

# Fatal airway obstruction following arterial trauma during internal jugular venous cannulation

Aparna Williams, Ashu S. Mathai, Gaurav Bhatia, John Abraham

## Abstract

Central venous cannulations are commonly performed in the intensive care unit. However, these may be associated with severe mechanical or bleeding complications. Here, we describe a patient who died following severe and rapid airway obstruction secondary to an arterial trauma during internal jugular vein cannulation. This case report highlights the importance of prompt recognition of arterial trauma so that it can be repaired surgically instead of sheath removal. The prompt diagnosis of an impending airway obstruction and obtaining early airway access cannot be overemphasized. Finally, we discuss the risk factors associated with this complication and what we could have possibly done to prevent this outcome.

**Keywords:** Airway obstruction, arterial trauma, internal jugular venous cannulation

### Access this article online

Website: [www.ijccm.org](http://www.ijccm.org)

DOI: 10.4103/0972-5229.76085

### Quick Response Code:



## Introduction

Arterial punctures can occur in 6–25% of internal jugular venous cannulations.<sup>[1]</sup> However, this complication leading on to fatal airway obstruction is extremely rare and only one case of the same has been reported in literature.<sup>[2]</sup>

## Case Report

A 65-year-old obese lady [body mass index (BMI) 35 kg/m<sup>2</sup>], with a diagnosis of pyelonephritis, requiring intravenous antibiotics, was shifted to the intensive care unit for central venous cannula (CVC) insertion as her peripheral venous access was poor. Earlier investigations had revealed mildly deranged bleeding parameters as follows: prothrombin time of 13 with a control of 12, activated partial thromboplastin time of 41.4 with a control of 25, platelet count of 200,000/mm<sup>3</sup> and a hematocrit of 27/mm<sup>3</sup>.

After transfusion of four units of fresh frozen plasma, a landmark-based right internal jugular venous (IJV) cannulation was attempted. Using the high central approach, the IJV was punctured and free-flowing dark “venous” blood was aspirated. After guidewire insertion, the vein was dilated. However, the 7-Fr triple lumen catheter could not be negotiated, and hence, the cannula over guidewire was removed. External pressure was applied over the puncture site for 5 minutes and, before the next attempt could be made, the patient was noticed to be agitated. The drape covering her head was removed and the patient was found to be diaphoretic, pale and tachypneic. Immediately, all the drapes were removed and a massive anterior neck swelling was evident, associated with breathing difficulty. Her pulses were feeble and heart rate was 145/minute and oxygen saturation by pulse oximetry was 80–85%. She was initiated on oxygen at fiO<sub>2</sub> 60%. In view of an impending airway obstruction, an immediate attempt was made to intubate the trachea, which was unsuccessful due to the severely distorted internal anatomy and secretions in the airway. The ENT surgeon was notified for an urgent tracheostomy. Intravenous crystalloids and colloids were rapidly transfused. Meanwhile, the anterior neck swelling was increasing rapidly in size and the patient’s heart rate was 160/minute. The ENT surgeons

### From:

Department of Anaesthesiology and Critical Care, Christian Medical College, Ludhiana, India

### Correspondence:

Dr. Aparna Williams, Department of Anesthesiology and Critical Care, Christian Medical College, Ludhiana, Punjab – 141 008, India.  
E-mail: [aparna\\_williams@yahoo.co.in](mailto:aparna_williams@yahoo.co.in)

present began doing an emergency tracheostomy while bag and mask ventilation was carried out. A second attempt at laryngoscopy using the BURP (backwards, upwards and right posterior) maneuver barely revealed the posterior part of the glottic opening, and a size-6.5 endotracheal tube was successfully slipped in, just as the skin and subcutaneous tissues were being opened. A large hematoma was found extending over the entire anterior surface of the neck. The patient developed bradycardia with a heart rate of 30/minute which quickly deteriorated to asystole. Cardiopulmonary resuscitation was immediately instituted but despite 40 minutes of advanced cardiac life support therapy, the patient could not be resuscitated. The time from initial vascular puncture to cardiac arrest was less than 20 minutes.

## Discussion

A review of literature suggests that although arterial trauma is not uncommon during central venous cannulations (CVCs),<sup>[1]</sup> a fatal outcome secondary to severe and rapid airway obstruction such as this is very rare. Our patient had severe airway obstruction associated with hemodynamic instability, and the presence of a large hematoma over the anterior surface of the neck. Hence, the most likely cause of this complication would have been trauma following dilator injury to the carotid artery, resulting in rapid blood loss and formation of hematoma which caused fatal airway obstruction.

Carotid artery trauma has been reported in 6–25% of patients, following landmark-based internal jugular venous cannulations.<sup>[1]</sup> The other, rarer arterial punctures include those involving the subclavian artery (0.1–1% of IJV cannulations)<sup>[1]</sup> and the aorta, which is associated with a 90% death rate.<sup>[3]</sup> Despite the advent of ultrasound guided vascular cannulation, which has reduced the incidence of complications drastically,<sup>[4]</sup> many centers in our country still rely on the landmark-based technique for cannulation, which has a success rate of 75–99%.<sup>[1]</sup> The factors associated with bleeding and mechanical complications during CVC insertions include unsafe manipulation, kinking of the guide wire, operator inexperience, increased needle passes, severe dehydration, morbid obesity, short neck, emergency procedures and coagulopathy.<sup>[5]</sup> Our patient had some of these risk factors, viz., obesity, short neck and coagulopathy.

The key factor that determines survival is prompt recognition of the arterial trauma. We failed to recognize the arterial trauma and pulled out the dilator directly, a practice that needs to change and henceforth be

strongly discouraged, especially if the artery has been dilated or the cannula inserted. The removal of the CVC and application of pressure over the arterial puncture site is reportedly associated with a significant risk of hematoma, airway obstruction, stroke, and even death.<sup>[6]</sup> Hence, if an arterial trauma is recognized during CVC insertion, the recommended approach is to leave the sheath in place and refer the patient for early and safe surgical arterial repair.<sup>[7]</sup>

In previous case reports of severe airway obstruction following inadvertent arterial trauma during IJV cannulation, obtaining timely airway access was the most important factor which determined survival.<sup>[2,8,9]</sup> In our patient, there was a delay in recognizing the early signs of airway compromise due to the drapes covering the patient. Also, the cessation of external bleeding when pressure was applied led us to falsely believe that the bleeding was controlled. By the time the airway obstruction was recognized, the hematoma had increased significantly and visualization of the larynx was impossible. Thus, there was a delay by nearly 10–12 minutes before the airway was finally secured.

In conclusion, arterial trauma during IJV cannulation can lead to catastrophic consequences if not rapidly detected. The factors which might have helped us avoid this unfortunate outcome are the use of transparent drapes through which we could have noted the developing hematoma earlier, better airway preparedness, and possibly, the use of ultrasound guidance for cannulation, more so with the risk factors involved in our patient. Also, if the arterial trauma had been recognized, especially after dilatation, the correct approach would have been to leave the dilator in place while referring the patient for emergent and safe surgical repair.

## References

1. Oliver WC Jr, Nuttall GA, Beynen FM, Raimundo HS, Abenstein JP, Arnold JJ. The incidence of artery puncture with central venous cannulation using a modified technique for detection and prevention of arterial cannulation. *J Cardiothorac Vasc Anesth* 1997;11:851-5.
2. Lau H, Lin T, Lee Y, Liou W, Tsai S. Delayed airway obstruction secondary to inadvertent arterial puncture during percutaneous central venous cannulation. *Acta Anaesthesiol Sin* 2001;39:93-6.
3. Carr M, Jagannath A. Hemopericardium resulting from attempted internal jugular vein catheterization: A case report and review of complications of central venous catheterization. *Cardiovasc Intervent Radiol* 1986;9:214-8.
4. Randolph AG, Cook DJ, Gonzales CA, Pribble CG. Ultrasound guidance for placement of central venous catheters: A meta-analysis of the literature. *Crit Care Med* 1996;24:2053-8.
5. Sznajder JI, Zveibil FR, Bitterman H, Weiner P, Bursztein S. Central vein catheterization: Failure and complication rates by three percutaneous approaches. *Arch Intern Med* 1986;146:259-61.
6. Reuber M, Dunkley LA, Turton EP, Bell MD, Bamford JM. Stroke

- after internal jugular venous cannulation. *Acta Neurol Scand* 2002;105:235-9.
7. Guilbert MC, Elkouri S, Braeco D, Corriveau MM, Beaudoin N, Dubois M J, *et al.* Arterial trauma during central venous catheter insertion: Case series, review and proposed algorithm. *J Vasc Surg* 2008;48:918-25.
  8. Kua JS, Tan IK. Airway obstruction following internal jugular vein cannulation. *Anaesthesia* 1997;52:776-80.
  9. Jeganath V, McElwaine JG, Stewart P. Ruptured Superior thyroid artery from central vein cannulation: Treatment by coil embolization. *Br J Anaesth* 2001;87:302-5.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

### Author Help: Online submission of the manuscripts

Articles can be submitted online from <http://www.journalonweb.com>. For online submission, the articles should be prepared in two files (first page file and article file). Images should be submitted separately.

1) **First Page File:**

Prepare the title page, covering letter, acknowledgement etc. using a word processor program. All information related to your identity should be included here. Use text/rtf/doc/pdf files. Do not zip the files.

2) **Article File:**

The main text of the article, beginning with the Abstract to References (including tables) should be in this file. Do not include any information (such as acknowledgement, your names in page headers etc.) in this file. Use text/rtf/doc/pdf files. Do not zip the files. Limit the file size to 1024 kb. Do not incorporate images in the file. If file size is large, graphs can be submitted separately as images, without their being incorporated in the article file. This will reduce the size of the file.

3) **Images:**

Submit good quality color images. Each image should be less than **4096 kb (4 MB)** in size. The size of the image can be reduced by decreasing the actual height and width of the images (keep up to about 6 inches and up to about 1800 x 1200 pixels). JPEG is the most suitable file format. The image quality should be good enough to judge the scientific value of the image. For the purpose of printing, always retain a good quality, high resolution image. This high resolution image should be sent to the editorial office at the time of sending a revised article.

4) **Legends:**

Legends for the figures/images should be included at the end of the article file.