

**SELF-INFLATING RESUSCITATORS FOR ASSISTED RESPIRATION IN CHEST TRAUMA:
THE HIDDEN RISK**

Dear Sir,

We report a 54-year-old man who was brought to the casualty department of our hospital after a road traffic accident. The patient was examined for injuries and was found to be semi-conscious (Glasgow coma scale E2V3M4), dyspnoeic, and have bilateral pneumothoraces, haemoperitoneum and fractured shaft of the left femur, along with multiple abrasions. The patient was in shock (heart rate 140/minute, systolic blood pressure of 60 mm Hg, pulse oxymeter showed no trace on monitor). The blood gases revealed partially-compensated metabolic acidosis (pH 7.16, PaCO₂ 26 mm Hg, PaO₂ 80 mm Hg, SBC 10 mEq/L, BE ecf 12 mEq/L).

The patient was intubated with a 7.5 mm endotracheal tube under direct laryngoscopy. Placement of the tube was confirmed with chest movement, auscultation, and condensation in the endotracheal tube with ventilation. He was resuscitated with fluid infusion and vasopressor. Bilateral intercostal drains were inserted for pneumothorax. The patient was then put on assisted respiration using self-inflating resuscitator bag with oxygen-enriched air and transferred to the operating room for an exploratory laparotomy for haemoperitoneum. All these procedures took about 30 minutes.

As the patient was connected to an anaesthesia ventilator (Ohmeda 7000, Ohmeda, Madison, WI, USA), it started giving off the low pressure alarm, and there was no reading and graph on capnograph (Capnogard, Novamatrix, Wallingford, CT, USA). Examination revealed that the endotracheal tube was in the larynx on laryngoscopy, with no disconnection of circuit, and the air coming out from the chest drains on ventilation, which was more on the right side. This prompted us to change the endotracheal tube to a double lumen tube (Bronchopart Ruschelit left 37, Willy Rusch AG, Kernen, Germany). After this, ventilation was possible with the left-sided lumen. However, attempts to ventilate the right lung reverted to the initial scenario. Suspecting a major thoracic injury, the operation was then converted to an emergency thoracotomy, which revealed disruption of the right main bronchus. The patient ultimately succumbed to his injuries.

Tracheobronchial injuries are rare, with an incidence of 0.13% (16 of 12,789). Its association with blunt chest injury is even rarer (3 of 12,789). When it is associated with blunt chest trauma, it is usually part of a multisystem involvement with numerous associated injuries⁽¹⁾. Almost 25% to 68% of these injuries are missed on initial assessment⁽²⁾. A high index of suspicion and early institution of bronchoscopy is required for the diagnosis of condition, as it may even be missed on imaging. Early surgical treatment is required for the prevention of pulmonary resection and the associated morbidity and mortality⁽³⁾.

Self-inflating resuscitator bags are an integral part of resuscitation in the life support module. The predominant use of this apparatus for assisted respiration in different scenarios is due to its simplicity, economy, portability and lack of requirement for pressurised gas supply. As such, its use is recommended in the internationally-accepted guidelines for resuscitation⁽⁴⁾. However, these attributes also confer some inherent risks in their use, like failure to deliver adequate tidal volume^(4,5), hyperventilation^(6,7) and gastric aspiration⁽⁸⁾.

This case highlights the hidden risk of ventilating a chest trauma patient with a self-inflating resuscitator bag for a prolonged period, even when using an advanced airway device. The lack of any type of pressure alarm may predispose a patient with chest trauma involving major airways to life-threatening hypoxia on ventilation with a self-inflating resuscitator bag, because the air leakage through the chest drains may go unnoticed by the person ventilating, in spite of a properly-placed airway and initial confirmation of adequate ventilation. This is especially so in a scenario where there is multisystem involvement with multiple injuries, and attention is diverted because of multiple procedures continuing simultaneously, and also in developing countries and in remote areas where a capnogram and the facilities of mechanised ventilation may not be available.

When a self-inflating resuscitator bag is used for prolonged assisted ventilation in blunt chest trauma, the use of a rebreathing bag-based manual breathing system, like the Bain breathing system, might be used to complement the clinical signs of rise of chest with assisted breath and auscultation of breath sounds, in the early detection of adequacy of ventilation. The failure of the bag to refill will prompt a search for the cause and institution of corrective measures.

Yours sincerely,

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