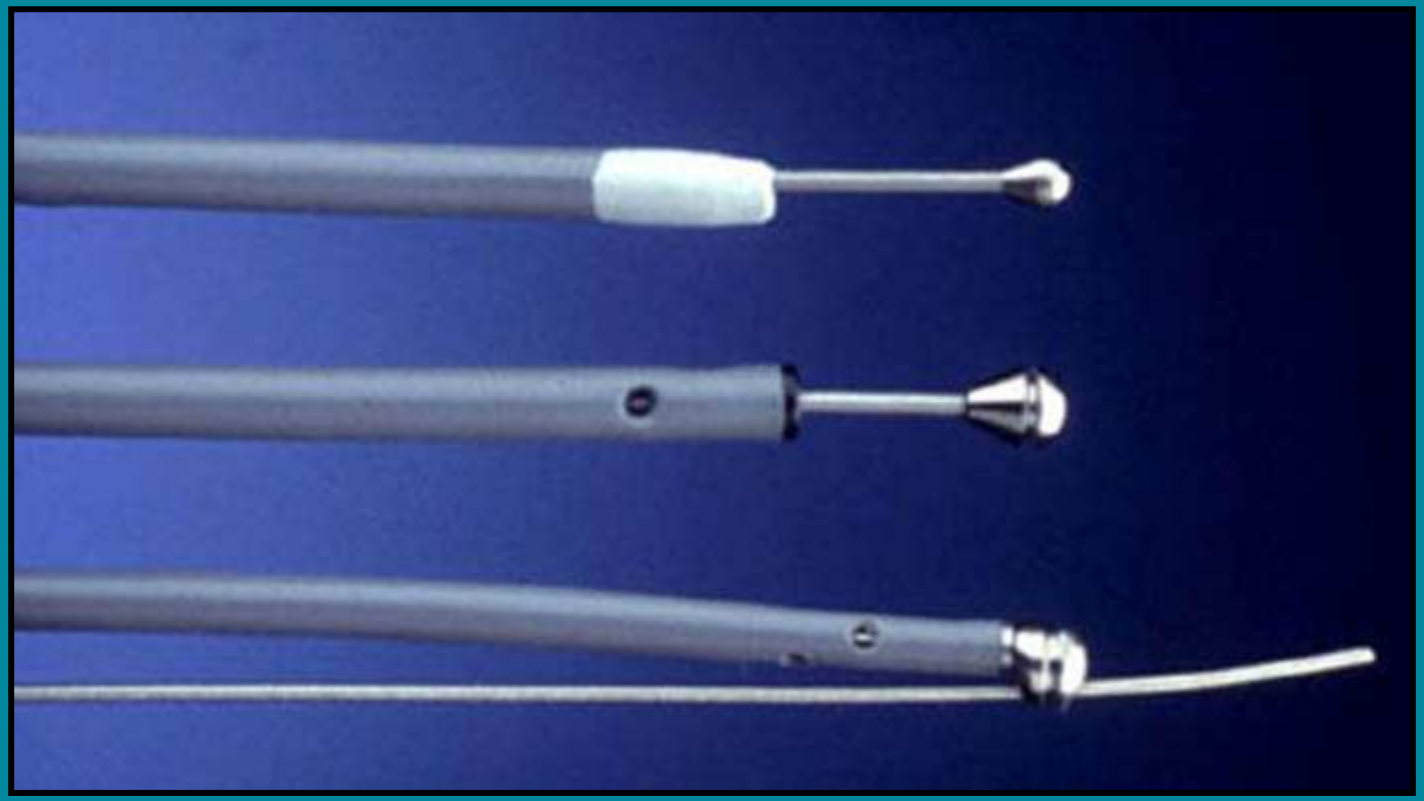

Early ultrasound wire designs used to recanalize occluded or highly stenotic human femoral and popliteal arteries

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

The Baxter peripheral arterial ultrasound angioplasty system including generator, transducer and catheter

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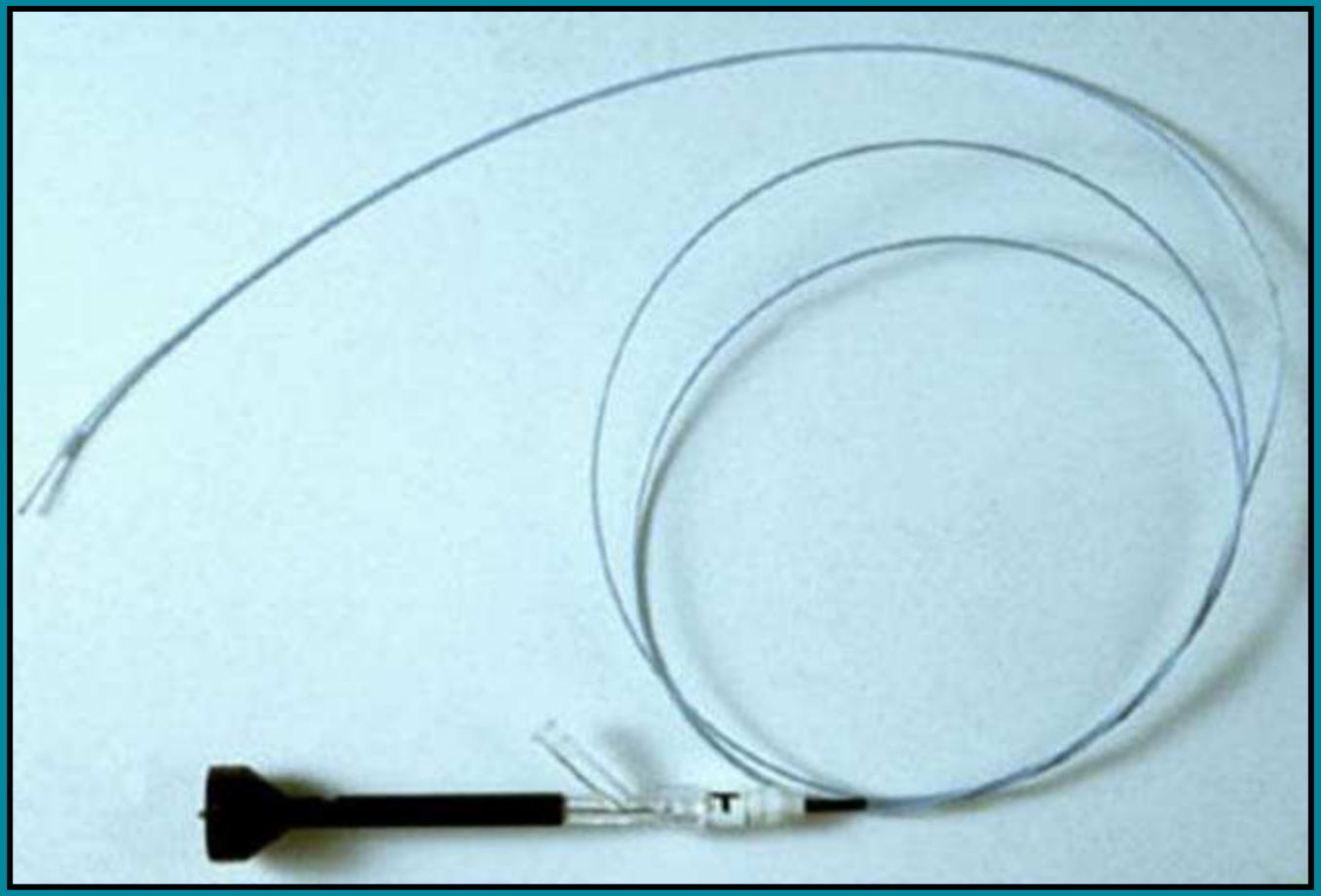
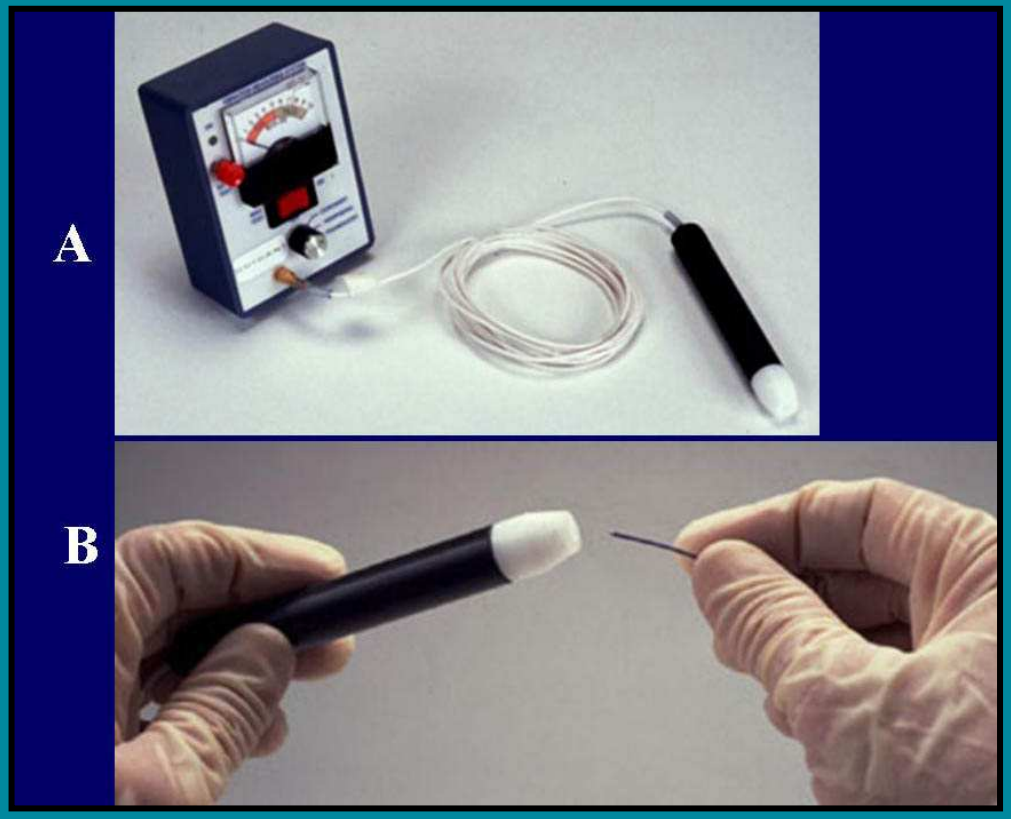


An over-the-wire coronary ultrasound catheter

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease



A. Testing system used to confirm adequate energy output of the ultrasound catheter

B. Prior to each case, the energy output of the catheter was verified by placing the catheter into the white tipped electronic sensor

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Dr Marzelle (left) catheterizing a pig (centre) with Dr Siegel (right) to assess the effects of ultrasound on pulmonary emboli

Catheter-delivered ultrasound for the treatment of peripheral and coronary artery disease

From the upper left: Robert Bowes, Richard Myler, David Cumberland, Robert Siegel, engineers Henry Nita and Douglas Gusswein, and a Baxter representative
Below centre: Dr Julian Gunn in the white coat