



Absence of the Right Internal Jugular Vein During Ultrasound-Guided Cannulation

Sağ İnternal Juguler Venin Ultrason Eşliğinde Kanülasyonu Sırasında Yokluğu

Ali Alagöz¹, Mehtap Tunç¹, Hilal Sazak¹, Polat Pehlivanoglu¹, Atila Gökçek², Fatma Ulus¹

¹Department of Anaesthesiology and Reanimation, Atatürk Chest Diseases and Thoracic Surgery Training and Research Hospital, Ankara, Turkey

²Department of Radiology, Atatürk Chest Diseases and Thoracic Surgery Training and Research Hospital, Ankara, Turkey

Cannulation of the internal jugular vein (IJV) may be difficult because of anatomical variations. A 66-year-old female patient, who was in the intensive care unit, underwent ultrasound-guided cannulation of the right IJV. The right IJV could not be visualized by ultrasonography despite positional changes of the patient and Valsalva manoeuvre. The left IJV was easily determined by ultrasonography and cannulated. Although the landmark technique may be sufficient for most of the central vein cannulations, the rate of anatomical variations and related complications is quite high. We point out that even if ultrasound cannot be used in real-time, the ultrasonographic confirmation during the pre-insertion period may be crucial for successful central vein cannulation.

Keywords: Right internal jugular vein, ultrasonography, complication, anatomic variation

İnternal juguler ven (İJV) kanülasyonu anatomik varyasyonlar nedeniyle zor olabilir. Yoğun bakımda 66 yaşındaki kadın olguya ultrasonografi eşliğinde sağ İJV kanülasyonu planlandı. Sağ İJV olgunun pozisyonunu değiştirmemize ve Valsalva manevrası uygulamamıza rağmen görüntülenemedi. Sonrasında Sol İJV kolayca görüntülenerek ultrasonografi eşliğinde kanülasyon yapıldı. Anatomik işaretlere göre santral ven kanülasyonu birçok hastada başarılı olmakla birlikte, anatomik varyasyonların oranı çoktur ve buna bağlı komplikasyon oranı da oldukça yüksektir. Santral ven kanülasyonlarında ultrasonografi eş zamanlı kullanılmasa dahi işlem öncesi anatomik yapıların ultrasonografi ile doğrulanmasının başarılı santral ven kanülasyonu için önemli olduğunu vurgulamak istedik.

Anahtar Kelimeler: Sağ internal juguler ven, ultrasonografi, komplikasyon, anatomik varyasyon

Introduction

Correct placement of an internal jugular vein (IJV) catheter may become a technically challenging procedure because of anatomical variations. The anatomical variations increase the central venous catheterization (CVC) failure and the rate of malposition (1). Recently, the guidance of ultrasonography (USG) either in pre-insertion or in real-time is accepted as a remedy to reduce the failure and malposition rate (2). Here, we reported a case with a rare anatomical variation, which was determined during cannulation of the right IJV with ultrasound guidance in an intensive care unit (ICU).

Case Presentation

A 66-year-old female was admitted to the ICU and mechanically ventilated. The patient was diagnosed with acute respiratory failure due to rigid Parkinson disease. The anaesthesiologist planned the right IJV cannulation with ultrasound guidance. An informed consent for IJV cannulation was obtained from the patients' primary relative because of her clinical condition. The patient was placed in the 15° Trendelenburg position for the procedure. Lidocaine (2%, 3 mL) was administered for local anaesthesia following sedation with 0.05 mg kg⁻¹ intravenous midazolam and sterilization. A portable ultrasound machine (Sonosite M-Turbo®, Sonosite Inc, Bothell, WA, USA) with a linear, high frequency transducer (6-13 MHz, Sonosite) was used for catheter placement. The transducer was covered with a sterile sheath, and the right neck area was examined. Nevertheless, the right IJV was not visible by USG despite the positional changes of the patient and the transducer during examination (Figure 1a). Color Doppler imaging revealed the presence of the right carotid artery without the right IJV (Figure 1b). An experienced radiologist was consulted for ultrasonographic confirmation of the absence of the right IJV. After the confirmation, the patient was positioned for ultrasonographic examination of the left neck. The left IJV was easily

Address for Correspondence/Yazışma Adresi: Dr. Ali Alagöz, Department of Anaesthesiology and Reanimation, Atatürk Chest Diseases and Thoracic Surgery Training and Research Hospital, Ankara, Turkey Phone: +90 312 567 72 35 E-mail: mdaalagoz@gmail.com

©Telif Hakkı 2015 Türk Anesteziyoloji ve Reanimasyon Derneği - Makale metnine www.jtaics.org web sayfasından ulaşılabilir.

©Copyright 2015 by Turkish Anaesthesiology and Intensive Care Society - Available online at www.jtaics.org

Received / Geliş Tarihi : 06.06.2014

Accepted / Kabul Tarihi : 27.09.2014

Available Online Date /

Çevrimiçi Yayın Tarihi : 16.02.2015

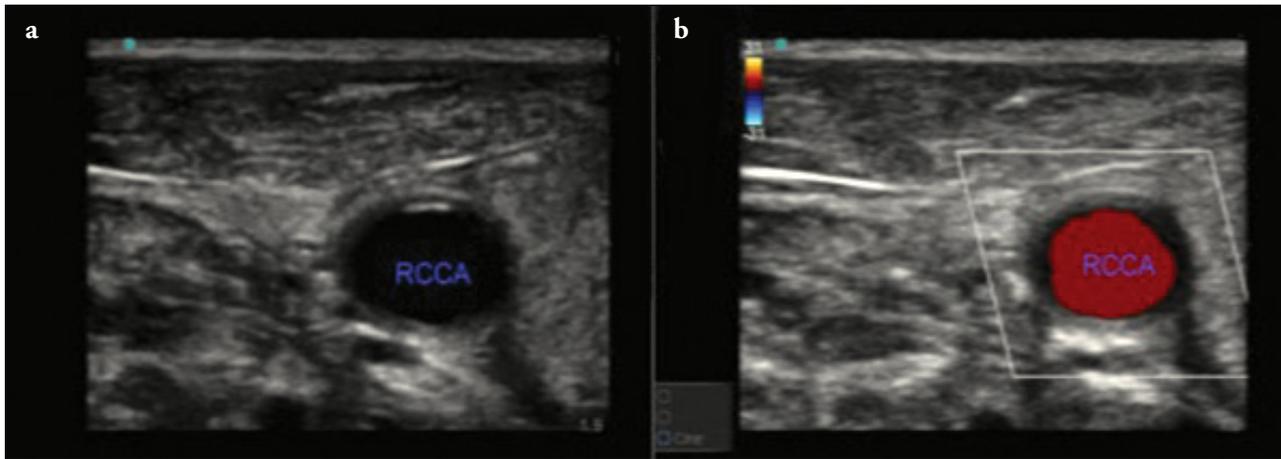


Figure 1. a, b. Ultrasonographic appearance of the right common carotid artery (RCCA) with the absence of the right internal jugular vein. The image was obtained during the Trendelenburg position and Valsalva maneuver. (a) RCCA (b) RCCA with color Doppler imaging

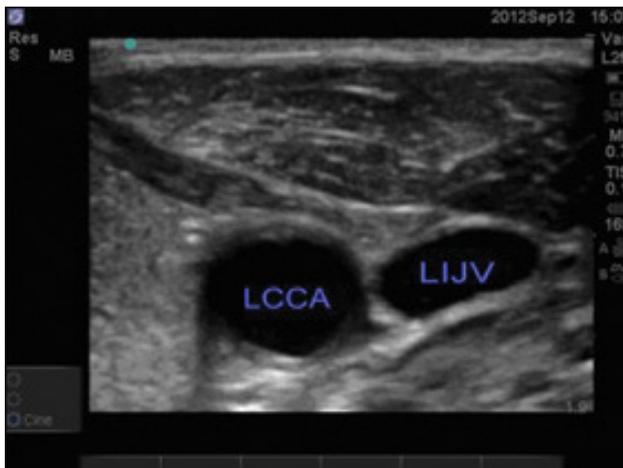


Figure 2. Ultrasonographic appearance of the left common carotid artery (LCCA) and the left internal jugular vein (LIJV)

determined by USG without any positional changes of the patient and the transducer (Figure 2). The left IJV cannulation was performed without difficulty, and placement of the catheter was also confirmed by ultrasound.

Discussion

Anatomical variations of the IJV are common and exhibited in a wide range. All abnormalities of IJV may be related to an increased complication rate and CVC failure (1). Generally, the physicians may perform multiple attempts for cannulation according to the anatomical landmarks. The rate of complication, particularly carotid artery puncture, increases because of several and consistent attempts. The close anatomical relationship between the IJV and carotid artery may also augment these obstacles. Carotid artery puncture is a serious complication of IJV cannulation, and it may be related to vascular damage, airway obstruction and neurologic injury (1).

In the literature, cerebral venous insufficiency has been reported in neurological disorders, particularly in multiple sclerosis. It may be characterized by stenosis or lack of ve-

nous flow. The lack of a Doppler detectable venous flow in the cerebral venous system was reported by researchers (3). Initially, we assumed that the present patient presented with cerebral venous insufficiency because of her neurological disorder; however, we could not observe the right IJV despite multiple colour Doppler screenings in different locations on the right IJV. Another possibility is IJV thrombosis. It is a rare condition and generally secondary to various aetiologies such as existence of central vein catheter, malignancy, trauma, infection and hypercoagulable status (4). Our case did not have any history of catheter insertion of the right IJV, and we eradicated the other possibilities related to IJV thrombosis. With the aid of these findings, we assumed that IJV thrombosis may result from the undiagnosed absence of the right IJV. We found only one paediatric case report with the absence of the right IJV by B-mode and colour Doppler imaging. The author also located the left IJV easily under the guidance of USG and performed left IJV cannulation without any complication (5).

Ultrasonography imaging is helpful, but it may not be sufficient to confirm the absence of the IJV. Invasive investigations such as venography may have been helpful to confirm this anatomical circumstance. However, we did not perform venography in this case because of ethical issues and the patients' poor physical status. It should have been performed as an elective procedure after USG confirmation.

It was stated that the patient's position and Valsalva manoeuvre could affect the IJV diameter. The Trendelenburg tilt significantly increased the right IJV diameter compared to the neutral supine position (6). In our case, despite the several position changes and Valsalva manoeuvre, we could not locate the right IJV.

Conclusion

The landmark technique could be satisfactory for most of the CVC attempts. However, the IJV abnormalities are common

and are also related to a high complication rate. We claim that even if it cannot be used in real-time, USG confirmation in the pre-insertion period may be crucial for successful CVC attempts without complication and prolongation.

Informed Consent: Written informed consent was obtained from patients' relative.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - A.A.; Design - A.A., M.T.; Supervision - A.A., H.S., A.G.; Funding - P.P., F.U., H.S.; Materials - P.P., A.G.; Data Collection and/or Processing - A.A.; Analysis and/or Interpretation - A.A., P.P., M.T., F.U., A.G.; Literature Review - A.A., H.S., P.P.; Writer - A.A., F.U., H.S.; Critical Review - F.U., M.T., A.G., P.P., H.S.; Other - A.A., P.P., A.G., H.S., M.T.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

Hasta Onamı: Yazılı hasta onamı bu olguya katılan hastanın yakınından alınmıştır.

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir - A.A.; Tasarım - A.A., M.T.; Denetleme - A.A., H.S., A.G.; Kaynaklar - P.P., F.U., H.S.; Malzemeler - P.P., A.G.; Veri toplanması ve/veya işlemesi - A.A.; Analiz ve/veya yorum

- A.A., P.P., M.T., F.U., A.G.; Literatür taraması - A.A., H.S., P.P.; Yazıyı yazan - A.A., F.U., H.S.; Eleştirel İnceleme - F.U., M.T., A.G., P.P., H.S.; Diğer - A.A., P.P., A.G., H.S., M.T.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

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. [\[CrossRef\]](#)
2. Milling TJ Jr, Rose J, Briggs WM, Birkhahn R, Gaeta TJ, Bove JJ, et al. Randomized, controlled clinical trial of point-of-care limited ultrasonography assistance of central venous cannulation: The Third Sonography Outcomes Assessment Program (SOAP-3) trial. *Crit Care Med* 2005; 33: 1764-9. [\[CrossRef\]](#)
3. Khan O, Filippi M, Freedman MS, Barkhof F, Dore-Duffy P, Lassmann H, et al. Chronic cerebrospinal venous insufficiency and multiple sclerosis. *Ann Neurol* 2010; 67: 286-90. [\[CrossRef\]](#)
4. Pata YS, Ünal M, Gülhan S. Internal jugular vein thrombosis due to distant malignancies: two case reports and literature review. *J Laryngol Otol* 2008; 122: 318-20. [\[CrossRef\]](#)
5. Miller BR. Absence of a right internal jugular vein detected by ultrasound imaging. *Paediatr Anaesth* 2011; 21: 91. [\[CrossRef\]](#)
6. Parry G. Trendelenburg position, head elevation and a midline position optimize right internal jugular vein diameter. *Can J Anesth* 2004; 51: 379-81. [\[CrossRef\]](#)