Heterotopic Ossification of the Vocal Cords After Spinal Cord Injury

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Abstract

Background/Objective: To report a rare complication of heterotopic ossification of the vocal cords after spinal cord and multiple organ injuries.

Study Design: Case report.

Setting: Acute rehabilitation in the Department of Neurologic Rehabilitation.

Results: A 55-year-old patient sustained spinal cord injury and multitrauma after falling from a height. Approximately 3 months later, after weaning from mechanical ventilation, plugging of the cannula resulted in severe stridor indicating upper airway obstruction. A computed tomography scan showed bilateral vocal cord fixation in a para-median position, with hyperossification of the vocal processes of the arytenoids. Direct laryngoscopy revealed interarytenoid ossification, and sawing through the ossification resulted in remobilization of the vocal cords enabling decannulation.

Conclusions: Heterotopic ossification of the vocal cords was found to be an early complication of acute spinal cord injury and multiple trauma. This rare complication should be considered in the differential diagnosis of patients showing signs of upper airway obstruction.

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Key Words: Heterotopic ossification; Vocal cords; Acute spinal cord injuries; Multitrauma; Airway obstruction

INTRODUCTION

Heterotopic ossification (HO) is a metabolic disorder, characterized by new lamellar bone formation in sites outside the normal skeletal structure. It may occur in the periarticular regions, particularly after trauma to the brain (1) or spinal cord (2) and less frequently in nontraumatic central nervous system (CNS) disorders (3,4). HO has also been associated with other processes such as joint replacement surgery (5), burns (6), and rarely in peripheral nerve disorders (7,8). The incidence of HO after trauma to the CNS varies from 16% to 53% (1,9).

Prolonged intubation, a life-saving procedure in major trauma insults, may, in itself, cause trauma to the larynx (10), including scarring of the posterior commissure and the cricoarytenoid joints. We present an unusual

case of HO involving both vocal cords after acute spinal cord injury (SCI) and multiple trauma.

CASE HISTORY

A 55-year-old man sustained a SCI after a fall from a ladder. Initial workup showed fractures of T3, T4, T7, and T8 vertebral bodies, bilateral multiple rib fractures, hemothorax, and lung contusions. Neurologic examination revealed a motor and sensory T3 level American Spinal Injury Association (ASIA) impairment scale (11) grade A. The patient underwent urgent thoracotomy and discectomy of T3 to T4 and fusion of T7 to T8 vertebrae with titanium mesh cage. After surgery, he was mechanically ventilated through a nasotracheal tube. Percutaneous tracheostomy was performed on the 12th day after intubation because of continued respiratory instability. Ten weeks later, he was successfully weaned off of mechanical ventilation, and decannulation was planned. Plugging of the cannula resulted in a severe stridor indicating upper airway obstruction. Fiberoptic

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Figure 1. Consecutive series of larynx showing fixed and ossified arytenoids.

laryngoscopy revealed bilateral vocal cord fixation leading to a presumption of posterior glottic scar. Preoperative laryngeal computed tomography (CT) showed bilateral cord fixation in a para-median position with hyperossification of the vocal processes of the arytenoids (Figure 1).

The surgical plan was for posterior glottic scar release and mucosal grafting through laryngofissure. However, the operative findings disclosed interarytenoid ossification with an unnoticed tiny (<1 mm) gap between the ossification and the intact mucosa of the posterior commissure. The ossified bridge was sawed through by a striker, leaving osseous raw surfaces on the medial surfaces of both arytenoids. Vocal cord mobility was

noted on the first day after surgery, enabling uneventful decannulation. A 3-phase bone scintigraphy performed after the surgery did not reveal increased activity. Diphosphonate drug treatment with etidronate disodium was started for secondary HO prevention: 1200 mg for 2 weeks and 600 mg for the next 10 weeks. The patient was followed up for a period of 6 months with no clinical evidence of recurrent laryngeal impairment.

DISCUSSION

Vocal cord fixation may result from primary insults to the cricoarytenoid joints such as dislocation after traumatic intubation, inflammatory disorders, or secondary to prolonged immobilization by interarytenoid scarring.

Posterior glottic stenosis was recognized as one of the complications of prolonged intubation and is more common among adults. The severity of the lesions varies from interarytenoid fibrous scarring up to uni- or bilateral cricoarytenoid joint fixation (12). Posterior glottic scarring may be corrected through endoscopic or open approaches. Splitting the scar and mucosal coverage are the main steps of its reconstruction. Often, a laryngeal stent serves to keep the graft in place, demanding a second stage for stent removal and then decannulation.

In this particular case, the mucosa that covered the posterior commissure was found intact, enabling sawing through the ossified bridge between the vocal cords. The differentiation between tissue calcification and ossification was made by a surgeon experienced in laryngeal framework surgery. Secondary, uneventful, healing of the raw surface of the arytenoids was noted on follow-up fiberoptic laryngoscopy.

In SCI, the most common sites for the development of HO are at the larger joints below the level of lesion (2).

The pathophysiology of HO remains poorly defined in the setting of upper motor neuron lesions and even more so in lower motor neuron lesions. Several mechanisms have been suggested, but all lack ultimate scientific consistency. We assumed that prolonged intubation caused an inflammatory process that, in this particular case, triggered HO. HO is usually diagnosed 1 to 6 months after injury. Periarticular swelling, an expression of exudative cellular infiltration, is detected in its early stage. Fibroblastic proliferation with subsequent bone-matrix deposition follows. Neurogenic HO originates in the connective tissues, leaving the joint space and capsule intact (2). It is reasonable to assume that laryngeal involvement expressed by discomfort and odynophagia, dyspnea, and hoarseness caused by swelling of the arytenoids may be overlooked in the scenario of a cannulated patient.

HO is primarily diagnosed on clinical signs and likelihood. A 3-phase bone scanning is considered the most sensitive technique in the diagnosis of HO, especially in its early active stage. The study usually becomes normal as the newly formed bone matures. However, there are no specific laboratory tests to establish its diagnosis. There has been only one prior description of HO of the vocal cords, in a young man who suffered 45% second- and third-degree burns (13). In that case, it was not possible to exclude an inhalation injury of the larynx and trachea, and thus, an additional mechanism may be involved.

CONCLUSION

Heterotopic ossification of the vocal cords is an unusual and rare complication. In this case, the correlation to the

SCI is unlikely, because of the location above the neurologic level and the atypical location. Nevertheless, specialists treating patients with SCI who have often suffered severe multitrauma injuries should be aware of this possible complication. HO of the vocal cords should be considered in the differential diagnosis when upper airway obstruction develops after weaning from mechanical respiration and decannulation.

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