

An Unusual Complication: Cardiac Tamponade During Internal Jugular Vein Cannulation

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Citation

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Abstract

Central venous cannulation via Right Internal Jugular Vein is a common technique performed for cardiac surgeries. Cardiac tamponade resulting during the central venous cannulation is a very rare complication and is poorly recognized. We present a case of cardiac tamponade after successful cannulation of rt. internal jugular vein in a patient posted for intracardiac repair of Ventricular Septal Defect (VSD) with mitral valve prolapse. Cardiac tamponade is recognized intraoperatively and should be suspected in a patient who deteriorates with no other obvious cause for deterioration. We conclude that the use of ultrasonographic guided Central Venous Cannulation would have prevented such an inadvertent puncture of the Aorta, which resulted in cardiac tamponade.

INTRODUCTION

Complications from central venous catheters are numerous. Cardiac tamponade is a rare but well documented complication that is fatal. Many of the times we fail to consider the diagnosis in patients with typical acute signs and symptoms^{1, 2, 3}.

Risk factors for the development of cardiac tamponade include incorrect tip position and infusion of hyperosmolar fluids.^{4, 5, 6, 7} As prevention is not always feasible, timely diagnosis can save a patient. We describe one such case where cardiac tamponade had occurred due to a nick to aorta with the cannulating needle during puncture of right internal jugular vein, which was diagnosed intraoperatively, when the pericardium was opened. The use of two-dimensional (2-D) imaging ultrasound guidance should be considered in most clinical circumstances where Central venous cannulation insertion is necessary either electively or in an emergency situation and thus preventing inadvertent arterial puncture.

We discuss identification of such a rare condition and could be a likely possibility to be kept in mind while performing Central venous cannulation.

CASE REPORT

A 13 year old female weighing 30 kg with VSD with mitral valve prolapse with pulmonary artery hypertension was posted for repair of the same. After induction of anaesthesia,

an arterial cannula was placed in the right radial artery and the right internal jugular vein was cannulated using the Seldinger technique. The vein was initially located without problem with a 22-gauge "finder" needle at the apex of the triangle formed by the two bellies of the sternocleidomastoid muscle and the clavicle. The vessel was then punctured with a 2^{3/4} inch long 18-gauge intravenous cannula, during the second attempt. Blood flowing from the 18-gauge intravenous cannula was dark and nonpulsatile. A 0.035-inch "J"-tip guide wire was threaded through the 18-gauge cannula without problem, and an 8.5-French introducer (B Braun®) was threaded over the wire. To confirm placement, blood was aspirated from the introducer, the blood was nonpulsatile and dark. At no point of the procedure, was there any clinical suspicion of an arterial puncture. The catheter was connected to a pressure transducer and monitoring system, and the central venous pressure (CVP) was approximately 11/7 mmHg with respiratory variation. Post venous cannulation blood pressure was 118/68 mmHg with a heart rate of 84 per minute. The surgery started and the surgeon proceeded with sternotomy. During sternotomy the blood pressure suddenly dropped to 54/28 mm Hg and heart rate increased to 134/min with a sudden drop in venous pressure to 4/3 mm Hg. There was no injury to the pericardium post sternotomy, as confirmed by the surgeon. The condition persisted and a fluid challenge was given with a colloid and a blood gas was sent which was unremarkable. The suspicion was that of pericardial tamponade and the

surgeon immediately opened the pericardium. Nearly 500 ml of fresh bright red blood was found in the pericardium, along with clot. Immediately on release of the blood the blood pressure rose to 86/52 mm Hg but the heart rate remained the same. The patient was infused with 500 ml of colloid with a close watch on the venous pressure. The surgeon found out the cause of the bleed to be from the junction of innominate artery and arch of aorta, it was a small needle stick induced discontinuity in the wall of the vessel, which was promptly sutured with a single stitch.

DISCUSSION

Cardiac tamponade caused by central venous cannulation is well documented with more than 100 cases being reported since 1958.^{1, 4, 8} Central venous cannulation is mandatory in patients who have to undergo open cardiac surgical procedures. Internal jugular vein is commonly used for this purpose, but femoral vein is also used in selected group of patients.⁹ Nasim and colleagues² noted that before 1980 there was a 77% death rate in central venous cannulation reported in English literature. From 1980 to 1989 this was 47%.²

Complications of the internal jugular vein cannulation are quite a few. Among the arterial injuries, commonest is injury to the carotid artery followed by subclavian artery and also the vertebral artery.^{10, 11, 12} Cardiac tamponade is more frequent when catheters are inserted via peripheral rather than central veins. This risk could be partly related to the movement of the catheter tip with changes in arm, neck and head position.^{1,14}

Early recognition and treatment of cardiac tamponade is essential if mortality is to be avoided. Symptoms and signs are usually sudden and include nausea, dyspnoea, retrosternal chest pain, cyanosis, venous engorgement, pulsus paradoxus and confusion.³ Diagnosis of cardiac tamponade is more difficult in sedated ventilated patients, so awareness of catheter related complications is even more vital. Also it is important to note that the diagnosis of this condition is very difficult in non cardiac surgery patients.

Commonest sites of perforation are the right atrium and the right ventricle (80%) followed by the superior vena cava.^{3, 8} However, there are fatal cases where no evidence of erosion and perforation could be found.⁸ In our case the cannulation was achieved in the second attempt and it is most likely that the needle has gone way down and had nicked the arch of aorta, also as age of the patient was 13yrs and more over the arch of aorta of the patient was shifted towards the right due

to dilated pulmonary artery. As the nick was a small one, the blood gradually started to collect in the pericardium and when it reached significant proportion it resulted in tamponade.

Pericardial tamponade usually presents with hypotension (88%), raised central venous pressure (70%) and a disturbance in cardiac rhythm (67%). However in 29% of these cases death occurs suddenly after vague premonitory signs.⁵

ECG and chest radiograph may not always assist in diagnosis, as signs like low voltage complex or electrical alternans may not be present and chest radiograph requires considerable amount of fluid to be present.^{6, 7} In our case there was no changes in ECG and radiography was not performed as the sternotomy was through. Echocardiography is diagnostic. Early diagnosis requires suspicion and attention to the clinical signs. We conclude that Two-dimensional (2-D) imaging ultrasound guidance is recommended as the preferred method for insertion of central venous catheters (CVCs) into the internal jugular vein (IJV) in adults and children in elective situations.^{13, 14} It is recommended that all those involved in placing CVCs using two-dimensional (2-D) imaging ultrasound guidance should undertake appropriate training to achieve competence.¹⁴

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