CASE REPORT

Ultrasound-guided insertion of pulmonary artery catheter: Case report

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Abstract This is a case report of a 17-year old girl, who presented with aortic valve regurgitation and patent ductus arteriosus, and she underwent aortic valve replacement (AVR) and (PDA) ligation. Because of the extensive thrill and pulsation in the neck due to carotid artery dilatation, pulmonary artery catheter (PAC) was inserted under ultrasound guidance. This case report is to encourage the use of ultrasound for the safe puncture of internal jugular vein for the insertion of central line and PAC, particularly in the case of aortic valve regurgitation patients where carotid artery dilatation expected.

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1. Introduction

Aortic valve regurgitation is frequently seen in the daily practice of cardiac surgery. This is a case of advanced aortic valve regurgitation and patent ductus arteriosus (PDA), which showed severe dilatation of right common carotid artery (RCCA), and severe compression of right internal jugular vein (RIJV), that made pulmonary artery catheter (PAC) insertion very risky. This case illustrates the importance of ultrasound in localizing the IJV and avoid injury to the RCCA.

2. Case report

A 17-year old female patient was referred to our center because of severe aortic regurgitation and patent ductus arteriosus.

The patient had dyspnea on mild to moderate exertion, cardiac examination showed diastolic murmur 6/6, Corrigan sign (a jerky carotid pulse characterized by full expansion followed by quick collapse), and pulsus bisference. Blood pressure (BP) was about 85 over 55 mm Hg, she received 1 mg midazolam premedication before entering the operating room, oxygen supplementation via a face mask yielding 60% oxygen. In the operating room she was connected to the monitor to view the EKG, the invasive blood pressure monitoring line was inserted in the right radial artery to avoid any interference of the PDA on the blood pressure. Anesthesia was induced with midazolam 0.15 mg/kg, Fentanyl 5 mcg/kg, and Rocuronium 1 mg/kg. Tracheal intubation was performed, as there was a drop in Bp 70/40 mm Hg, Calcium chloride 0.5 G and a bolus of 250 ml albumin 5% were administered, the blood pressure improved to about 100/55 mm Hg. She was put in
trendelenberg position to insert (PAC) under aseptic condition, right side of the neck was prepared and draped for the insertion of central line and PAC.

The pulsation of the carotid artery was diffuse in the neck; it was not easy to determine the exact lateral edge of the carotid artery to insert the needle. The line was inserted under the guidance of ultrasound.

The ultrasound showed dilated carotid artery (1.713 cm²), lateral to it, and the right internal jugular vein (RIJV) looked narrow (small lumen) (0.34 cm²) which is due to the pressure of the dilated carotid artery (Fig. 1).

Puncture of the IJV was successful from the first attempt, afterwards PAC sheath was introduced on the guide wire, then the patient was put in supine position, then PAC catheter was successfully inserted through the sheath and forwarded till it reached wedge position.

Pressure readings and curves indicated correct position of the PAC catheter; also the chest radiograph confirmed the correct position. Afterwards skin was disinfected and draped, in the preparation for surgery. Aortic valve replacement with mechanical valve and patent ductus arteriosus ligation was performed on cardiopulmonary bypass under moderate hypothermia 24°C. Before going off bypass PAC was pulled out about 4 cm to assure its free movement (that it is not inadvertently sutured). The patient was weaned successfully from CPB and shifted to the intensive care unit in stable hemodynamic condition, and the lung ventilated.

3. Discussion

Carotid blood flow and brain circulation in severe aortic regurgitation were studied by Morimoto et al. Serial duplex scan of the RCCA showed reversal of the flow before aortic valve replacement but the carotid flow normalized after surgery. In the same study single photon emission-computed tomography showed that cerebral blood flow was reduced in the territory of the right middle cerebral artery (reduced brain circulation) before the surgery which normalized after aortic valve replacement (Moritomo et al., 2008). In severe AR (grade III–IV), there is reversal of diastolic flow in 39% of patients, with significant increase of shrink ratio of proximal common carotid arterial diameter (Kervancioglu et al., 2004).

In this patient, right carotid artery was dilated because of the long standing reversed aortic flow due to regurgitation; the carotid artery diameter is three times bigger than the internal jugular vein. Ultrasound-guided insertion of central venous line was very helpful when difficulties are expected due to the abnormal anatomy as in this case.

Our case supports NICE guidelines which recommend using ultrasound in all central line insertions (NICE reference). In a meta analysis study it was found that according to best evidence, ultrasound reduced the complications and time required for insertion of central line in difficult cases (Espinet and Dunning, 2004).

4. Conclusion

This case shows that changes which happen to the Rt. IJV compression by the RCCA can make lines’ insertion very difficult and risky. Insertion under ultrasound guidance is very important and useful to identify the vein and avoid the complications of arterial puncture and ensure safe insertion of the central lines and the PAC.

References

