CLINICAL reports

J-Wire versus Straight Wire for Central Venous System Cannulation via the External Jugular Vein

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In 1974, we reported a technique for obtaining access to the central venous system utilizing the external jugular vein and a flexible angiographic wire catheter guide or J-wire (1). Since that report, more than 100,000 cannulations of the central venous system and pulmonary artery via the external jugular vein have been performed with a success rate of 80% to 95% (2). Since our initial report, the use of angiographic wire catheter guides by anesthesiologists and other physicians appears to have increased. During the past 5 years pulmonary arterial catheters for invasive hemodynamic monitoring have achieved widespread acceptance. The popularity of the pulmonary arterial catheter (Swan-Ganz) and the increased use of angiographic wire catheter guides for various vascular catheterization applications has led to the speculation that the J-configuration of an angiographic wire catheter guide may not be responsible for its ability to traverse tortuous vascular channels. The flexibility of the end of the wire guide, be it straight or of the J-type, could be responsible for its vascular passage characteristics. Most introducer sheaths and dilators for passage of a pulmonary arterial catheter contain a straight angiographic wire catheter guide (with a flexible end) as an integral part of the apparatus. Additionally, unpublished personal communications regarding the efficacy of the straight wire in traversing the external jugular vein needed to be verified. There is a difference in cost between the straight wire and the J-wire (approximately $1.25 per wire) and thus a significant economical impact might be felt if the straight wire could be shown to be equivalent to the J-wire.

This study was designed to compare the J-wire with the straight wire in external jugular vein catheterization so as to ascertain which of these devices was best suited for external jugular vein catheterization (Figure).

Methods

Human Subjects Committee approval was obtained and 36 consecutive patients requiring central venous system cannulation were studied. If a selected patient did not have visible external jugular veins, the central venous catheter was placed using an alternate technique and the patient was removed from the study. Cannulation of either the right or left external jugular vein (Trendelenburg position) was accomplished with a 16- or 18-gauge, 6.35-cm over-the-needle Teflon apparatus utilizing sterile technique. After the external jugular vein was successfully cannulated, a 50-cm long, 0.089-cm (0.035-inch) diameter, straight angiographic wire catheter guide (Argon Medical Products, Inc., Athens, TX) was passed through the short Teflon catheter and manipulated until it was ascertained to be in the thorax. If the straight wire was successfully passed to an intrathoracic position, the short cannula was removed and a longer definitive central venous pressure (CVP) catheter inserted over the wire using

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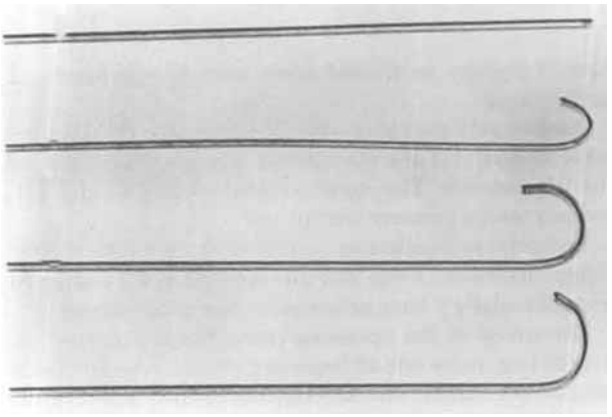

FIGURE. Four flexible angiographic wire catheter guides: top, wire of straight variety with flexible tip; lower three wires, J variety with varying radii of curvature.

it as a guide. If the straight wire could not be advanced into the thorax after 3 minutes of manipulation, it was removed and a flexible angiographic wire catheter guide with a 3-mm radius of curvature J (Argon Medical Products) (other dimensions the same as straight wire) was passed through the short catheter and manipulated until it was ascertained to be intrathoracic. The short catheter was then removed and a longer definitive CVP catheter passed over the J-wire.

After passage of the definitive catheter, the quality of the CVP reading was observed (fluctuation with respiration) and the ability to withdraw blood easily from the catheter was ascertained. All patients had postoperative chest roentgenograms to determine catheter position. Data were evaluated using the chi-square test and $p < 0.05$ was selected to represent statistically significant differences.

Results

The straight wire was successfully placed in an intrathoracic position and a catheter threaded over it in 16 of our 36 patients (44%). In instances where the straight wire could not be successfully passed into the thorax, the J-wire was subsequently successfully passed in all instances ($p < 0.05$). No complications occurred using either technique. Blood was easily withdrawn from all catheters and an acceptable CVP reading was obtained. Chest roentgenograms showed all catheters to be in the superior vena cava (Table).

Discussion

Our results indicate that the J-wire is superior to the straight wire for intrathoracic catheter placement via the external jugular vein. The fact that half of the straight wires were successfully passed into the chest is somewhat intriguing as well as mystifying. This could be interpreted to mean that either the flexible end of the straight wire is beneficial in traversing tortuous vessels or that a number of patients have tortuosities not severe enough to require the J-configuration. We prefer to believe the latter of these two hypotheses is true. Success in passing the J-wire into the chest in the 20 instances where the straight wire failed certainly indicates a beneficial effect of the J-configuration. Because the straight wire was always attempted first, there is no way (in this study) of ascertaining how frequently the J-wire would have been unsuccessful if it had been used initially. It is possible that the success of the J-wire was due to information gained from the first attempt in passing the straight wire. We feel this explanation, however, is highly unlikely.

TABLE

J-Wire versus Straight Wire for External Jugular Central Venous Pressure Line Placement

External jugular vein placement attempts		Successful intrathoracic catheter placement	
		J-wire	Straight wire
Right	22	10 (100%)	12 (55%)
Left	14	10 (100%)	4 (29%)
Total	36	20 (100%)	16 (44%)

The beneficial effects of the J-wire are apparently explained by its lack of interaction with a vessel wall. The J-configuration "bounces off" or "rolls through" tortuous areas and sharp angulations in a vascular channel.

The J-wire is superior to the straight wire in navigating difficult vascular channels. When central venous system access is attempted utilizing the external jugular vein, we recommend utilizing an angiographic wire catheter guide with a J-tip configuration as this will result in a higher success rate. Because the J-wire appears to be superior to the straight wire in navigating vascular channels, it may be appropriate to utilize the J-wire in all situations of central venous system access where an angiographic wire catheter guide is desired.

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