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A Simple Method to Determine Patency of the Ulnar Artery Intraoperatively Prior to Radial-artery Cannulation

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Percutaneous radial-artery cannulation for continuous pressure monitoring and arterial blood–gas sampling is now routine in operating rooms and intensive care units. The incidences of thrombosis of the radial artery after cannulation have been as high as 20–60 per cent in recent series[1–3]. Even with complete occlusion of the radial artery, ulnar-artery collateral circulation usually prevents serious sequelae to the area of the hand whose normal vascular supply is from the occluded artery. Assessment of the patency and distribution of ulnar-artery flow prior to radial-artery cannulation is, therefore, necessary.

The most commonly employed method is the modified Allen's test.[4] This technique is simple and requires no special equipment. However, it does require patient cooperation, adequate lighting for observation of the blush, and freedom to move and manipulate the patient's hand. Allen's test cannot be performed intraoperatively while the patient is anesthetized.

In those cases in which unanticipated intraoperative radial-artery cannulation is indicated, a simple method using plethysmography to determine ulnar-artery patency and distribution can be performed. A finger-pulse transducer (Model T-301, Lexington Instru-

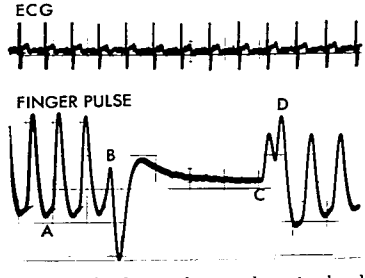

FIG. 1. The finger-pulse transducer is placed over the patient's thumb and a pulse contour is noted (*A*). The examiner compresses both the radial and ulnar arteries (*B*), resulting in loss of the pulse on the monitor screen. Release of the pressure over the ulnar artery (*C*) results in immediate return of pulsations in the thumb, due to flow through collaterals (*D*).

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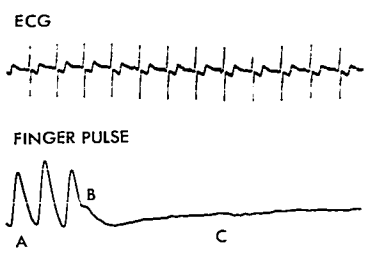

FIG. 2. The finger-pulse transducer is placed on the thumb of a patient with a positive Allen's test (*A*). Both radial and ulnar arteries are compressed (*B*) Release of the pressure over the ulnar artery does not result in the return of pulsations in this patient's thumb (*C*). His collateral circulation is insufficient, and radial-artery cannulation is contraindicated.

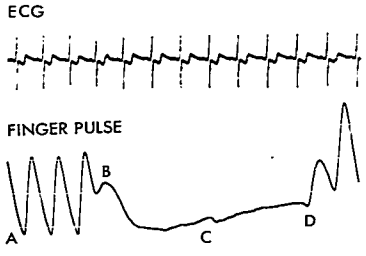

FIG. 3. Same patient as in figure 2. Release of pressure over the radial artery results in immediate return of pulsations in the thumb (*D*).

ment Company, Waltham, Mass.) is placed over the patient's thumb and the resulting pulse contour is observed on the monitor console (Lexington Instrument Physioscope, Model D-303, Lexington Instrument Company, Waltham, Mass.) (fig. 1). The examiner compresses both radial and ulnar arteries, resulting in immediate loss of the pulse on the monitor. Release of the pressure over the ulnar artery will normally result in almost immediate return of a pulse contour to the monitor screen (fig. 1*C*). Figure 2 was taken from a patient with atherosclerotic vascular disease. Failure of the pulse to return after compression of the ulnar artery was released (fig. 2*C*) was correlated with a positive preoperative Allen's test in this patient. Relaxation of the pressure over the radial artery (fig. 3*D*) resulted in immediate return of pulsations in the thumb. The presence of pulsations in the thumb while the radial artery is still compressed is taken as evidence of adequate ulnar-artery circulation, and the radial artery can then be cannulated.

Even in cases of total radial arterial occlusion, pulsations in the thumb from ulnar collateral circulation are associated with a very favorable prognosis.[5]

My method does not require patient cooperation, can be done without direct visualization of the hand (*i.e.*, under surgical drapes) and can be performed while the arm is secured to an armboard. The results are objective and can be more easily quantitated than those of the Allen's test. In those cases in which the performance of the Allen's test is impractical or impossible, the described method is an accurate means of evaluating the patency of collateral ulnar-artery circulation prior to radial-artery cannulation.

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