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Letter to the Editor

Thoracic vertebral fractures and azygos or hemiazygos vein injuries during cardiopulmonary resuscitation: Caution needed

To the Editor

Cardiopulmonary resuscitation (CPR) potentially results in undesirable injuries.¹ Among them, CPR-related thoracic vertebral fractures and its associated azygos vein injuries are extremely rare.^{2,3} We describe two patients with kyphosis who received CPR and developed thoracic spinal fractures and azygos vein injuries.

Case 1: An 84-year-old woman with malignant lymphoma and kyphosis was transferred to our emergency department due to cardiac arrest. CPR was initiated using an automatic chest compression device by the emergency medical service. After intravenous injection of 2 mg adrenalin and intratracheal intubation, spontaneous circulation was obtained. Her kyphosis was not apparent on arrival. Enhanced computed tomography (CT) showed right hemothorax consistent with azygos vein injury derived from fracture of the ninth thoracic vertebra and dehiscence between the ninth and 10th thoracic vertebrae (Fig. 1(A)). The patient fell into cardiac arrest again after CT. Resuscitation was terminated due to persistent cardiac arrest. Her death was inferred to have been caused by an intrinsic lethal disease combined with azygos venous injury and fracture of the ninth thoracic vertebra caused by CPR.

Case 2: A 92-year-old woman with a medical history of colon cancer was found unconscious and her family called an ambulance. The emergency service recognized cardiac arrest at the scene and CPR was immediately initiated. Although the patient had kyphosis, chest compression was conducted in the supine position. Despite administration of intravenous adrenaline (total 2 mg) and intratracheal intubation, resuscitation was not successful, and CPR was terminated with the family's agreement. Autopsy imaging revealed subarachnoid hemorrhage and left hemothorax from dehiscence of the 12th thoracic vertebra (Fig. 1(B)). Her cause of death was inferred to have been caused by subarachnoid hemorrhage combined with possible hemiazygos venous injury derived from dehiscence of the 12th thoracic vertebra from CPR.

Our cases indicate that chest compression for patients with dorsal kyphosis may cause spinal fractures and azygos vein injuries. Kyphosis is an excessive forward curvature of the back, occurring most commonly in elderly women. Age-related kyphosis is often caused by fragility of the spinal bones causing them to crack or compress.^{3,4} Azygos venous injuries sometimes occur due to thoracic trauma, leading to massive bleeding.⁵ Since the azygos and

hemiazygos veins are bent in patients with kyphosis, these veins may be likely to rupture if excessive force is applied, for example, with chest compression during CPR. Although treatment of azygos venous bleeding is challenging, conservative or surgical treatment of the azygos vein system damage have been mentioned.²

Basic Life Support courses instruct learners to perform standard chest compression by putting the patient in the supine position, in which the chest wall is horizontal along the ground. Complications can unintentionally occur, even with proper technique. Our experiences suggest that clinicians should be aware of and avoid these complications during CPR, particularly for patients with dorsal kyphosis.

Authors' contributions

TN, TY, HN, and AN contributed to the conception, data acquisition, and writing of the manuscript. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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Consent

The patients' families provided informed consent for publication of these cases. Approval from the ethical committee was waived.

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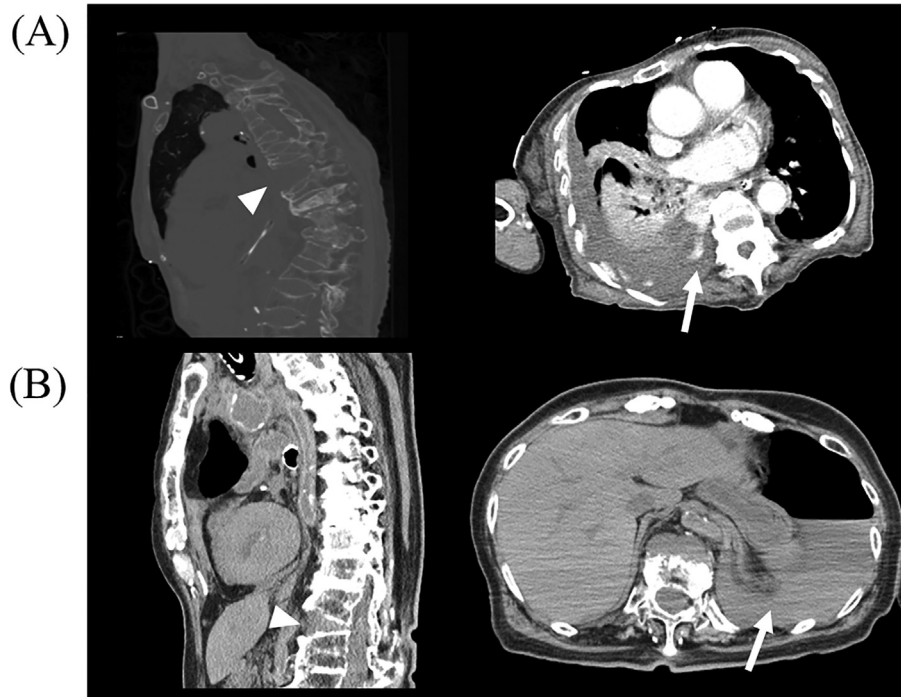


Fig. 1 – Computed tomography (CT) images of Case 1 (A) and 2 (B) after cardiopulmonary resuscitation. A: Sagittal CT image demonstrating transverse fracture of the ninth thoracic vertebra (triangle arrow). Axial contrast-enhanced CT showing hemothorax on the right due to azygous vein injury (arrow). B: Sagittal CT image demonstrating transverse fracture of the 12th thoracic vertebra (triangle arrow). Axial plane CT showing hemothorax on the left due to possible hemiazygos vein injury (arrow).

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Abbreviations: CPR, cardiopulmonary resuscitation, CT, computed tomography

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