Horner Syndrome Caused by Central Venous Port Placement via the Internal Jugular Vein: A Case Report

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Abstract

Pneumothorax and unintended arterial puncture are well-known complications of central venous (CV) access via the internal jugular vein (IJV), whereas injury to nerves around the IJV is a relatively rare complication. We describe the case of a male patient in his 60s who developed Horner syndrome after CV port placement via the IJV. We also point out the anatomical nerve structures around the IJV that clinicians should be aware of in order to minimize the risk of nerve injury during CV access. Additionally, with a brief literature review, we describe other nerve injuries that can be caused by CV access.

Key words: Horner syndrome, central venous access, internal jugular vein, nerve injury, venous access port

Introduction

Central venous (CV) catheter insertion and CV port placement are integral components of chemotherapy and parenteral nutrition [1]. These are common interventional procedures in clinical practice. The IJV or the subclavian vein is usually selected as an access site because of the lower thrombotic and infectious complication rate compared to femoral access [2].

Although pneumothorax and hematoma due to unintended arterial puncture are common complications of CV puncture via the IJV [1-4], nerve injury is rare [5,6]. We describe a case of Horner syndrome caused by sympathetic nerve trunk injury during IJV puncture for CV port placement and also highlight anatomical nerve structures that an operator should be aware of with a literature review.

Case Report

Institutional review board (IRB) approval was waived for this case report because this is not necessary for a case report in our hospital. A male patient in his 60s who had multiple pulmonary metastases from colon cancer was referred to our department for CV port placement for chemotherapy. The patient was diagnosed with sigmoid colon cancer and bladder invasion and had undergone sigmoidectomy, cystectomy, and ileostomy, followed by five courses of capecitabine as adjuvant chemotherapy. Partial hepatectomy had also been performed for hepatic oligometastases 7 months after the initial surgery. However, as new multiple pulmonary metastases were found 14 months after the initial surgery, CV port placement was performed in our department for additional systemic chemotherapy.

The procedure was performed using a PowerPort with Groshong silicone catheter (Bard Access Systems, Salt Lake
the day after the procedure he came back to the hospital, three hours of observation in the outpatient department. On served at that time, and he was allowed to return home after catheter kink (catheter of the CV port). The patient might have been underestimated in clinical practice. These results suggest that the risk of this complication might have been underestimated in clinical practice.

**Discussion**

According to previous reports, injury to the cervical sympathetic nerve trunk (CSNT) causing Horner syndrome, injury to the brachial plexus, phrenic nerve, and vagus nerve were reported as being uncommon complications of CV access via the IJV [7-13]. Butty et al. reported in their prospective study that the frequency of Horner syndrome after CV catheter insertion was 2%. The authors concluded that Horner syndrome is a definite complication of CV catheter insertion even with ultrasound guidance, although a not insignificant 70% of the cases in their report were performed by trainees from postgraduate year (PGY) 1 to PGY 4 [14].

Horner syndrome is a combination of symptoms caused by injury or disruption of the cervical sympathetic nerve pathway to the eye and face, including miosis (persistent small pupil) and anisocoria, ptosis (drooping eyelid), and anhidrosis (decreased sweating) on the affected side [15]. The CSNT is derived from the anterior rami of the upper section of the thoracic cord, ascending anterior to the transverse processes of the cervical vertebrae, and composed of the superior, middle, and inferior cervical ganglia [16]. At the lower level of the cervical spine, the CSNT runs in front of the longus colli muscle, which is anterior to the transverse processes and is also located posteromedial to the carotid sheath. The schema of the axial anatomical structure at C6 level is shown in Fig. 3.

The CSNT is located posteromedially to the carotid sheath, and therefore, the puncture needle will not impinge on the CSNT when advanced in an anteroposterior (perpendicular) direction without neck rotation. (Fig. 3). However, it is common to rotate the patient’s neck to the opposite side of the puncture site by some degrees to make the procedure easier. This neck rotation does not change the absolute loca-
trolled trial (RCT) by Lamperti et al. reported no significant difference in complication rates between IJV cannulation in the 45-degree neck rotation group and the no neck rotation group [17]; however, no nerve injury was reported in either group in their study population.

In the IJV puncture technique with ultrasound guidance, a short-axis out-of-plane approach and a long-axis in-plane direction of the needle toward the CSNT, as shown in Fig. 3) . If vertical puncture from anterior to posterior is performed on axial (short-axis) view, the cervical sympathetic nerve and longus colli muscle are located in the path of the puncture tract. IJV, the right internal jugular vein; LCM, the right longus colli muscle; 1, the right cervical sympathetic nerve trunk.

In the IJV puncture technique with ultrasound guidance, a short-axis out-of-plane approach and a long-axis in-plane
approach are two widely used techniques [18]. Although a lower complication rate was reported with the long-axis approach compared to the short-axis approach in a recent prospective RCT [18], and although a long-axis in-plane approach reportedly improved the visibility of the needle tip during vessel puncture [19], this approach is not feasible for long-term catheter placement, such as a tunneled CV catheter or a CV port [20]. Since the long-axis in-plane approach requires puncturing from a superior part of the IJV due to the length of the ultrasound probe, a long subcutaneous tract is necessary. This may increase the risk of mechanical malfunction of the catheter and of patient discomfort. In addition to these two approaches, a short-axis lateral in-plane approach has been described [20,21]. According to previous reports, this technique provides good visualization of the needle and the surrounding tissue, which can contribute to a low complication rate; it also provides a smoother angle of the subcutaneous tract for a tunneled catheter or CV port [20,21]. Since the needle is advanced from lateral to medial in this technique, the risk of the IJV posterior wall puncture that may cause complications is considered to be minimal. Among these approach techniques, the short-axis out-of-plane approach at the inferior part of the neck was used in the present case. It is important to always visualize the needle tip with ultrasound to avoid complications; however, posterior puncture of the IJV may occur in the short-axis out-of-plane approach even with ultrasound guidance as in the current case; hence the short-axis lateral in-plane approach might have been useful to prevent the nerve injury. Changing the puncture site might also have aided prevention of this complication.

In addition to the CSNT, the phrenic and vagus nerves are located around the IJV (Fig. 3). Shawyer et al. [11] reported a pediatric case of phrenic nerve injury caused by tunneled CV catheter insertion via the IJV. Vagus nerve injury can cause unilateral vocal cord palsy (or hoarseness) because the recurrent laryngeal nerve is derived from the vagus nerve.

Conclusion

We presented a case of Horner syndrome caused by CSNT injury as a complication of IJV catheterization. Although nerve injury is unfamiliar and an uncommon complication of CV access via the IJV, the risk is not negligible. In addition to more common complications, physicians performing CV access should be educated about the nerve anatomy around the IJV as well as the risks and symptoms of these nerve injuries that can be induced by CV access in order to minimize the risk and enable prompt diagnosis of these complications.

Conflict of interest: None of the authors have any conflict of interest to declare for this article.

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