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# An Overview on Diagnostic and Management Approach of Road Traffic Accidents in Emergency Department

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**ABSTRACT**

Road traffic accidents are a main cause of fatality worldwide. The WHO estimates that RTA is the eighth principal cause of mortality and the primary cause of decease in young adults. Several life-threatening injuries are attributed to RTA; some are more common than others for specific mechanisms. For instance, head-on collisions are associated with lower limb and facial injuries. Meanwhile, rear-end collisions are associated with hyperextension injury of the cervical spine. Since road traffic accidents pose a high risk to the patient's mortality, proper management is essential. We aimed to review the literature on road traffic accidents from epidemiology, mechanism of injury, and latest management updates.
PubMed database was utilized for articles selection, papers from where were obtained and reviewed. Due to the high rate of mortality, the role of the ER physician is to resuscitate, stabilize, and treat life-threatening conditions in all patients presenting after an RTA. The ATLS protocol has been put forth to systematically manage trauma patients, not to miss any condition that may kill the patient. Important conditions to treat include active bleeding, flail chest, cardiac tamponade, massive hemothorax, tension pneumothorax, and airway obstruction. Once the patient is stable, further examination and researches are necessary to assess the full condition of the patient.

**Keywords:** Traffic accidents, Emergency, Airway obstruction, Hemothorax.

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## INTRODUCTION

Road Traffic Accidents (RTA) are a major health challenge globally, both in mortality and resources used. In the year 2000, the number of deaths reached 1.15 million. Meanwhile, in 2018, this number jumped to 1.35 million [1]. According to the WHO, death from a road traffic injury is the eighth cause of mortality globally, accounting for 2.37%, and the main cause of decease for people between 5 to 29 [2]. In Saudi Arabia, road traffic accidents resulted in 16,159 deaths and 89,050 injuries from 2018-2020 [3]. Injuries resulting from RTA can be classified from minor wounds and concussions to major, complicated injuries including multiple organ systems. In the emergency department, all trauma patients must be treated and managed

using an organized technique to boost results and decrease the hazard of undiagnosed damages [4]. In the present review paper, we will go through the common injuries in RTA and how to approach those patients in the emergency department.

## MATERIALS AND METHODS

To select articles PubMed database was used, and the following keys were used in the mesh (((Hemophilia) AND (Symptoms)) OR (Diagnosis)) OR (Management). Concerning the inclusion criteria, the articles were chosen based on including one of the these topics: hemophilia A, hemophilia B, acquired hemophilia, diagnosis, and management. Exclusion criteria were all other articles that did not have one of the mentioned topics as their primary endpoint.

*Epidemiology*

As stated earlier, RTA is a main cause of decease globally, especially in the younger population [1, 2]. The outcome, i.e., whether the patient lives or not following an RTA, depends on many factors, including but not limited to older age, obesity, vehicle type, type of accident, and pre-existing medical conditions [5-10]. A low Glasgow Coma Scale (GCS) and older age independently predict fatality in the patient presenting with significant bleeding [11]. The most common cause of mortality in RTA are hemorrhage and cardiopulmonary arrests [1, 12-14]. In the emergency department, the "golden hour" concept has been circulating for years since early studies on trauma were published. This concept puts emphasis on the enhanced decease hazard and the necessity for rapid intervention within the first hour after major trauma. However, recent studies have shown that the correlation between injury and fatality can be more complicated than once thought [15, 16].

*Mechanism of injury*

The mechanism of injury is an important aspect to document and ask about, as some injuries are more common with specific mechanisms than others [17]. For instance, in head-on collisions, the most common injuries are facial and lower extremity injuries. Meanwhile, rear-end collisions run the risk of hyperextension injury of the cervical spine rather than limb injuries [1, 17, 18]. Further mechanisms are enlisted in **Table 1**.

**Table 1.** Road Traffic Accident Mechanism of Injury

| Mechanism of Injury | Associated injury |
|---|---|
| Head-on Collision | Aortic injuries<br>Facial injuries<br>Lower extremity injuries |
| Rear-end collision | Cervical spine fractures<br>Central cord syndrome<br>Hyperextension injuries of the cervical spine |
| T-bone (Lateral) collision | Clavicle, humerus, rib fractures<br>Thoracic injuries<br>Pelvic injuries<br>Abdominal injuries: spleen, liver |
| Rollover | Compression fractures of the spine<br>Crush injuries |
| Ejected from vehicle | Spinal injuries |
| Windshield damage | Cervical spine fractures<br>Closed head injuries<br>Facial and skull fractures<br>Coup and countercoup injuries |
| Steering wheel damage | Thoracic injuries |
| Seat belt use | Pulmonary contusions<br>Sternal and rib fractures |

*Management*

Before the patient is received at the emergency department, the emergency medical services (EMS) provide a list of information to the hospital regarding the patient. This list includes the patient's mechanism of injury, vital signs, age and sex, and apparent injuries [1, 13]. The advantage of this early warning is to notify additional personnel, assure resources are available and prepare for anticipated procedures and blood transfusion [19]. In large hospitals and trauma centers, a trauma team usually resuscitates and stabilizes the patient. However, in rural areas, saving the patient could be dependent on a single doctor and a nurse. Thus, the Advanced Trauma Life Support (ATLS) protocols put forth a systematic approach in treating trauma patients [4]. The most important element of the ATLS protocol is the initial investigation. It is organized based on the lethality of the injuries, from most to least lethal. It is also practical in cases of limited personnel at hand, as it simplifies priorities. Thus, any injury found can be dealt with before moving on to the next step [4]. Primary investigation is split into five core steps: airway examination and protection, breathing and ventilation, circulation examination, disability evaluation, and exposure.

*Airway*

An obstructed airway can lead to death within few minutes [20]. Therefore, airway assessment and management is the most critical step in managing trauma patients. Recent studies show that following a checklist for assessing and managing the airway may improve the efficacy and reduce complications [21-24]. For the airway assessment, the first step is to ask the patient a simple question such as "What is your name?". If the patient answers the question clearly, this indicates that they can talk, breathe, and protect their airway to a certain degree. Next, the chest, neck, face, and abdomen inspection looks for respiration signs and respiratory problem. After that, inspection and palpation of the oropharyngeal cavity and anterior neck for any lacerations, injury to the teeth or tongue, crepitus, and pooling of secretions [4]. In an unconscious patient, the airway must be protected. Protection can be achieved with oral or nasal airways, rescue airways, or intubation depending on the clinical status [19]. While one physician is working on the airway, the other should immobilize the cervical spine. One should always assume a cervical spine injury in all blunt trauma patients [1]. The cervical spine can be immobilized with a cervical collar. Once applied, the anterior portion can be detached momentarily to help with airway assessment and management [19].

*Breathing and ventilation*

Once the airway has been protected, one should examine the oxygenation and ventilation sufficiency [4]. Chest injuries are common in RTA and account for 20-25% of trauma-related deaths due to reducing oxygenation and ventilation [7, 24]. While examining the patient's chest, look for the red flags. The red flags are asymmetric chest movement, paradoxical movement, crepitus, absent breathing sounds, distended neck veins, and dullness or hyper-resonance on percussion [12, 16]. These signs indicate dangerous, life-threatening conditions: massive hemothorax, tension pneumothorax, flail chest, and cardiac tamponade. The most dangerous of these is tension pneumothorax. Signs for tension pneumothorax include dyspnea, hypotension, and ipsilateral absence or reduced breath sounds. If suspected, needle decompression with a large-bore needle (14 gauge or more) either in the second intercostal space in the midclavicular line or in the fifth intercostal space in the midaxillary line, followed by tube thoracostomy [25]. Delaying decompression to obtain radiographic evidence is not advised. If the signs strongly correlate to tension pneumothorax, treatment must begin. If suspicion is high for other diagnoses, ultrasonography can be used [26]. If the patient is unstable, a Tube thoracostomy should be inserted to anticipate hemo- and pneumo-thorax [4].

*Circulation*

Once the airway and breathing have been stabilized, assess the patient's circulatory condition by palpating central pulses. If the carotid and femoral pulses are felt and are strong, with no clear external hemorrhage, the patient's circulatory status can be assumed to be intact [4]. Additionally, two large-bore (16 gauge or larger) IV catheters should be placed, classically in the antecubital fossa of each arm [19]. Blood should be drawn for cross-matching and blood typing. This is done in anticipation of fluid resuscitation and blood transfer.

Life-threatening bleeding must be stopped. Signs for bleeding are hypotension and signs of shock (pale, cool, moist skin). Physicians can use manual pressure, tourniquet application, and elevation for external arterial hemorrhage [4]. Pelvic injuries, common in a head-on collision, may bleed profusely, and all of that bleeding is kept internally. In cases of pelvic injury, a pelvic binder may be used to control the internal hemorrhage [27]. Initial resuscitating step is to start with a bolus of intravenous crystalloids. Nevertheless, patients with obvious severe or ongoing bleeding should be transfused type O blood instantly, as a prolonged infusion of crystalloids may negatively impact survival rates [28]. Blood transfusion should be done with a 1:1:1 ratio of plasma, platelets, and packed red blood cells. Patients who require blood transfusion may benefit from treatment with tranexamic acid, particularly within three hours of the trauma [29]. While resuscitating bleeding patients, it should be kept in mind that one must maintain perfusion to prevent cardiopulmonary arrest. In one study of patients who required CPR within one hour of hospital arrival, only 13% survived till discharge [30].

*Disability*

A focused neurological examination should be done once the airway, breathing, and circulation have been evaluated, stabilized, and managed accordingly. This must involve a report of the patient's consciousness level by GCS, pupillary size and reactivity assessments, gross motor function, and sensation [4]. Of note, lateralizing signs should be check, as these may indicate acute neurologic injury. These signs include unequal pupil size, asymmetrical pupillary reflex, abnormal deep tendon reflexes, and plantar extension [31].

*Exposure*

While ER physicians treat airway, breathing, circulation, and disability, the patient must be completely undressed. Their entire body must be examined, looking for obvious injuries missed during the primary survey, as they pose a major threat to life [32]. Regions often neglected contain abdominal folds, perineum, axillary folds, and the scalp in obese patients [4]. Once an injury has been ruled out from these areas, the patient must be covered again to prevent hypothermia, as it may lead to coagulopathies and multiple organ dysfunction syndromes [33, 34]. If the patient is hypothermic, heating should be initiated with warm blankets, warm IV fluids, and active external warming devices [4].

*Adjunctive*

Several studies can be done to ascertain a definitive diagnosis of life-threatening conditions. These include plain radiographs, ultrasound exam (eFAST), CT scan, and diagnostic peritoneal lavage [4, 35]. However, the general rule of thumb is that these studies should not delay therapy. If the suspicion is high of a certain diagnosis that requires immediate action, prioritize taking action rather than using an adjunctive [4, 24, 25].

*Secondary survey and patient transfer*

Once the primary survey is done and the patient is stable, a secondary survey should be initiated. A secondary survey includes a full history of events leading to and after the injury, along with a full head-to-toe physical examination [4]. Important points in history include the mechanism of the injury, whether air-bag were deployed or not, whether a seat belt was worn or not, medications taken before the accident, allergies, and mental illness, especially for suicidality [1, 12, 36]. Once the secondary survey is over, the patient must be transferred to a trauma center if not already present for further assessment and management [4].

## CONCLUSION

Road traffic accidents are a leading cause of injury and death worldwide, especially in the younger population. The injury depends on the mechanism of the accident, as specific injuries are associated with particular accidents. The primary goal in managing these patients is to ensure that patients do not suffer from life-threatening conditions, and if they do, they are managed swiftly and appropriately. The Advanced Trauma Life Support protocol has been put forth to approach trauma patients and manage accordingly systematically. These protocols have helped physicians save countless patients who were afflicted with injuries from traumatic events.

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