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# Harlequin Syndrome Following Resection of Mediastinal Ganglioneuroma

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Harlequin syndrome is a rare disorder of the sympathetic nervous system characterized by unilateral facial flushing and sweating. Although its etiology is unknown, this syndrome appears to be a dysfunction of the autonomic nervous system. To the best of our knowledge, thus far, very few reports on perioperative Harlequin syndrome after thoracic surgery have been published in the thoracic surgical literature. Here, we present the case of a 6-year-old patient who developed this unusual syndrome following the resection of a posterior mediastinal mass.

*Key words:* 1. Harlequin syndrome
2. Mediastinal tumor
3. Ganglioneuroma

## Case report

A previously healthy 6-year-old boy visited Samsung Medical Center with complaints of dyspnea and a barking cough lasting for 3 days. Chest radiography revealed a mass-like lesion in the right upper mediastinum. Chest computed tomography demonstrated a well-defined posterior mediastinal mass measuring 4 cm, which was suspected to be a neural foraminal extension to the thoracic spine (T3–T4). Magnetic resonance imaging was conducted for further evaluation; it showed a right upper paravertebral enhancing mass with an adjacent neural foraminal extension to the T2–T5 spine (Fig. 1). A preoperative neurologic examination revealed that the patient had no abnormalities. He underwent mediastinal mass excision by video-assisted thoracic surgery. The mass was in the right posterior mediastinum, was located at the T2–T5 level of the spine, and did not extend to the neural foramen. It was resected by electrocautery. The sympathetic chain at the T2 level was inevitably resected as part of the complete resection of the mediastinal tumor during the operation, because the tumor originated from this sympathetic chain. The intraoperative course was uneventful, with a stable hemodynamic status throughout the surgery. After the patient was sent to the post-anesthesia recovery unit, a sharp midline facial demarcation was observed, and the left face, neck, and chest (contralateral to the operation site) became flushed and warm (Fig. 2). These findings were noted to increase in intensity when the patient cried. In contrast, the right face, neck, and chest (ipsilateral to the operation site) were pale and cool and did not change in color when the patient cried. A neurologic examination including that of the cranial nerves was normal, and miosis and ptosis were absent. The patient's vital signs and laboratory tests were normal. The symptoms, including the color and the warmness of the face, started to show minimal improvement with-

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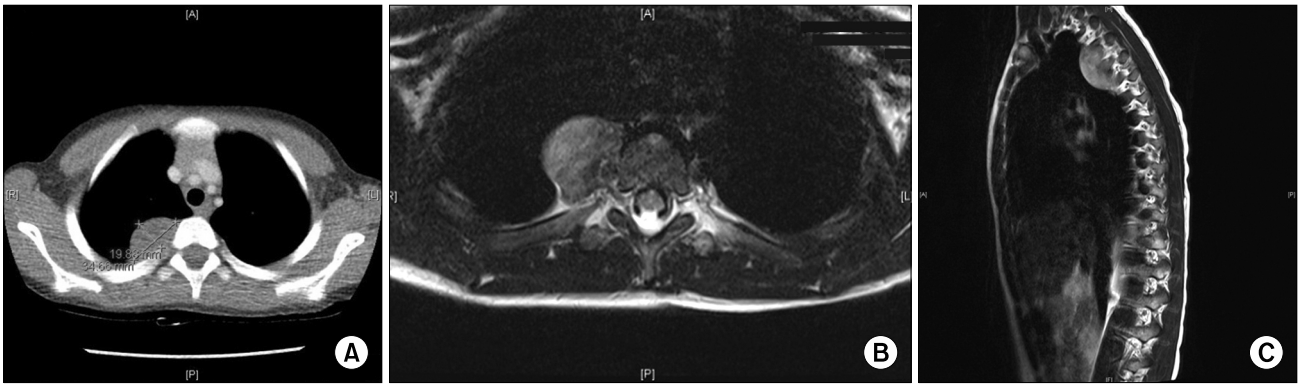


**Fig. 1.** (A) Chest computed tomography showed a well-defined right posterior mediastinal mass measuring 4 cm. (B, C) Thoracic spine magnetic resonance imaging revealed a 4-cm right upper paravertebral enhancing mass lesion (T2–T5) with an adjacent neural foramina extension.

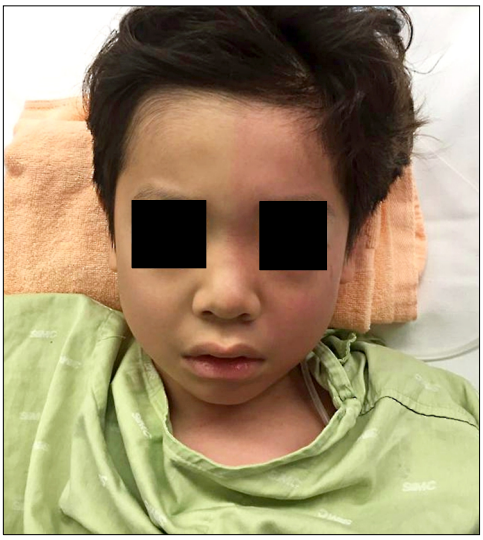

**Fig. 2.** Harlequin syndrome. Asymmetric flushing of the left face, neck, and upper chest after surgery.

in an hour and completely resolved without any treatment 3 hours after surgery. The patient was discharged on postoperative day 2. The permanent pathologic findings revealed that the resected tumor was a ganglioneuroma. During follow-up on postoperative day 30, there was no sign of color change on his face, neck, or chest.

## Discussion

Harlequin syndrome was first described by Lance et al. [1] in 1988. It is a rare disorder of the autonomic nervous system characterized by asymmetric facial flushing and sweating.

The site of sympathetic nerve injury is known to be associated with normal face color. Excessive flushing and sweating on the unaffected side of the face are recognized as a compensatory overreaction of vasodilatation for thermoregulation [1]. The cervicothoracic sympathetic chain consists of a 3-neuron pathway. The first neuron (central) originates from the hypothalamus and synapses onto the second neuron (preganglionic) in the lateral horn of the spinal cord. The second neuron synapses onto the third neuron (postganglionic) in the superior cervical ganglion. Most of the vasomotor and sudomotor neural chain that innervates the face originates in T2 and T3 and connects to the superior cervical ganglion. The postganglionic vasomotor and sudomotor neural chains innervating the medial forehead and the nose travel with the internal carotid artery; the other facial areas are regulated by the postganglionic neural fiber traveling with the external carotid artery [2].

In the present case, the mass was adjacent to the right thoracic spine (T2–T5). Histology of the resected mass revealed a ganglioneuroma, which is a tumor of the sympathetic nervous system, arising from neural crest cells [3]. The sympathetic chain at the T2 level was inevitably resected to completely remove the mediastinal tumor during the operation, as the tumor originated from this sympathetic chain. This caused a disturbance of the vasomotor regulation of the face. The patient suffered asymmetric flushing of the left face; his symptoms disappeared after 3 hours without complications.

Most cases of Harlequin syndrome are primary or idiopathic. Approximately one-fourth of the patients

with Harlequin syndrome have secondary Harlequin syndrome or iatrogenic causes. Secondary Harlequin syndrome is caused by structural lesions and may be treated by surgical resection. According to a literature review, 13 cases of Harlequin syndrome have been due to organic lesions. The most common organic lesions are neurogenic tumors that compress the sympathetic trunk, such as mediastinal neurinoma and cervical syrinx [4,5]. Three patients underwent resection of thoracic neurogenic tumors. Among them, 2 patients recovered from their symptoms, but the third patient's symptoms did not disappear postoperatively [5,6].

An increasing number of cases of iatrogenic Harlequin syndrome have been reported. Thus far, 10 cases have been reported in the literature: following a paravertebral thoracic block (5 patients), resection of a neck mass (3 patients), jugular vein catheterization (1 patient), thoracic sympathectomy (1 patient), and lung resection (1 patient). Most of these cases resolved spontaneously within a few hours. However, 2 cases, which followed thoracoscopic sympathectomy and thoracoscopic wedge resection of the lung, had long-term sequelae according to the literature [5,7]. The patient's concerns are often relieved by explaining the pathophysiology and the benign nature of the condition. If the symptoms are not tolerable, a contralateral sympathectomy or a stellate ganglion block could be considered for symptom relief [8].

This is an extremely rare case report of iatrogenic Harlequin syndrome that developed following thoracic surgery. We hope that this report will make thoracic surgeons aware of this rare syndrome as a possible complication after thoracic mediastinal mass excision.

## Conflict of interest

No potential conflict of interest relevant to this article was reported.

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