Diaphragmatic Irritation Caused by Nail-gun: An Unusual Cause of Bradycardia

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Abstract

A 42-year-old construction worker presented following an accident in which a nail gun had been fired 1 meter away from him and the nail had entered his chest at the anterior axillary line in the tenth right intercostal space. The only positive symptom of the patient was the decrease of the pulse rate while turning round in the stretcher. The nail was removed without operative debridement under local anesthesia in the operating room. (JAEM 2012; 11: 243-4)

Key words: Phrenic nerve, irritation, bradycardia, emergency

Introduction

Phrenic nerve irritation occurs from trauma during movements of the diaphragm, mediastinum and pericardium. Diagnosis should be suspected in patients who have a paradoxical breathing pattern, hiccups, hypotension and bradycardia. An elevated hemi diaphragm may not be obvious on radiography or on fluoroscopic or ultrasound evaluation of diaphragmatic motion if the injury is bilateral (1).

Case Report

A 42-year-old construction worker presented to the emergency department following an accident in which a nail gun had been fired 1 meter away from him and the nail had entered his chest at the anterior axillary line in the tenth right intercostal space. Physical examination revealed a healthy-looking male, with a small puncture wound visible at the anterior axillary line in the tenth intercostal space. The only positive symptom of the patient was the decrease in the pulse rate when the patient turned around on the stretcher. Posteroanterior (PA) chest radiographs showed a 3 cm nail entering into the right costodiaphragmatic area on the liver (Figure 1). Computerized tomography scan showed penetration to the liver (Figure 2).

The patient was consulted with a general surgeon and they decided to remove the nail under local anesthesia in the operating room without open surgical intervention. He was admitted to hospital, all observations of the patient were stable. He was discharged with full recovery two days after admission.

Discussion

The normal diaphragm, mediastinum and pericardium have mechanoreceptors connected to the phrenic nerve and vagal nerve afferents. These mechanoreceptors lower blood pressure and slow heart rate with stimulation. Needless to say, the lack of electrophysiological phrenic nerve irritation findings was the major limitation of this case report. However, the observed bradycardia attacks dependent on the vagal stimulation caused by diaphragm movements suggested the presence of phrenic nerve irritation. Phrenic nerve injury is a well-known clinical condition following cardiac surgery (2). However, traumatic injury of the phrenic nerve is a rare condition, and it usually results from both blunt and penetrating neck trauma (3). To our knowledge, there were no previous reports of phrenic nerve injury by this mechanism in the literature. Phrenic nerve injuries may closely mimic diaphragmatic rupture (4) and is seen as elevation of the diaphragm.
contour on PA chest radiograph (5). Clinical manifestations of this injury include breathlessness, orthopnea, respiratory distress, hypotension and bradycardia (6). Since irritation of the phrenic nerve is unilateral and transient in our patient, elevation of the diaphragm contour on the chest radiography was not seen.

**Conclusion**

Pneumatic nail-guns are common tools in work settings such as construction and wood product fabrication because of the speed, ease of use, ready availability. A lot of injuries occur on the body surface resulting from nail-gun. One of the rare conditions of these injuries is phrenic nerve irritation from trauma during movements of the diaphragm. The only positive symptom of the patient might be decrease in the pulse rate.

**Conflict of Interest**

No conflict of interest was declared by the authors.

**References**

5. Dalshaug GB, Rothwell BC. Diaphragmatic paralysis following minor blunt trauma. J Trauma 1999; 47: 413-5. [CrossRef]

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**Figure 1.** Chest radiography of the patient

**Figure 2.** CT scan of the upper abdomen showing hepatic penetration of the nail lodged in a costal cartilage