Case Report

Air embolism through open hub of external jugular vein intravenous cannula

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ABSTRACT

Introduction: Venous air embolism is a catastrophic complication that can result in sudden cardiac arrest and death. Massive air embolism has been reported with central venous catheter through the internal jugular and subclavian veins. Though external jugular vein is a potential site of an air embolism to cardiac chambers and subsequently to vital organs such as brain, heart and lungs but has not been reported yet in literature.

Case presentation: We are reporting a case of sudden pulmonary air embolism in a patient through the open hub of an intravenous cannula, vigilant monitoring and timely action saved the patient from a catastrophic outcome.

Conclusion: We recommend vigilant monitoring and adequate precaution in patients with external jugular venous cannulation in the operation theater, intensive care unit or wards to prevent iatrogenic complications.

1. Introduction

External jugular venous (EJV) cannulation is being increasingly used in emergencies patients for fluid and inotrope administration. Air embolism is a catastrophic complication that can result in sudden cardiac arrest and death. Massive air embolism has been reported with central venous cannulation through the internal jugular and subclavian veins. Although the external jugular vein is a potential site of an air embolism to cardiac chambers and subsequently to the lungs, in the literature, there is only one case report published. We are reporting a case of sudden pulmonary air embolism in a patient being operated for fracture humerus, through the open hub of an intravenous (IV) cannula in the EJV. However, vigilant monitoring and timely action averted a calamitous outcome.

2. Case presentation

A 48-year old male, BMI-27, ASA grade I, who sustained a bilateral proximal humerus fracture in a road traffic accident 5 days prior to hospital admission was posted for bilateral open reduction and internal fixation. His preoperative investigations were within normal limits, with a hemoglobin value of 14 g m%. The patient had a 16 Gauge IV cannula in the right EJV which was inserted in the emergency department during initial resuscitation. Before induction of anesthesia, another 16 Gauge cannula was inserted in the right lower limb in anticipation of the additional blood loss during a bilateral surgery. The patient was administered general anesthesia and positioned in the beach chair position. Sterile draping covered the head end of patient and anesthetist machine was shifted back a little to enable two surgical teams to operated simultaneously. The surgery started uneventfully on the ECG. An arterial blood sample was taken from the arterial line for urgent arterial blood gas examination. The surgery was stopped and a search for the possible cause of intraoperative hemodynamic and respiratory changes was carried out. Meanwhile, injection adrenaline 100μg IV and ringer lactate bolus was administered. The estimated blood loss was about 400 ml. We found the IV set detached from the EJV cannula and the internal jugular vein distended. The EJV cannula was promptly closed. On auscultation, no clinical murmur was heard.
over precordium and the chest was clear. We suspected pulmonary air embolism as a possible cause for the changes in ETCO₂, tachycardia and hypotension. The patient was placed in a Trendelenburg position with a left lateral tilt of the table, The ABG reports revealed a PH of 7.33, hypotension. The patient was placed in a Trendelenburg position with a

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caused the disconnection between the IV cannula and IV line without operating

the neck vein cannulation. As two teams were simultaneously oper-

cannulation and BP monitoring. Draping of the surgical part obscures

3. Discussion

Bilateral humerus fracture surgery poses a restricted area for IV
cannulation and BP monitoring. Draping of the surgical part obscures

the neck vein cannulation. As two teams were simultaneously oper-

ating, the anesthesia machine and the anesthetist moved away from the

operating field. Surgeon’s manipulation of the operative site may have
cauased the disconnection between the IV cannula and IV line without

the anesthetist realizing this. Air entrainment can occur because of the

gradient between the external atmospheric pressure and the intravascular low venous pressure, which may be sub-atmospheric at baseline values in up to 40% of patients.\(^5\) This gradient can be increased by hypovolemia and patient position, which could be risk for air embolism in our case. Kapoor et al. have described the solitary case train of air bubbles in the EJV during neck dissection in a patient, which they were able to manage successfully.\(^6\) Else venous air embolism (VAE) has been reported more commonly during insertion or removal of central venous catheter by the interventionist with a rate up to 2% apart from the surgical procedure per se.\(^6\)

Even though the many cases may be subclinical and dormant, VAE remains a medical emergency with reported fatality as high as 50–80%.\(^7\) Clinical manifestation of VAE depends on volume of air en-

trainment that manifest mainly as cardiovascular, respiratory, and

central nervous system dysfunction.\(^7,8\) In an intubated patient, sudden decrease in the ETCO₂ level should alarm the anesthetist of altered ventilation - perfusion relation and possible obstruction of pulmonary arteries.\(^8\) Transesophageal echocardiography and precordial doppler ultrasonography are sensitive tools that can detect air of 0.02–0.05 ml/

kg.\(^9,10\) In the absence of this facility in our trauma operation theatre, high clinical suspicion remains the mainstay in diagnosis

Fat embolism (FE) is a very important differential diagnosis partic-

ularly in orthopedic scenario for intraoperative hypoxemia and hy-

potension.\(^11\) FE can occur in long-bone fractures and even during

intramedullary nailing but is usually asymptomatic. Few patients do

develop signs and symptoms of multiorgan dysfunction, particularly

involving the triad of lungs, brain, and skin.\(^12\) Massive intraoperative pulmonary FE, leading to fatal outcomes has been rarely reported in the

literature.\(^13\) FE however was excluded in this case as the hypoxemia

easily reversed with positioning and stopping N₂O administration.

Moreover, fever and petechiae were absent. The urine fat globules were also negative there was no neurological dysfunction post operatively.

4. Conclusion

Vigilant monitoring of patients having EJV cannulation for fluid and

vasopressor therapy is of utmost importance in preventing complica-

tions such as VAE. Strong clinical suspicion in absence of intraoperative

echocardiography forms the cornerstone in aggressively managing

these morbid conditions.

Authors contribution

MJ was chief operating surgeon where CM was anesthetist. SA was

help when the episode occurred. MJ and CR followed up patient while

BS and SA reviewed the literature. SA, BS and MJ wrote up the paper.

All authors have read and agree to content of manuscript.

Competing interest

None.

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None.

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We acknowledge the patient for permitting us to share this event for

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1. Prasad VSV, Dharwal S, Bahe A. External jugular venous access in children : a low
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