Practical procedures

Accidental mediastinal entry via left internal jugular vein cannulation

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Abstract. Two cases are reported in which mediastinal penetration by a pulmonary artery catheter and a temporary venous pacemaker wire occurred following cannulation of the left internal jugular vein and placement of an indwelling venous introducer sheath. The anatomy of the left internal jugular vein and possible mechanisms of accidental mediastinal penetration with this approach are discussed. Extreme caution must be exercised when using the left internal jugular venous access route and an indwelling venous introducer sheath.

Key words: Pacemaker wire - Pulmonary artery catheters - complications - Mediastinal entry - Left internal jugular veins

The practice of intensive care medicine requires frequent cannulation of the central venous system. A long list of potential complications from central venous access, pulmonary artery catheter and temporary pacemaker wire procedures have been identified [3, 4, 6, 7, 9, 10, 13-17]. To aid in the placement of some of these devices, e.g. pulmonary artery catheters and pacemaker wires, and to provide additional venous access sites, several companies have provided kits which include venous puncture needles, guidewires, venous dilators, indwelling venous introducer cannulas and side port attachments. In a recent 12 month period, two cases involving cannulation of the left internal jugular vein with an indwelling venous introducer sheath have resulted in accidental mediastinal placement of devices through them.

Case 1

A 69-year-old male with a long history of heavy alcohol abuse was admitted to the University of California Davis Medical Center (UCDMC) because of epigastric pain, nausea and vomiting. Evidence for dehydration, pancreatitis, chronic alcohol abuse, and ascites was found.

The patient's cardiac rhythm became irregular with frequent atrial arrhythmias. Digoxin and verapamil were instituted but episodes of atrial fibrillation and flutter continued. Worsening respiratory status necessitated endotracheal intubation and mechanical ventilation. Because of his nutritional status, total parenteral nutrition was started through a left subclavian vein line.

A pulmonary artery catheter was placed utilizing the right internal jugular vein because of a precipitous drop in urine output despite saline boluses and albumin administration.

On the same day, the patient developed asystole and underwent successful cardiopulmonary resuscitations but because of recurrent episodes of asystole despite metabolic and hemodynamic corrections, an emergency bedside temporary pacemaker placement was undertaken. A high left internal jugular approach was utilized. After gaining access with a small catheter, a guidewire was placed and a No. 7 French dilator with a No. 8 French 10 cm introducer sheath was entirely placed into the left internal jugular vein. Blood gases and blood pressures were obtained from this venous access site because of massive neck swelling, hypotension and pulsating blood return from the introducer sheath. These were compared to simultaneously obtained arterial measurements which confirmed central venous and not arterial cannulation. A No. 5 French bipolar balloon tipped temporary pacemaker wire was then inserted through the introducer sheath. The balloon was inflated with 1 ml of air following insertion of approximately 20 cm of the wire. It was then advanced smoothly without resistance. Complete ventricular capture was obtained.
Fig. 1. A portable anterior-posterior chest x-ray from Case 1 showing temporary pacemaker wire from left internal jugular approach through introducer sheath into mediastinum and along left cardiac silhouette. Also seen are a pulmonary artery catheter into the left pulmonary artery, a nasogastric tube and an endotracheal tube.

Fig. 3a. A left anterior oblique view taken during hand injection of contrast through the introducer sheath side port which was inserted into the left internal jugular vein. A suggestion of extravascular dye extravasation is seen inferior of the subclavian vein. The tip of the introducer sheath is against the inferior border of the subclavian vein. b The introducer sheath has been pulled back into the internal jugular vein and a repeat injection of contrast has been made.

A 12-lead EKG showed complete ventricular capture with a right bundle branch pattern. A portable chest X-ray (Fig. 1) revealed that the pacing catheter was lying along the left border of the heart. An echocardiogram (2D and M-mode) demonstrated a small anterior and posterior pericardial effusion without any echographic evidence of pericardial tamponade. A lateral chest X-ray revealed the pacemaker to be at the mid-chest level (Fig. 2). Under fluoroscopy, 10 ml of contrast were rapidly injected into the left jugular vein introducer sheath (Fig. 3a). This revealed an outline of the internal jugular vein with the dye streaming into the mid-subclavian vein (Fig. 3). Inferior to the junction of the jugular and left subclavian veins, the pacemaker wire was seen exiting the subclavian vein. The introducer was touching the inferior portion of the left subclavian vein and the pacemaker wire entered the mediastinum. At this location, a suggestion of extravascular extravasations of dye could be seen (Fig. 3a). The introducer sheath was then slightly withdrawn and contrast injection was repeated. This revealed that the introducer was now in the left internal jugular vein and no evidence of leakage of contrast into the mediastinum could be seen (Fig. 3b). By this time, the patient’s condition at 40 cm with a 0.5 mA pacing threshold and normal sensing. Utilizing a paced heart rate of 120 beats/min, the arterial blood pressure increased from 95/53 mmHg to 110/70 mmHg.