

Case Report

# Bilateral Diaphragmatic Paralysis in a Patient with Spinal Shock

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## Introduction

Spinal Shock (SS) is a rare type of shock in multitrauma patients. It is defined as a loss of sensation accompanied by motor paralysis with initial loss but gradual recovery of reflexes, following a Spinal Cord Injury (SCI). This injury is most often a complete transection of the spinal cord. Spinal cord reflexes, caudal to the SCI are depressed or absent, while those rostral to the SCI remain unaffected. SS has a convalescence period of four phases which starts with are flexia, continues with increasing reflexes and ends with hyperreflexia and spasticity in months [1].

Diaphragm is the main muscular component of respiration. Bilateral diaphragm paralysis is a rare condition and usually associated with Central Nervous System (CNS) disorders. Severe cervical trauma and bilateral phrenic nerve injuries may also cause diaphragm paralysis. In such conditions, if secondary respiratory muscles get tired, loss of breath is inevitable. Phrenic nerve Pacing (PCP) is a clever choice when the patient needs to be separated from mechanical ventilation [2].

## Case Presentation

A 46 year old male construction worker was referred to our clinic with a history of fall from the fifth floor of a building. He was brought by an emergency ambulance with cervical collar installed and put onto a spinal immobilization board. He was conscious, hardly speaking and none of the extremities were mobile. He had cuts on his face and his body. He was suffering from no sensations of touch or pain on his body. He was hypotensive and tachypneic but heart rate was normal. There was nothing abnormal in his airway but he was trying hard to breath by using his neck and intercostal muscles. Both hemithoraxes were involved in respiration and heart rate was normal. He had broken bones in his upper and lower extremities. His neurological examination was not pleasant. He had no sense of fine touch or pain. Deep tendon reflexes were not responding at all. Upper extremities were barely moving and lower extremities had no movement at all.

## Abstract

Patients with spinal cord injury who does not respond well enough to fluid resuscitation therapies and blood transfusions may be at risk of spinal shock. Bilateral diaphragm paralysis is another life threatening condition and it is rarely seen in multiple trauma patients. Intrathoracic diaphragm pacing is a good choice for those if they are depended on mechanical ventilator. In this case, a 46 year old male construction worker is presented with diagnosis of spinal shock with severe spinal cord injury and bilateral diaphragm paralysis.

**Keywords:** Spinal shock; Bilateral diaphragm paralysis; Intrathoracic diaphragm pacing

Bedside ultrasonography showed no free fluid in abdominal cavity. Intravenous fluid resuscitation and positive inotropic support were started immediately. SCI was the possible diagnosis. 2 grams of methyl-prednisolone was given intravenously. After initial medical stabilization was taken to X-Ray and Computerized Tomography (CT) scans.

CT scans revealed severe SCI on cervical C3-C5 and thoracic level T3-T6 vertebrae. Cervical vertebrae C3-C5 were broken but not collapsed at the level of the injury. Unfortunately Thoracic vertebrae were broken into pieces and spinal cord had lost its integrity. There were also broken ribs on each side of the affected vertebrae. CT scans also revealed a small pneumothorax on the right. The patient was consulted to neurosurgery, orthopedics and chest surgery departments. He was taken to operation room immediately for internal fixation of vertebrae and extremities.

After the operation, the patient was followed up in intensive care unit. He had 3 units of blood transfusion during surgery. In the follow up he was usually bradycardic. IV fluid resuscitation with inotropic and chronotropic agents was going on. But the patient was not responding effectively. After two days of mechanical ventilation, he had a tube thoracostomy operation for increased pneumothorax on the right. With no efforts of ventilation, it was detected that his diaphragm was paralyzed. After his clinical stabilization, he was referred to inspiratory muscle pacing surgery, but died before pacing procedure.

## Discussion

Multiple trauma patients may have many reasons for going into shock. External or internal bleeding or improper fluid resuscitation may also cause shock. Cardiac or neurological reasons may also be a cause for hypotension. For these reasons, it is hard to diagnose SS unless the clinician rules out the other causes of shock. Unexpected hypotension in multiple trauma patients may be a clue for this diagnosis. In our case, there were some wounds which may cause

bleeding. But after surgical and medical stabilization of the patient, we expected to have a stable blood pressure and normal cardiac rhythm. However, there were no significant progresses about circulatory functions. Day by day blood pressure and cardiac rhythm became better and were recorded as normal after two weeks. As we observe in our case, SS is characterized with no total body fluid loss but vasodilation causes a relative collapse in circulatory system.

Our patient had an upper location of SCI that affected bilateral accessory nerves at cervical spinal level. For this reason he had bilateral diaphragm paralysis. Le Pimpec-Barthes F had also experienced a case which they applied intrathoracic phrenic pacing [2].

In the literature, there are some cases of bilateral diaphragm paralysis. Yelgec also reports a case of unknown origin [3]. However, as best of our knowledge, this is the first case declared with spinal shock and bilateral diaphragm paralysis at the same time.

Multiple trauma patients with spinal shock are under risk of mortality so they should be observed in intensive care units. Casha S declares poor cardiovascular and respiratory outcomes and the need for ventilatory support of high cervical and complete SCI patients [4]. If bilateral diaphragm paralysis is also involved, the patient will be a

candidate for intrathoracic phrenic pacing. Despite these therapies, neurological outcome and quality of life is not fulfilling.

## Conclusion

SS is a diagnosis of exclusion in patients with SCI. Emergency specialist should always think any types of shock and organize proper treatment immediately. Intrathoracic diaphragm pacing is a good choice if the SCI patient is depended on mechanical ventilator.

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