

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

Çivi Tabancasına Bağlı Diyafram İrritasyonu: Bradikardinin Nadir Bir Nedeni

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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

## Özet

Kırk iki yaşında bir inşaat işçisi, yaklaşık 1 metreden çivi tabancasının kazaara ateşlemesi sonucu, çivinin sağ ön aksiller hattın onuncu interkostal aralığı kestiği bölgeden girmesi nedeniyle acil servise getirildi. Hastadaki tek pozitif bulgu, hastanın sedye üzerinde hareketleriyle ortaya çıkan bradikardi atakları idi. Çivi ameliyathanede, lokal anestezi altında çıkarıldı. (*JAEM 2012; 11: 243-4*)

**Anahtar kelimeler:** Frenik sinir, iritasyon, bradikardi, acil tıp

## 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. The nail was embedded in 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

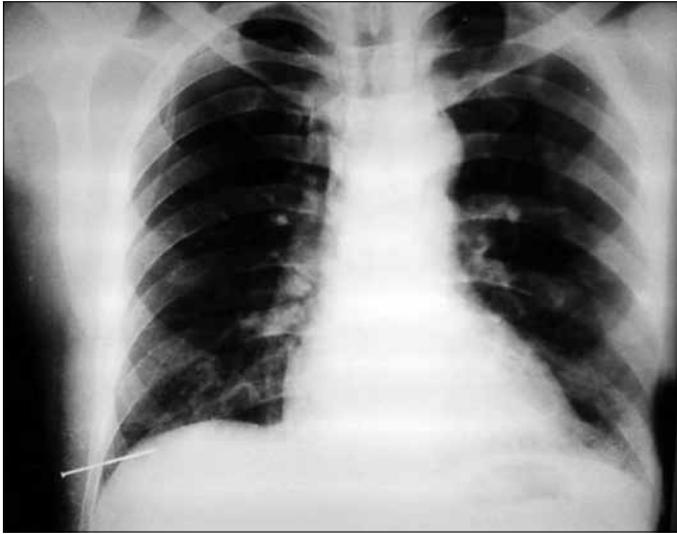
The normal diaphragm, mediastinum and pericardium have mechanoreceptors connected to the phrenic nerve and vagal nerve afferents. These mechanoreceptors lower blood pressure and slow heart rate with stimulation. Needless to say, the lack of electrophysiological phrenic nerve irritation findings was the 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

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

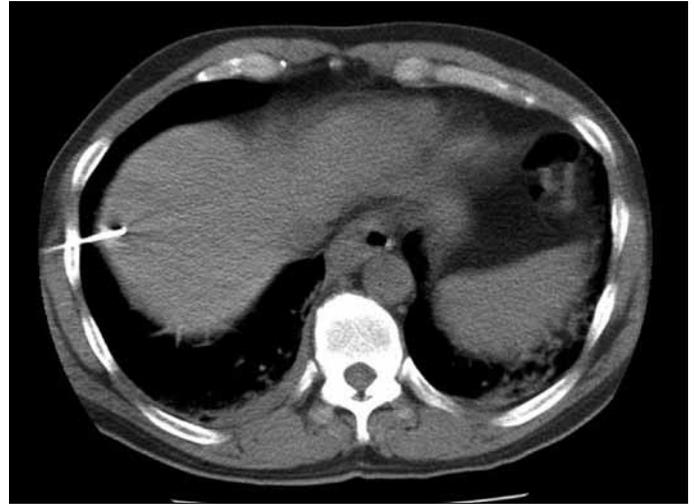
contour on PA chest radiograph (5). Clinical manifestations of this injury include breathlessness, orthopnea, respiratory distress, hypotension and bradycardia (6). Since irritation of the phrenic nerve is unilateral and transient in our patient, elevation of the diaphragm contour on the chest radiography 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.



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

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