

Service d'Anesthésie-Réanimation

Unusual complication during central venous catheterization: pierced endotracheal tube cuff.

What about ultrasound guided techniques for central venous catheterization?

Observation-Case report

Central venous catheter (CVC) placement is a routine, daily performed technique used by the anesthesiologists in the operating room and in the intensive care unit. The main common indications for the insertion of a central venous catheter are the use of vasoactive or irritant drugs, parenteral nutrition, central venous pressure monitoring, or the need for an intravascular access when a peripheral catheter is not an option. Though, the complication rate remains significant. The most common complications are infection, pneumothorax, arterial puncture, and mechanical problems such as a long venous access time (1), which can be particularly unpleasant for the patient.

This is a case report about a rather uncommon complication, namely an accidentally pierced endotracheal tube cuff during the attempt of the right internal jugular vein cannulation. The indication of CVC was the perioperative care of an abdominoperineal resection for a 63-year-old woman. The indication had been discussed with the surgeon, and there was a necessity for parenteral alimentation during postoperative rehabilitation. Another reason was the possible need for vasoactive drugs during this long surgical procedure. CVC placement occurred in the operating room, immediately before surgery, and after induction of general anesthesia.

We chose to place the catheter in the right internal jugular vein, insofar as it is usually considered as the most accessible. Indeed, left internal jugular vein access is more delicate, due to the fact that the catheter has to follow the sinuous brachiocephalic vein before entering the superior vena cava. The subclavian access is at higher risk of pneumothorax. The initial puncture site was defined using anatomic landmarks by locating the apex of the triangle formed by the two heads of the sternocleidomastoid muscle. During the attempt of venous puncture, we observed a few air in the syringe. The first suspicion was that we caused a pneumothorax, but the amount of air was small (only 4 to 5 ml), no clinical symptoms were present to confirm the suspicion, and vital parameters remained strictly unchanged and normal. After a few minutes, we noticed that an acceptable tidal volume could not be maintained, despite any ventilation modifications made on the workstation. There was obviously a leak in the system. Patient parameters were stable, as was the peripheral oxygen saturation. Pulmonary auscultation revealed normal and symmetrical sounds. Considering the stable situation, we decided to proceed with the CVC placement, which was quickly achieved. Then we tried to figure out the ventilation problem. At first, we tried manual ventilation but the leak was persistent. There was no apparent defect in the breathing circuit. We decided then to remove the endotracheal tube to check its integrity. We clearly observed a damaged cuff that was obviously punctured during the attempt of central vein cannulation. After placement of a new endotracheal tube, we did not experience any other volume leak during ventilation. No other anesthetic complication occurred during the time of surgery. We obviously caused a tracheal puncture with endotracheal tube cuff damage during the CVC placement, which is not a commonly described complication.

Discussion

Central venous catheters are daily placed and used by the anesthesiologists for multiple and different purposes, in both elective and emergency situations. Some complications during placement are well known, such as accidental arterial puncture, pneumothorax and technical problems with the material. Although it is almost a daily practice, it is not a trivial procedure, and it should be adapted in order to minimize the occurrence of such complications. Indeed, these complications can be very serious, and may lead to death in certain circumstances. In addition, patient comfort, safety, and the pain related to the procedure have to be considered, insofar as it is frequently performed on wide-awake patients, using only local anesthesia of the site. There are also long-term serious complications of CVC placement, but we will focus here on the complications directly related to the placement technique.

Several steps are available for the anesthesiologists to render CVC placement as safe as possible. One has first to clearly identify the right indications. Less experimented practitioners asking for CVC placement often think that a peripheral vascular access is not adequate, while it often is. Second, practitioners have to prepare adequate material, and be familiar with the aseptic rules to avoid infection. Thereafter, the most difficult and delicate step in the procedure is vein identification and precise localization, in order to lead to the cannulation. Classically, anatomic landmarks (triangle formed by the two heads of the sternocleidomastoid muscle) are used to define the initial puncture zone.

This step can require some time and several attempts. It is important to keep in mind that CVC placement attempt can fail due to patient condition. Hypovolemia, thrombotic veins, dyspnea, agitation, shock, emergency situations, and other elements can affect the success rate of CVC placement. Failure can be an obstacle to treat the patient in some situations (2).

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The rupture of the endotracheal tube cuff referred in this case report has occurred during this initial step, and it is not a frequent complication. At least, it is not well described in the literature. In this case, no serious complications were observed, but the tracheal puncture can lead to infections and permanent lesions, and cannot be considered as a trivial event. This quite unknown complication leads to wonder if using the “classic” way of anatomic landmarks only offers enough safety for such a procedure.

Ultrasound has been developed widely these last years, facilitating vein cannulation for practitioners. Multiple studies have shown that ultrasound-guided CVC placement decreases overall mechanical complication rate, number of attempts, and time to cannulation of the internal jugular vein (3). Ultrasound-guided techniques require training and time to master. Concretely, adequate equipment is also needed. Ultrasound machines are expensive, and require financial resources.

Conclusion

Practitioners should not forget all the issues related to CVC placement. Several tools are available to reduce the incidence of complications. Ultrasound-guided CVC placement has been proved to be superior as compared to placement through anatomic landmarks only(2). Although it requires some changes in most institutions (financial investment to purchase enough material and training for the practitioners are the two most specific obstacles), CVC placement should evolve and be approached with an ultrasound guided technique.

It has been proved that this lead to a significantly lower complication rate, demonstrating a direct impact on patient care and safety (4). Therefore, ultrasound-guided CVC placement is nowadays a way to improve the outcome of an invasive technique.

Bibliography

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