Importance of Checking Central Venous Catheter Tip Location by X-Ray

To the editor: Central venous cannulation is currently an indispensable technique in medicine and is widely used for the management of critically ill patients and to administer hemodialysis, chemotherapy, or total parenteral nutrition. Complications arise, however, with more than 15% of catheters inserted.[1] These complications are sometimes serious and can occasionally be prevented by correct observation of the catheter tip in a chest x-ray. We present the case of a patient who developed a cardiac tamponade after central venous cannulation.

A 29-year-old man was admitted to the intensive care unit with severe head injuries. During initial stabilization, an outer central venous catheter was inserted into the left internal jugular vein without difficulty. A 20-cm polyurethane internal catheter was then inserted and blood was drawn through both lumens. A chest x-ray showed that the catheter tip was in the right atrium and had an anomalous bend (Figure). It was decided not to change the position and 24 hours later the patient presented sudden hypotension refractory to volume infusion and sinus tachycardia at 180 beats/min. The physical examination revealed no signs to justify the deterioration of the patient's condition. No variation in pupil dilation or intracranial pressure was observed. An electrocardiogram showed sinus tachycardia with no other disorders and an emergency chest x-ray showed no changes with regard to the previous x-ray, although this time it was decided to move the catheter away from the heart chambers. An emergency echocardiogram showed a moderate pericardial hemorrhage and indications of hemodynamic compromise. A pericardial drain was inserted to remove 500 mL of whitish liquid corresponding to the propofol that was being administered through the distal lumen, and the patient's clinical status improved rapidly. The patient died 10 days later from endocranial hypertension.

The most frequent mechanical complications associated with central venous cannulation are arterial puncture, local hematoma, and pneumothorax.[1] Cardiac tamponade is an extremely rare complication caused by vascular or cardiac perforation and has a high mortality rate (between 47% and 100%). It can appear from minutes to months after insertion of a catheter and is more common when catheters are inserted on the left side.[2] The clinical picture is usually nonspecific and onset is sudden; thus, a high level of suspicion is required to reach the diagnosis, particularly in patients under sedation or when a long time has elapsed since the puncture. An emergency echocardiogram is the test of choice but a chest x-ray may play a key role in early diagnosis. In 6 out of 9 patients with perforation of the superior vena cava by a central venous catheter, Tocino and Watanabe[2] described a radiographic sign consisting of a slight bend in the tip of the catheter, observed hours or days before symptoms commenced. Though not always present, this sign is an early indicator of perforation and means that the central line must be relocated. Massive pleural hemorrhage associated with cardiac tamponade has also been reported.[3]

Prevention is clearly important in avoiding this serious complication. Using a careful technique, never forcing the sheath, and checking tip placement by x-ray are the most important points. There is some controversy regarding the most suitable place for the

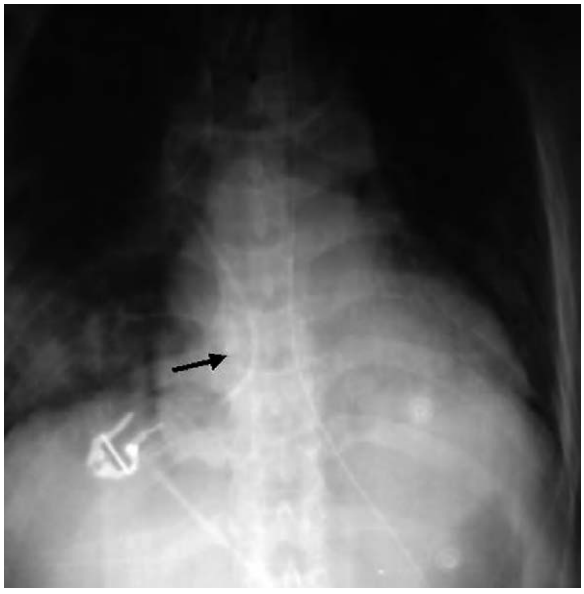

Figure. Chest x-ray showing a central venous catheter inserted through the left internal jugular vein, with the tip in the right atrium and an anomalous bend (arrow).

catheter tip. In 1989, the United States Food and Drug Administration[4] published recommendations in which it insisted on distancing the catheter from the heart cavities or from locations from which it might migrate into them. Subsequently, Schuster et al[5] and, more recently, Albrecht et al[6] proposed the carina as the lower limit for placement of the catheter tip, following studies of the mediastinal anatomy of 34 and 39 patients, respectively. In all cases, the carina was situated above the pericardial sac. Despite the high risk involved in placing the catheter inside the heart cavities, compliance with these recommendations is poor and in most cases, it has been found that even when a chest x-ray shows the tip to be in the wrong place, the catheter is generally not relocated, as occurred with our patient.

This case shows, once again, that cardiac tamponade is a very serious and sometimes overlooked complication of central venous cannulation. The chest x-ray plays an essential role both when perforation is suspected and when attempting to prevent it. Placing the catheter tip above the carina would seem to be a simple maneuver and one that is highly recommendable in light of published studies.

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