



A CASE OF MOTOR VEHICLE ACCIDENT WITH RIBS AND MID STERNAL FRACTURES

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ABSTRACT

Motor vehicle accidents (MVAs) have been a major cause of morbidity and mortality since the introduction of the automobile. Multiple injuries often occur in people who are involved in traffic accidents, and rib fractures are among the most common of these injuries, with an occurrence as high as 60 %. The location of specific rib fractures is an important indicator of related injury. A case of ribs and sternal fractures was discussed in this report. In this case, the patient was not wearing seatbelt and had a contact with the steering wheel on the lower abdomen. He complained of chest and abdominal pain which were made worse upon movement and breathing. After careful examination and investigation, the patient was diagnosed with ribs and sternal fracture. Treatment plan during admission included monitoring of vital signs and worsening of chest or abdominal pain, intravenous analgesic which was later switched to oral analgesics, incentive spirometry, breathing exercise and ambulation encouragement. Patient was allowed to be discharged with oral analgesics after two days of admission and to be followed up in two weeks time.

Keywords: Analgesic; Motor Vehicle Accident; Ribs and Mid Sternal Fractures; Pain

INTRODUCTION

Motor vehicle accidents (MVAs) have been a major cause of morbidity and mortality since the introduction of the automobile. In developed countries, MVAs are the most common cause of death in persons younger than 50 years, especially in young men. Traffic accidents in Malaysia have been increasing at the average rate of 9.7 % per annum over the last three decades. Compared to the earlier days, total number of road accidents had increased from 24,581 cases in 1974 to 328,264 cases in 2005, reaching more than 135 % increase of accident cases over 30 years. Furthermore, the number of fatalities (death within 30 days after accident) also increased but at slower rate compared to total road accident from 2,303 in 1974 to 6,200 in 2005.¹

The great forces during impact usually cause multiple trauma and fatal injuries to internal organs. Most injuries in motor vehicle accidents are due to the impact of the passenger against some part of the interior of the car or the intrusion of part of the car or of another object into the passenger compartment. Thoracic and abdominal injuries were associated with contacts with steering wheel or column in drivers, contacts with dashboard or as a result of intrusion into the vehicle by a collision in front passengers. Brain or cervical injuries were caused by direct impact to the interior objects; hyper flexion and rebound hyperextension in passengers.²

Passenger restraints have saved thousands of lives and prevented even more injuries. Most injuries sustained by unrestrained occupants occur when the occupants hit the interior of the car at full speed or are ejected from the vehicle.³

Daffner *et al* studied the difference in injuries sustained by unbelted drivers versus front seat passengers. Head, face, chest, and pelvic injuries were common in both groups. Drivers, however, suffered relatively more injuries to the spine, chest, and upper extremities, presumably caused by striking the steering wheel, and more injuries to the ankles

and feet from the pedals. Passengers had a higher incidence of head, face, and abdominal injuries.⁴

Chest wall injury is extremely common following blunt trauma. It varies in severity from minor bruising or an isolated rib fracture to severe crush injuries of both hemithoraces leading to respiratory compromise. The chest trauma that results from a motor vehicle accident may result in injury to the sternum, the ribs, and the heart, aorta, and lungs. Multiple injuries often occur in people who are involved in traffic accidents, and rib fractures are among the most common of these injuries, with an occurrence as high as 60 %. The location of specific rib fractures is an important indicator of related injury.^{5,6}

Case Description

A 36-year-old Malay male was sent to Hospital Universiti Sains Malaysia (HUSM) on the May 7, 2012 due to an alleged MVA at 12.30 am last night. He claimed that his car skidded and hit something due to damage was seen on his car. Patient was driving the car without wearing seatbelt and claimed to have hit his lower abdomen to the steering wheel. He lost conscious during the accident and could not recall what happened.

The patient presented alert, conscious and oriented complaining of chest at the central part and abdominal pain that is increased upon movement and during inspiration. Patient denied of shortness of breath, nausea or vomiting, dizziness or vertigo and blackout. He had no significant medical history and no known drug allergies. Vital signs on examination were blood pressure 133/87 mmHg, pulse 82 beats/min and temperature 37.4°C.

Chest examination revealed reduced air entry and clear symmetrical lung sounds bilaterally with no wheezes, rhonchi or rales. There was a positive chest spring and palpable pain at the sternum. Cardiac examination showed normal heart sounds without murmurs, rubs or abnormal rhythm. Abdominal examination showed abrasion wound on the right and left hyperchondrium area, mildly tender and tensed.

Laboratory findings were normal except for total WBC of $21.8 \times 10^9/L$ (normal range: $4-11 \times 10^9/L$), AST 583 (normal range 5-35 U/L), ALT 764 (normal range 7-56 U/L), CK (1188 normal range 38-120 ng/ml) and CK-MB 33 (normal range 0-3 ng/ml).

During admission in A and E department, a focused assessment with sonography for trauma (FAST) scan was done and result showed minimal free fluid in Morrison's pouch. No ultrasound evidence of solid organ injury was found. CT scan on abdomen showed hematoma at the segment V of liver with normal spleen and kidney. Chest X-ray result showed right ribs fracture at the 7th and 8th ribs and left ribs fracture at the 6th and 7th ribs. Sternal view showed displaced fracture of upper mid sternum with soft tissue swelling. Electrocardiogram showed normal sinus rhythm, no acute ischemia changes and no arrhythmias.

Patient was admitted to surgery ward with the diagnosis of rib and sternum fracture. Treatment plan during admission included monitoring of vital signs and worsening of chest or abdominal pain, intravenous analgesic (IV Tramadol 50 mg TDS) which was later switched to oral analgesics (Tramadol 50 mg TDS and Celecoxib 200 mg BD), incentive spirometry, breathing exercise and ambulation encouragement. He was discharged after 2 days with oral analgesics (Tramadol 50 mg TDS and Celecoxib 200 mg BD) and was to follow up at the specialist outpatient department 2 weeks later.

DISCUSSION

Rib fractures are among the most common injuries to the chest. Fracture of the first or second ribs can result in injury to the lungs, ascending aorta, subclavian artery and brachial plexus. However, these particular ribs are not commonly fractured because they are well protected and therefore more difficult to break. Fracture of the lower ribs on the left can cause injury to the spleen and on the right to the liver while fractures of the eleventh and twelfth ribs may be associated with renal injuries. Evaluation of respiratory parameters in patients who suffer significant chest trauma can be a useful predictor of injury severity and possible prognosis. Multiple fractures may interfere with normal movement of costovertebral and diaphragmatic muscles, causing ventilatory insufficiency. If two or more connected ribs are each fractured in more than one place, flail chest occurs. In this condition, part of the chest wall is able to move independently because of the negative intrapleural pressure generated on inspiration, which causes the isolated segment of chest wall to collapse inward, compromising ventilation. In most cases it is the severity and extent of the lung injury that determines the clinical course and requirement for mechanical ventilation. Most significant chest wall injuries will be identified by physical examination. Bruising, grazes or seat-belt signs are visible on inspection, and palpation may reveal the crepitus associated with broken ribs. Awaken patients will complain of pain on palpation of the chest wall or on inspiration.

Chest X-ray (anteroposterior and lateral views) can assist with the diagnosis of rib fractures and underlying injuries such as pneumothorax (air in the pleural cavity), haemothorax (blood in the pleural cavity), atelectasis (collapse of lung tissue leads to absence of gas from part or all of the lungs), and pneumonia or lung contusions. The mainstay of treatment for rib fractures is to provide the patient with adequate analgesia, rapid mobilization and meticulous respiratory care in order to prevent complications

such as atelectasis and pneumonia.⁷ An adequate oral analgesic or an intercostal nerve block plus an oral analgesic should provide reasonable pain relief. Opioid analgesics are useful, but when used as the sole analgesic agent may require such high doses that they produce respiratory depression - especially in the elderly. Patient controlled administration of an opioid infusion (PCA) is the best method for cooperative patients. It is a safe method of analgesic delivery, and has significant benefits over conventional methods such as intramuscular injections. It is adaptable, allowing titration of dose to reduce the risk of respiratory depression. It also allows the patient to control the amount of analgesia required at any one time. A multimodal approach is the most effective way of controlling pain.

Research has demonstrated that adding a non-steroidal anti-inflammatory drug (NSAID) further enhances pain relief. NSAIDs inhibit the activity of cyclo-oxygenase (COX) and therefore prevent the production of inflammatory mediators or prostaglandins and the swelling associated with bone injury and surrounding tissue damage.⁸ The addition of a non-steroidal anti-inflammatory agent may provide adequate relief, but these should be withheld until other injuries have been excluded and used with caution in the elderly. Rapid mobilization can include oscillation therapy or body positioning in patients that are on bed rest or who are intubated. This mobilization can involve the patient's ambulating, sitting up in bed, or getting out of bed to move into a chair. Respiratory care entails incentive spirometry, pulmonary toilet, and even mechanical ventilation, when indicated. Incentive spirometry is a procedure that is used to increase transpulmonary pressure and inspiratory volumes, improve inspiratory muscle performance and re-establish or stimulate the normal pattern of pulmonary hyperinflation. These techniques are particularly useful if the patient is unable to mobilise.⁵

Patients with minor rib injuries able to cough and clear secretions may be discharged with adequate analgesic medications. Adequate analgesics are critical to successful outpatient management of rib fractures. In one study, 19 % of patients discharged with the diagnosis of rib fracture returned to the hospital for unplanned follow-up with chief complaint of insufficient analgesia. Most patients who will develop complications will do so within 2 weeks, thus, a follow-up plan within 2 weeks should be made.⁹

CONCLUSION

Rib fractures vary from being a minor injury that can be treated in outpatients, to a major injury that can have life-threatening consequences. Accurate diagnosis, adequate analgesia and effective physiotherapy are all essential components in the management of rib fractures if complications are to be avoided.

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