Guidewire advancement is interrupted by an internal jugular vein valve with a restricted opening: an ultrasound image

Takahiro Tadokoro, MD · Kouji Yoza, PhD ·
Kazuhiro Sugahara, MD, PhD

Received: 5 July 2013 / Accepted: 15 August 2013 / Published online: 7 September 2013
© Canadian Anesthesiologists' Society 2013

To the Editor,

Anesthesiologists have generally paid relatively little attention to the internal jugular vein valve (IJVV) during central venous catheter insertion. Interruption of guidewire insertion by the IJVV is known to occur; however, very few related images appear in the published literature. Recently, a 73-yr-old male with a bicuspid aortic valve and a history of hypertension presented to our hospital for aortic valve replacement. Following induction of anesthesia, we attempted an ultrasound-guided placement of the Sheath Introducer (Multi-lumen access catheter, ARROW®) into the patient's right internal jugular vein (IJV). We rotated the patient's head to the left while slightly extending his neck, and we then confirmed that the IJV was lying parallel to the right carotid artery which had no evidence of stenosis. Ultrasound imaging was used to confirm the location of the needle tip within the vessel and backflow of blood. Next, we attempted to introduce a guidewire into the right IJV; however, we were unable to advance the guidewire more than 8 cm due to resistance. During ultrasound-guided indwelling of the guidewire, a large membranous structure was detected protruding from the posterior wall of the IJV. Although we attempted to advance the guidewire with the assistance of ultrasound imaging, the wire could only push the bottom of membranous structure ([Figure, Panel A](#)). The guidewire was caught by the membranous structure, and we could not

advance the wire further. After several failed attempts, we placed the Sheath Introducer into the left IJV instead.

Internal jugular vein valves are the only barrier between the brain and the heart that prevent retrograde venous blood flow when the intrathoracic pressure increases. Malfunction of the IJVV may include restriction of the opening and valve incompetence. As was the case here, a restricted opening may impede insertion of the catheter or guidewire during central venous catheterization, while valve incompetence may be a complication of catheterization.

A guidewire is introduced along the posterior wall of the IJV. In this case, the patient's IJVV was a bicuspid valve which consisted of a large posterior leaflet and a small anterior leaflet. Advancement of the guidewire was obstructed by the bottom of the posterior leaflet with a restricted opening. Based on our experience, we suggest assessing any malfunctioning opening movement of the IJVV with a preprocedural ultrasound scan.

Macchi *et al.* reported that IJVV incompetence may be considered a normal finding;¹ however, a pressure gradient develops in this valve during coughing.² Catheterization of the IJV involves a risk of injury to the IJVV. Wu *et al.* reported that IJVV incompetence is more commonly caused by cannulation and catheterization at the proximal site of the IJV than at the distal site.³ Internal jugular vein valve incompetence causes an increase in retrograde

T. Tadokoro, MD (✉) · K. Yoza, PhD
Department of Anesthesiology, Okinawa Prefectural Nanbu
Medical Center & Children's Medical Center, Okinawa, Japan
e-mail: rover2727@yahoo.co.jp

K. Sugahara, MD, PhD
Department of Anesthesiology, Faculty of Medicine, University
of the Ryukyus, Okinawa, Japan

Figure *Panel A*) Advancement of the guidewire is obstructed by the bottom of the posterior leaflet with a restricted opening. *Panel B*) Ultrasound colour flow imaging showing the internal jugular vein valve at the opening phase

venous blood flow, which results in an increase in intracranial pressure. Several reports suggest that IJVV incompetence may be associated with transient global amnesia⁴ or a benign cough headache.⁵ Therefore, careful measures to prevent injury to the IJVV, which may cause exacerbation of valve incompetence, are warranted. In order to minimize risk of catheterization involving IJVV trapping and injury, we suggest using high-resolution ultrasonography and paying careful attention to resistance while introducing the guidewire. In case of resistance, guidewire advancement should be performed with ultrasound imaging. If there is any suggestion that the guidewire could be trapped by the IJVV, a helpful maneuver is to rotate the guidewire, raise the tip of the needle, and advance the guidewire through the central portion of the IJV.

Conflicts of interest None declared.

References

1. Macchi C, Catini C. The valves of the internal jugular veins: a statistical investigation in 120 living subjects using ultrasonic tomography. *Ital J Anat Embryol* 1994; 99: 123.
2. Imai M, Hanaoka Y, Kemmotsu O. Valve injury: a new complication of internal jugular vein cannulation. *Anesth Analg* 1994; 78: 1041-6.
3. Wu X, Studer W, Erb T, Skarvan K, Seeberger MD. Competence of the internal jugular vein valve is damaged by cannulation and catheterization of the internal jugular vein. *Anesthesiology* 2000; 93: 319-24.
4. Boes CJ, Matharu MS, Goadsby PJ. Benign cough headache. *Cephalalgia* 2002; 22: 772-9.
5. Doepp F, Valdueza JM, Schreiber SJ. Incompetence of internal jugular valve in patients with primary exertional headache: a risk factor? *Cephalalgia* 2008; 28: 182-5.