IMAGE

Case 12

Caso 12

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CASE

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Male patient, 60 years-old, victim of a car-truck collision. The assessment recommended by the ATLS® showed unobstructed airways and immobilized cervical spine for the letter A (airways and cervical spine) and the following respiratory dynamics for the letter B (evaluation of ventilation and breathing), documented on video.

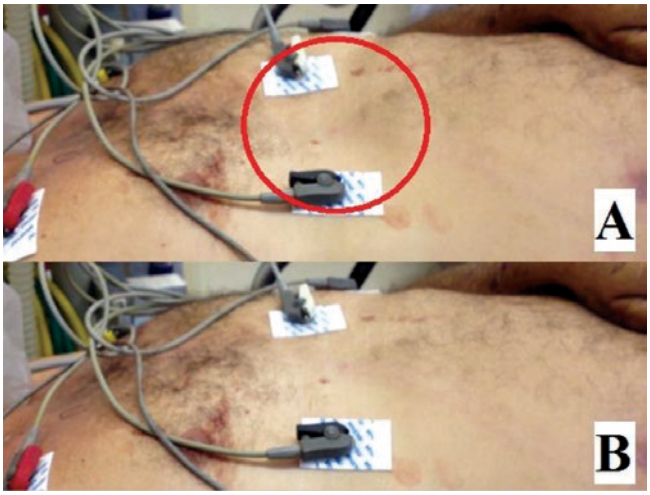

Figure 1 - Stills taken from video footage showing the patient's spontaneous breathing, after a car-truck collision, while receiving care in a trauma center. The photos refer to the patient's maximum inspiration (A) and maximum expiration (B). During inspiration, a flail sternocostal segment can be seen collapsing (see red circle) instead of expanding. To watch the full video footage, go to the Picture of the Week website. (http://www.medicina.ufmg.br/imagemdasemana/index.php?caso=128).

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Based on the images presented, select the main injury associated with this respiratory dynamics:

a. massive hemothorax;
b. pulmonary contusion;
c. hypertensive pneumothorax;
d. open pneumothorax.

IMAGE ANALYSIS

Paradoxical movement can be noticed during breathing. This movement is characteristic of patients with multiple fractures of adjacent ribs in consecutive spots, especially on the anterior portion of the chest. Physiologically, the muscles of the posterior and lateral portions provide protection against this movement. During inspiration and without the proper support of the chest wall, wall suction occurs as the negative intrapleural pressure increases. Paradoxical breathing is the main clinical finding of flail chest.

DIAGNOSIS

The four options presented represent lesions that can immediately harm the trauma victim's.ventilation. However, paradoxical breathing and flail chest immediately suggest pulmonary contusion, that is, injury to the lung parenchyma (blood in the alveoli and pulmonary interstitium) secondary to the impact of the flail segment. In addition to paradoxical breathing, palpation of abnormal respiratory movements and crackle caused by rib or cartilage fractures assist in the diagnosis.

Massive hemothorax is a result of the rapid accumulation of more than 1,500 mL of blood in the chest cavity. Some existing signs and symptoms are absence of breathing sounds and softness upon percussion of the affected hemithorax.

Hypertensive pneumothorax occurs when air enters the pleural cavity continuously and a valve mechanism prevents it from exiting, i.e., there is a "one-way valve" system. Some existing signs and symptoms are absence of breathing sounds and tympanism upon percussion of the affected hemithorax, thoraxic pain, dyspnea, respiratory discomfort, tachycardia, hypotension, tracheal deviation, distention of the neck veins, and cyanosis. For further practice, go to case 84 on the Picture of the Week website (http://www.medicina.ufmg.br/imagemdasemana/index.php?caso=84).

Open pneumothorax or "sucking chest wound" is characterized by the intake of air during inspiration, preferably through an injury on the chest wall and not through the trachea.

CASE DISCUSSION

Unstable thorax (flail chest) occurs when a segment of the chest wall stops having bone continuity with the rest of the rib cage and there are two or more fractures in one or more adjacent ribs. The presence of an unstable thoracic segment results in serious loss of the normal movements of the chest wall. For so many fractures to occur in a patient's rib cage without bone disease trauma has to be of great intensity. If the underlying lung parenchyma lesion is large, severe hypoxia may occur. The main repercussions of an unstable thorax are, therefore, due to pulmonary contusion and the pain associated with limited movement, not with paradoxical breathing. Correction of hypoventilation, administration of humidified oxygen, and fluid restitution constitute the initial therapeutic measures. In case there is no systemic hypotension, IV administration of crystalloid solutions should be carefully controlled to avoid overhydration. Definitive therapy consists of ensuring the fullest possible oxygenation, administering liquids carefully and providing analgesia to improve ventilation. Analgesia can be achieved through use of intravenous drugs or through various methods of administering local anesthetics, which include intermittent blockade of the intercostal, intra and extrapleural nerves, or epidural anesthesia. Preventing hypoxia is of utmost importance to the patient, thus justifying that a short period of intubation and ventilation be considered. The appropriate moment for intubation and ventilation is established through careful evaluation of respiratory rate and partial pressure of arterial oxygen, and estimation of breathing effort.

RELEVANT ASPECTS

- hypertensive and/or open pneumothorax, unstable thorax with pulmonary contusion and massive hemothorax are lesions that can immediately impair ventilation of a polytraumatized patient;
- paradoxical breathing is defined as the existence of a flail chest segment that collapses during inspiration and arches during expiration;
- an unstable thorax should have two or more fractures in one or more adjacent ribs;
- paradoxical breathing and unstable chest immediately raise suspicion of pulmonary contusion (blood in the alveoli and in the pulmonary interstitium);
- the biggest repercussions of an unstable thorax are, therefore, due to pulmonary contusion and the pain associated with limited movement, not with paradoxical breathing.

- treatment of pulmonary contusion: correction of hypoventilation, administration of humidified oxygen, cautious fluid restitution, and appropriate analgesia.

REFERENCES

1. American College of Surgeons. Advanced trauma life support. 8th ed. Chicago, IL: American College of Surgeons; 2008.