

## Case Report

# Acute tetraplegia following laryngotracheal reconstruction surgery

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Received: 30 October 17 Accepted: 24 November 17 Published: 16 January 18

## Abstract

**Background:** Paraplegia following thoracic spinal surgery or abdominal operations is usually attributed to spinal cord ischemia due to interruption of the segmental spinal vascular supply. Alternatively, the etiology of spinal cord ischemia following cervical surgery is less clear.

**Case Description:** A 14-year-old male became acutely tetraplegic with a C4 sensory level and sphincteric dysfunction 12 h following surgery for tracheal stenosis due to prior intubation. Signs included loss of pain and temperature below the level of C4 with preservation of deep sensations (position and vibration) and mute plantar responses. The cervical magnetic resonance imaging revealed diffuse intramedullary cord swelling between C2-C7 and hyperintense signal changes in the anterior and posterior columns of the cord on T2-weighted images. Various etiologies for this finding included a cervical hyperextension or hyperflexion injury vs. anterior spinal artery syndrome.

**Conclusions:** Postoperative treatment of spinal cord ischemia attributed to cervical and thoracoabdominal surgery is largely ineffective in reversing major neurological deficits. Therefore, it is critical to prevent ischemia during these procedures by the avoidance of coagulopathies, anemia, hypotension, and hyperflexion/hyperextension maneuvers.

**Key Words:** Anterior spinal artery syndrome, cervical, spinal cord injury, tracheal surgery

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**Website:**

[www.surgicalneurologyint.com](http://www.surgicalneurologyint.com)

**DOI:**

10.4103/sni.sni\_405\_17

**Quick Response Code:**

## INTRODUCTION

Cervical myelopathy and spinal cord injury may result from hyperflexion/hyperextension occurring during surgical positioning.<sup>[9]</sup> Other etiologies of spinal cord ischemia, however, include: epidural anesthesia, embolism, cardiovascular arrest, global ischemia, hypovolemia/hypotension, and anemia.<sup>[3]</sup> Cord ischemia is most frequently attributed to interruption of the segmental arterial vascular supply to the

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**How to cite this article:** Erhan B, Kemerdere R, Kizilkilic O, Gunduz B, Hanci M. Acute tetraplegia following laryngotracheal reconstruction surgery. *Surg Neurol Int* 2018;9:11.

<http://surgicalneurologyint.com/Acute-tetraplegia-following-laryngotracheal-reconstruction-surgery/>

spinal cord following thoracic or abdominal vascular surgery.<sup>[1]</sup> Rarely, however, the ischemia is attributed to head and neck surgery as in this case, due to laryngotracheal reconstruction.

## CASE REPORT

A 14-year-old male became acutely tetraplegic 12 h following treatment for tracheal stenosis. Three months earlier, after treatment for a metatarsal fracture, he sustained a respiratory arrest for 30 min; this was attributed to a massive pulmonary embolism. He was hospitalized in the intensive care unit (ICU) for the next 2 months. After discharge, he suffered from tracheal stenosis requiring tracheal resection/reconstruction. His neurological status before surgery was normal except for 4/5 motor power in his left distal lower extremity. Within 12 h of surgery, he became acutely tetraplegic with a C4 sensory level. His neurological examination revealed dissociated sensory loss with preservation of deep sensations (position and vibration). Anal tone was absent and plantar responses were mute.

### Diagnostic studies

The T2-weighted cervical magnetic resonance imaging revealed a diffuse hyperintense signal, with accompanying diffuse cord swelling from C2-C7 [Figure 1]. The sagittal cervical computed tomography (CT) additionally demonstrated cervical kyphosis and stenosis [Figure 2]. Although the diagnosis of an anterior spinal artery syndrome (ASAS) was established, resulting in the administration of high-dose methylprednisolone (30 mg/kg loading dose, 5.4 mg/kg maintenance dose) for 5 days, his deficit remained unchanged.

## DISCUSSION

The ASAS is largely attributed to vascular compromise to the spinal cord due to systemic hypotension, particularly in elderly patients.<sup>[6]</sup> The various

etiologies of spinal cord compression include epidural hematoma, spinal stenosis, and spinal anatomic variants.<sup>[5]</sup> Coagulopathies, anemia, and intraoperative hypotension are the other risk factors.<sup>[4,11]</sup> The anterior spinal artery originates from the vertebral artery at the level of medulla oblongata. It receives contributions from segmental medullary vessels arising from the costocervical trunk and the extracranial vertebral arteries. Additionally, branches of the vertebral arteries have rich anastomotic connections with arteries at the level of C3 and C6-C7 in the neck.<sup>[8]</sup>

The diagnosis of ASAS is generally based on clinical findings. Compromise of anterior spinal artery results in upper motor neuron signs (flaccid paralysis, areflexia), loss of pain and temperature sensation, bladder and bowel dysfunction.<sup>[10]</sup> This characteristic pattern of clinical profile was detected in our patient with tetraplegia and dissociated sensory loss.

Spinal cord infarction is usually due to occlusion of segmental vessels rather than direct involvement of anterior spinal artery. Here, a hyperextension injury, episodic hypotension, or a direct injury to branches from the vertebral arteries during tracheal reconstruction were all potential contributors to spinal cord ischemia.<sup>[10]</sup>

### Treatment and prevention options for spinal cord ischemia

Paraplegia/tetraplegia due to spinal cord ischemia with no compressive etiology is not likely to recover. However, some strategies developed to protect the spinal cord from injury occurring during thoracic spinal and/or thoracoabdominal surgery include deep hypothermia, maintaining mean arterial blood pressure on the upper limit of normal, and cerebrospinal fluid drainage.<sup>[2]</sup> Although its efficacy in prevention or treatment of spinal cord ischemia is still controversial,<sup>[7]</sup> high-dose steroid treatment was advocated postoperatively in our case.



**Figure 1:** T2-weighted cervical magnetic resonance images. (a) Sagittal image showing long segment swelling of the cervical spinal cord and increased signal intensity. (b) Axial image demonstrating increased signal intensity of the whole cord and swelling of the cervical spinal cord



**Figure 2:** Sagittal reconstruction of CT image showing cervical kyphosis and narrowing of the cervical spinal canal

## CONCLUSION

While the thoracic spinal cord is more susceptible to vascular ischemia/events following spinal or abdominal surgery, it can occur postoperatively in the cervical region as well. Because postoperative treatments are ineffective, measures to prevent spinal cord ischemia should include avoiding systemic hypotension, anemia, hyperextension/hyperflexion during positioning, and inadvertent vascular dissection.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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