The External Jugular Vein as an Injection Site in Radionuclide Angiography

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The first-pass radionuclide angiogram has been shown to be an effective method for evaluation of left ventricular function. When the first-pass technique is used, however, delivery of a compact radionuclide bolus is imperative. The external jugular vein is a safe, effective route of delivery for the bolus; it provides for a high quality, technically accurate test without deleterious effects to the patient.

Radionuclide angiography performed at rest and during maximal exercise provides useful information for evaluation of cardiac function (*1–3*). The procedure requires delivery of an isolated, compact bolus of radioactivity to derive high-count, high-frequency, time-activity curves. We describe our findings using the external jugular vein as the injection site for radioisotope administration.

Materials and Methods

Patients are positioned supine on an examining table in the Trendelenburg position to increase blood flow to the veins in the neck. We instruct patients on how to perform the "classic" Valsalva maneuver for 10–12 sec as a maximal expiratory effort against a closed glottis. The resultant increased pressure facilitates localization of the jugular vein (Fig. 1). Lidocaine hydrochloride, 2 mg subcutaneous, is given as a local anesthetic. A 1¼ in., 18-gauge indwelling Teflon catheter (Travenol Laboratories) is then inserted into the external jugular vein (Fig. 2). We prefer the right external jugular vein because of the physical arrangement of our monitoring equipment. Intravenous tubing with a three-way stopcock and a 20-cc syringe filled with saline are attached to the inserted catheter (Fig. 3). At the time of injection, 10–15 mCi of Tc-99m pertechnetate is administered by immediately flushing the IV tubing with the saline.

Results and Discussion

Radionuclide angiograms were performed on 500 patients from September 1979 to February 1980. Of the 500 patients, seven had pre-existing intravenous lines; four had central venous pressure lines; and three had Swan-Ganz catheters in place. In 432 patients (88%), a 1¼ in., 18-gauge catheter was inserted in the external jugular vein; in 334 patients (68%) the right external jugular vein was used; and in 98 patients (20%) the left external jugular vein was used.

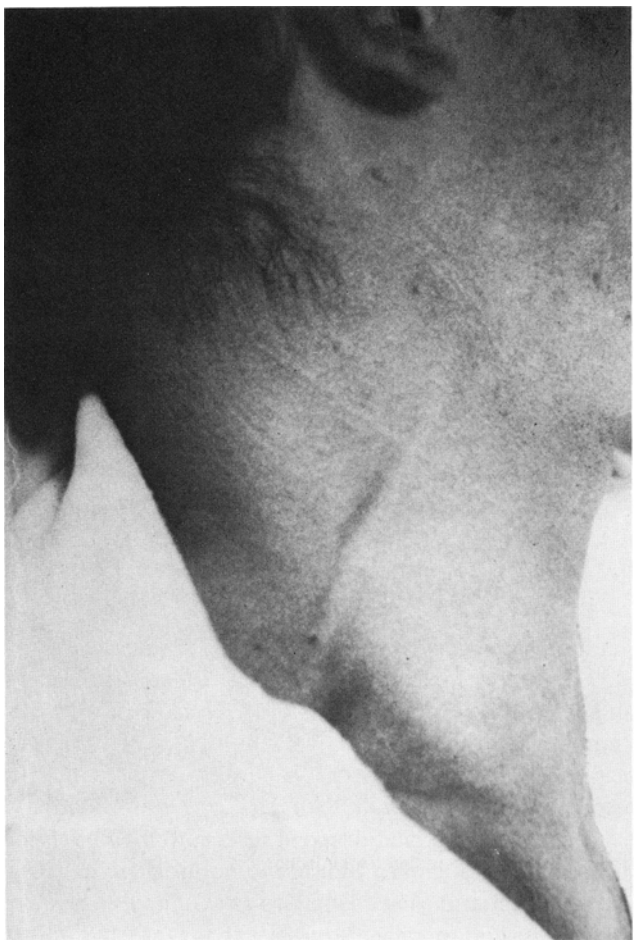

FIG. 1. Patient positioned for optimum localization of external jugular vein.

We were unable to use the external jugular vein in 60 patients (12%) because a small or fragile vein made threading the catheter impossible. One patient (0.2%) refused the insertion into the external jugular vein because of apprehension. In the 61 patients in whom we could not use the external jugular vein, 56 (11%) had an 8-in., 19-gauge radiopaque catheter introduced into antecubital veins. Four patients (0.8%) received 8 in.,

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FIG. 2. Placement of indwelling catheter into external jugular vein.

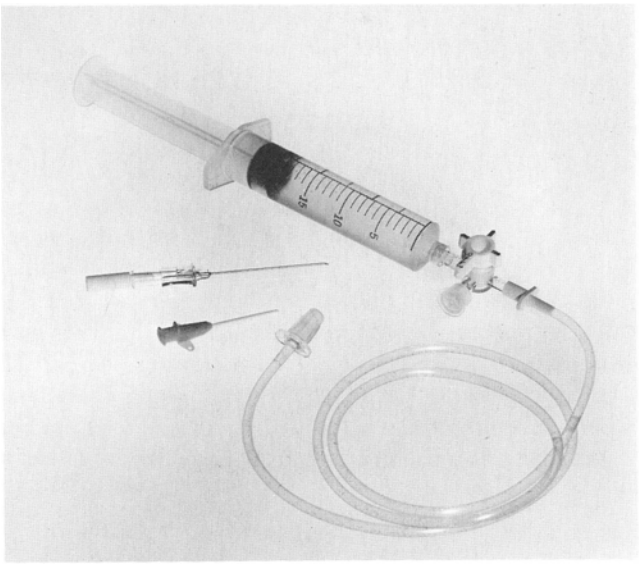

FIG. 3. Apparatus required for injection.

19-gauge catheters in the internal jugular vein, and one patient received an 8 in., 19-gauge catheter in the right subclavian vein.

We have not had any complications using the external jugular vein. Further, we have not seen any thrombosis or pneumothorax as a result of using the external jugular vein and we have not experienced any hematomas or increased incidence of localized infiltration. We have found the external jugular vein to be an easily accessible site for isotope administration and patients have been most cooperative in this respect.

The external jugular vein is also advantageous because it allows free movement of the arms during exercise, thus reducing the risk of infiltration. Further, it allows blood pressures to be taken in either arm. This is important because we monitor blood pressures

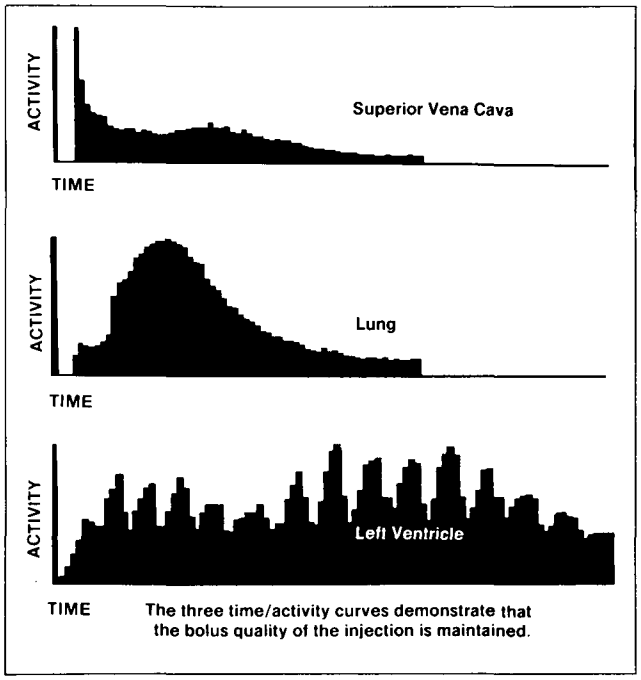

FIG. 4. Three time/activity curves demonstrate that bolus quality of injection is maintained.

throughout the exercise portion of the test and have found this particularly helpful in patients with an AV-fistula and in patients who have recently been catheterized. The external jugular vein injection site is also beneficial for patients whose blood pressures are more audible in one arm than the other and it works well for patients who are unable to exercise on a bicycle and must use a handgrip dynamometer (*4*), arm ergometer, or cold pressor test (*5*). (These tests all require use of the arms during exercise.)

Repeated inspections of time-activity curves of the bolus produced with this technique show superior delivery of an isolated compact bolus (Fig. 4).

Based on our findings, we have incorporated the external jugular vein catheter into all procedure protocols that require rapid delivery of a small bolus of radioactivity.

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