

## Grand Rounds

**Gelareh Zargaraff, MD**

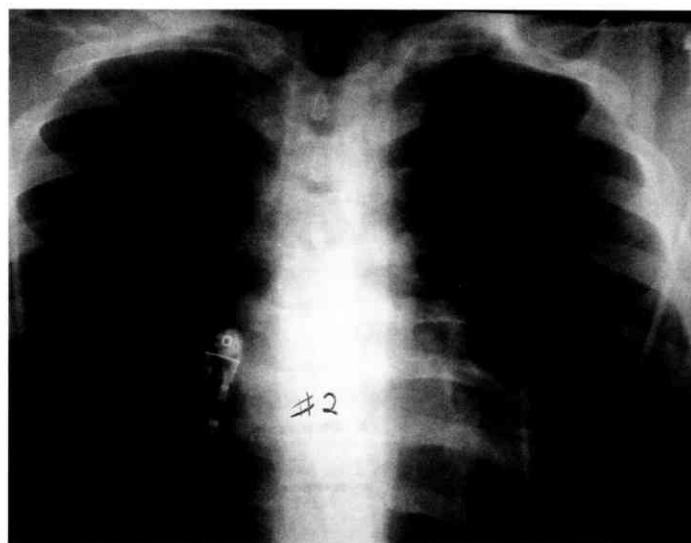
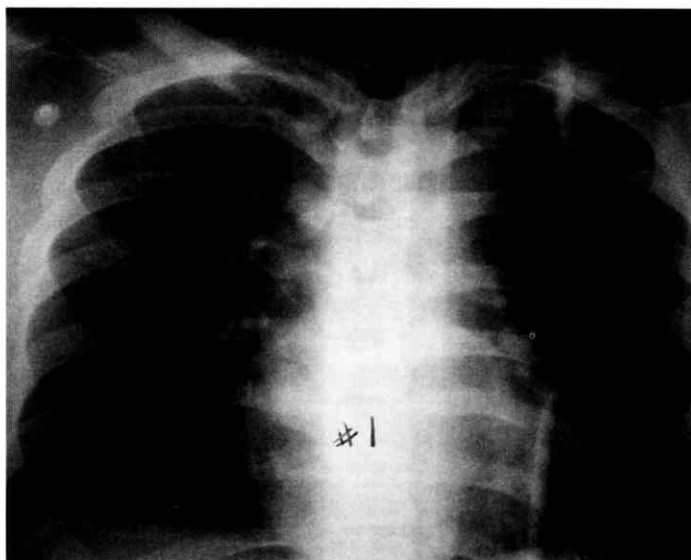
**Michael Zucker, MD**

The David Geffen School of  
Medicine at UCLA

### *The Ominous Fall*

#### Case Presentation

The patient is a 20 year-old man brought in by ambulance to the Emergency Department after a fall of 20 feet from a balcony. The patient suffered no loss of consciousness and was found to be alert and oriented in the field. On arrival, the patient presented with a blood pressure of 138/70, pulse of 79, and pulse oximeter of 98% on room air. He was awake and alert with a GCS of 4-6-5, complaining of bilateral wrist and right hip pain. On exam, he had normal heart and breath sounds bilaterally. His abdomen was soft, non-tender and non-distended. He had good peripheral pulses despite bilateral wrist deformities. He had cervical spine, pelvis, and supine AP chest x-rays performed. The patient was then removed from the resuscitation suite awaiting admission to the orthopedic ward. During this time a second supine chest x-ray was obtained. What is your diagnosis?



**Answer & Discussion:**

This patient has abnormal chest x-rays suggestive of an acute traumatic rupture of the aorta (TRA). A TRA is defined as a tear of the aortic wall, not a dissection. Both films show a widened mediastinum, an indistinct aortic knob, and an abnormal left paravertebral stripe extending above T4. Despite the patient's stable clinical condition, the abrupt deceleration mechanism of injury combined with the lack of a completely normal chest film should raise immediate suspicion as to the presence of a possible aortic injury. TRA accounts for 10-20% of fatalities in blunt chest trauma involving severe compression or deceleration (4,5). Of those that suffer aortic injury, only 10-20% survive to reach the hospital. These patients have an incomplete tear of the aorta resulting in intact adventitia or a contained hematoma, 80-90% have full thickness tears and die at the scene. Of the patients that reach the hospital 30% will die within 6 hrs, 40-50% within 24 hrs, and 90% within 4 months if the aortic injury is not discovered and repaired (3,5).

Because this patient appeared stable and had minimal physical complaints, TRA was not suspected. This is a common error. TRA has not been found to be associated with any specific physical signs or symptoms. On occasion, patients may complain of retrosternal pain radiating to the back, hoarseness, dysphagia, or dyspnea. They may present with hypertension in the upper extremities combined with hypotension in the lower extremities and/or massive swelling of the neck. But less than one-half of patients with TRA have suggestive clinical findings (2).

The portable chest x-ray is the initial imaging examination obtained in patients with blunt chest trauma. Because the severity of the injured patient requires supine examination and the patient has oftentimes a limited respiratory ability, a normal mediastinum can appear abnormal. The supine chest radiograph is therefore oversensitive. The erect chest radiograph is significantly more accurate but not practical in most trauma patients.

There are numerous radiologic signs that indicate the presence of possible TRA. All reflect altered mediastinal contour, which may be caused by mediastinal hematoma. Although no individual sign is specific for TRA, the presence of **any** abnormality in light of typical mechanism of injury should raise suspicion. The radiologic findings that have been found to be most valuable are:

1. **Widened mediastinum > 8cm:** This measurement is taken at the level of the aortic knob and is the most frequent finding in TRA. Mediastinal widening can be a result of magnification caused by a supine chest x-ray or it can be due to thoracic aortic ectasia and tortuosity, mediastinal lipomatosis, pulmonary atelectasis, pleural effusions, or lymphadenopathy. Another sign of TRA is progressive widening of the mediastinum on serial chest radiographs.
2. **Abnormal Aortic Arch or Descending Aorta:** Enlargement, blurring, or irregularity of the aortic knob or descending aorta.
3. **Obliteration of the aortico-pulmonary window (AP window):** An aortic lesion at the level of the aortic isthmus resulting in hemomediastinum may obscure the AP window.
4. **Left Apical Pleural Cap:** This is seen as a direct upward continuation of the paravertebral stripe above the aortic arch. This stripe parallels the thoracic spine and lies medial to the descending thoracic aorta. The stripe normally disappears at the level of the arch in the region of the fourth or fifth thoracic vertebral body. The direct continuation of the stripe is caused by an accumulation of blood in the extrapleural space extending along the left subclavian artery.

5. **Widened Right Paratracheal Stripe:** The paratracheal stripe represents the right lateral wall of the trachea and the mediastinal pleura of the right lung. In a properly exposed chest film, it is measurable between the superior margin of the azygous arch and the suprasternal notch and should not exceed 4 mm in diameter.
6. **Deviation of Trachea, Nasogastric tube, or Endotracheal tube to the Right:** Hemomediastinum may displace mediastinal structures to the right.

In patients with a likely mechanism of injury and **any** of the above abnormalities, additional imaging studies should be obtained. In patients in whom TRA was initially suspected, the possibility can be excluded **only** if they have a completely **normal upright chest x-ray** with none of the above abnormalities. Otherwise, advanced imaging is needed.

CT scan signs of TRA are pseudoaneurysm, intraluminal filling defect, intimal flap, irregular aortic contour, pseudocoarctation and dissection. If there are any abnormalities on CT that are suspicious for but not directly diagnostic of TRA, then transcatheter aortography is necessary (3). The most common finding in this indeterminate group is isolated mediastinal hematoma. Once the diagnosis of TRA is made, immediate surgery is indicated. Below is this patient's CT confirming TRA:

