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EDITORIAL

Pitfalls in internal jugular vein cannulation

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Abstract

Central venous catheter insertion in the internal jugular vein (IJV) is frequently performed in acute care settings, facilitated by its easy availability and increased use of ultrasound in healthcare settings. Despite the increased safety profile and insertion convenience, it has complications. Herein, we aim to inform readers about the existing literature on the plethora of complications with potentially disastrous consequences for patients undergoing IJV cannulation.

Key Words: Catheterization; Central venous; Complications; Thoracic duct; Arteriovenous fistula; Vocal cord paralysis; Pneumothorax; Cardiac tamponade

Core Tip: Central venous catheter placement is widely performed in healthcare settings, including critical care units, operating rooms, emergency departments, and patient-care wards. Although its safety profile has significantly increased with the routine use of ultrasound guidance, it is often associated with potential risks. The internal jugular vein remains the most preferred route for central venous cannulation. Potential complications can be due to anatomical variations or vascular, neural, pulmonary, cardiac, or lymphatic injuries, even with normal anatomy.

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INTRODUCTION

Central venous catheter (CVC) placement is an essential procedure performed

regularly in critical care setups, operating rooms, emergency department scenarios, and all wards throughout any healthcare setup. Although multiple major veins can be cannulated, the internal jugular vein (IJV) is one of the most preferred sites of cannulation. The indications of CVC cannulation include nutritional support, administration of vasoactive drugs, monitoring of hemodynamic status, and therapeutic interventions such as hemodialysis. The enhanced safety profile of IJV cannulation has dramatically increased following the wide usage of ultrasonography (USG) in identifying and cannulating IJV. IJV cannulation is frequently performed in acute care settings throughout the hospital and is associated with a plethora of complications[1].

Several vascular complications have been reported after IJV cannulation, ranging from inadvertent misplacements to multiple attempts (Table 1)[2]. While cannulating the IJV, aberrant neck vascular anatomy has led to arterial and venous injuries and subsequent endovascular salvage procedures[3,4]. Lucas *et al*[3] reported that CVC completely penetrated the right IJV into the right subclavian artery that terminates in the aortic arch. The carotid artery is a major structure with reported inadvertent puncture. It has a 3%-10% incidence, independent of the chosen technique or operator experience[5, 6].

Table 1 Complications associated with internal jugular vein cannulation

	Complications
Abnormal anatomy	Right sided arch of aorta
	Congenital persistence of a left-sided vena cava, with or without a bridging innominate vein
Vascular	Arterial injury
	Venous injury (lacerations of the vena cava, the mediastinal vessels, and the right atrium)
	Bleeding
	Hematoma
Neural	Recurrent laryngeal nerve injury
	Vocal cord palsy
	Sympathetic chain injury
	Brachial plexus injury
	Phrenic nerve injury
	Horner's syndrome
Pulmonary	Pneumothorax
	Pneumomediastinum
	Chylothorax
	Tracheal injury
	Injury to the recurrent laryngeal nerve
	Air embolus
Cardiac	Premature atrial and ventricular contractions
	Arrythmias
	Injury to tricuspid valves,
	Perforation of right ventricle
	Cardiac tamponade
	Cardiac arrest
Lymphatic	Iatrogenic lymphatic
	Thoracic duct injuries
Device related	Fibrin sheath formation
	Fracture
	Thrombosis
	Central venous stenosis
	Infection

Moreover, arteriovenous (AV) fistula formation has been reported with IJV cannulation, especially after removing accidental arterial catheters; these have manifested as profound hemiparesis symptoms and an innocuous humming in the ear[7,8]. Although AV fistula is more common on the right side, the left-sided AV fistula has been reported after left IJV cannulation attempt[9].

Prolonged arterial catheterization can lead to thrombus formation with chances of stroke and risk of neurological deficits. Katyal *et al*[10] (2018) reported a case of acute ischemic stroke from an inadvertently placed CVC into the right common carotid artery. Another rare complication of CVC placement using the landmark technique was its misplacement into the vertebral vein with subsequent subdural effusion in a 4-month-old infant[11]. The next complication of IJV cannulation is the unintentional and potentially life-threatening injury to the right thyrocervical trunk, even when the procedure was performed under the USG guidance[12].

Neural complications such as vocal cord palsy and Horner's syndrome have also been reported[13,14]. Regarding the vocal cord palsy, the right IJV cannulation was performed with the landmark technique, which was associated with transient hoarseness of voice, potentially due to deep infiltration of local anesthetic. Repeated puncture attempts, use of landmark technique, and hematoma formation caused Horner's syndrome in the aforementioned case reports[13,14].

Pneumothorax, pneumomediastinum, chylothorax, tracheal injury, hydrothorax, and air embolism are among the multiple pulmonary complications seen during a CVC insertion[6,15]. Cardiac complications include premature atrial and ventricular contractions, injury to the tricuspid valves, perforation of the right ventricle, and cardiac tamponade. Additionally, proximity to the AV node can lead to cardiac arrest scenarios[16].

Due to the anatomic proximity of the thoracic duct in the superior mediastinum, left IJV cannulation is also associated with lymphatic injury[6,17]. The US-guided IJV cannulation is practiced frequently and considered a safe approach with few complications; its use is recommended by several regulatory bodies. A Cochrane review on ultrasound guidance *vs* landmark technique showed a high success rate with the use of USG vis-a-vis landmark technique with a discernible decrease in overall complication rates[18].

CONCLUSION

Globally, IJV cannulation is a frequently practiced procedure in healthcare settings. The advent of USG has made it convenient and safe to cannulate IJV. However, it is pertinent to note and be wary of the various pitfalls of IJV cannulation to avoid potentially catastrophic therapeutic misadventures.

FOOTNOTES

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