

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 7, Issue – 2, April – 2024, Page No. : 166 - 172

Approaches to Primary management in maxillofacial trauma: Current Practices and Future Perspectives – A literature review

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Citation of this Article: Dr. Henil Parikh, Dr.Amit Kumar Sharma, Dr. Sunil Sharma, Dr.Vikram Sharma, Dr. Ritu Upadhyay, Dr. Dhiral Vijayvargiya, "Approaches to Primary management in maxillofacial trauma: Current Practices and Future Perspectives – A literature review", IJDSIR- April – 2024, Volume –7, Issue - 2, P. No. 166 – 172.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

The assessment and management of trauma patients, focusing on maxillofacial trauma. Securing the patient's airway is the first priority to ensure breathing and prevent further complications. An organized initial assessment following ABCDE protocol is critical to identify and treat life-threatening injuries during the golden hour. A thorough primary survey assesses the airway, breathing, circulation, disability and exposure of the patient. Management of soft tissue injuries, head injuries, pediatric trauma and geriatric trauma is also discussed with their unique challenges and considerations. A secondary survey is performed after initial stabilization to identify any missed injuries through a full history, physical exam and diagnostic tests. Overall, an organized and systematic approach is needed to optimize outcomes for trauma patients.

Keyword: Primary Survey, Management of Head injury, Secondary Survey, Pediatric Trauma

Introduction

The initial assessment and primary management of patients with maxillofacial trauma. It highlights the importance of a thorough evaluation to identify airway obstruction, sight-threatening complications, and other injuries.¹ Securing the airway is the first priority to ensure sufficient breathing and oxygenation. The physician must consider factors like the nature of the injury, potential difficulties intubating, cervical spine trauma, risk of aspiration, and blood loss that can obstruct the airway.² The optimal airway management depends on the circumstances and the time available is often short as the patient's condition can deteriorate rapidly.³ The goal of treatment is to restore function and esthetics while minimizing complications. The initial evaluation ensures appropriate care while the postoperative focus is on an expeditious recovery.⁴

Initial assessment

The Golden Hour: This refers to the critical first hour after a traumatic injury when appropriate medical care can significantly impact survival and outcomes. Within this hour, prehospital care aims to secure the airway, control bleeding, provide immobilization, and quickly transport the patient to a trauma center.⁵

Preparation: Both prehospital and hospital preparations are important. (Fig.1) In the field, coordination with the receiving hospital trauma team is key. In the hospital, the trauma team needs to have resources ready like airway equipment, IV fluids, monitoring devices, and laboratory and radiology personnel on standby.⁵



Fig. 1: Prehospital Phase

Triage: Patients are sorted based on the severity of their injuries and the resources required. Those with life-threatening airway, breathing and circulation issues are prioritized. This helps determine which patients go to which facilities. (Fig.2) 6



Fig. 2: Triage Chart

Adjuncts: Additional monitoring and testing can aid in the initial assessment, including ECG, pulse oximetry, blood gas measurements, urinary output monitoring, and basic X-rays of the chest and pelvis. These helps evaluate the patient's physiological status and guide resuscitation efforts.⁵

Overall, a systematic and organized approach following ATLS guidelines is important for the initial management of trauma patients to quickly identify and

treat life-threatening injuries during the critical Golden Hour period. Timely interventions can make a big difference in survival and outcomes.

Primary survey

The primary survey according to ABCDE protocol for trauma patients. This includes assessing the airway, breathing, circulation, disability, and exposure.⁷

Airway assessment is the first and most critical step. The patient's ability to speak indicates a patent airway. If compromised, interventions like chin lift, jaw thrust, bag mask ventilation, and endotracheal intubation may be needed. Advanced techniques like video laryngoscopy, retrograde intubation, and surgical airways can be used if initial measures fail.⁸ Patients at risk of airway issues include those with altered consciousness, maxillofacial injuries, facial burns, and neck trauma.⁹

Once the airway is secured, breathing and ventilation are evaluated. Factors like chest trauma, head injury, and spinal cord injury can affect breathing.¹⁰ Tracheostomy and percutaneous tracheostomy may be needed in some cases.¹¹

Circulation is assessed next to identify bleeding sources. Definitive bleeding control is essential along with fluid resuscitation.¹²

Disability is evaluated using the Glasgow Coma Scale to determine the patient's neurological status.¹²

Finally, the patient is fully exposed and environmental controls are put in place to prevent hypothermia.¹²

Adjuncts like vital sign monitoring, blood gas analysis, and capnography are used to supplement the primary survey and resuscitation. An organized and thorough primary survey according to ABCDE protocol is critical to identify and treat life-threatening injuries in trauma patients.¹²

Management of head injury

Head injuries are common and can be life-threatening, causing death and disability. Proper early management is crucial for outcomes.¹³ Patients are assessed based on the Glasgow Coma Scale to determine injury severity. Computed tomography scans are used to detect fractures and intracranial lesions like hematomas, contusions and diffuse injuries. (Fig. 3)

Intracranial pressure must be monitored and controlled to reduce secondary brain damage. Cerebral blood flow and oxygen levels also need to be maintained. Injuries to other parts of the head like the scalp and cervical spine are also common and should be evaluated. Cervical spine injuries can be classified based on fracture type and mechanism.⁵

Both non-operative and surgical treatments are used, depending on the injury severity, stability and neurological status. High-dose steroids are not recommended to improve outcomes.⁵



Fig. 3: Subdural hematoma

In summary, a multifaceted approach is needed to manage head injuries, focusing on initial stabilization, imaging, monitoring of vital parameters, treating complications, and optimizing cerebral hemodynamics to minimize secondary brain damage and maximize chances of recovery.

Management of maxillofacial soft tissue injury

Management of soft tissue injuries of the face and scalp is important for functional and esthetic outcomes.¹⁴ The

principles include controlling bleeding, thorough irrigation, debridement of devitalized tissue, and removal of foreign bodies before closure. Early closure within 8 hours is preferred. A layered closure is important to avoid dead space. Soft tissue reconstruction may be needed using local, regional, or free flaps based on the defect.¹⁵

Common soft tissue injuries include abrasions, contusions, lacerations, incised wounds, puncture wounds, and crush injuries. Injuries can involve nerves, vessels, and parotid ducts which need to be addressed. Wounds can be classified based on mechanism, communication with the external environment, and additional injuries.¹⁶

For facial wounds, closure in esthetic units is important. Local flaps are preferred for reconstruction of the eyelids, nose, cheek, and lips. Neurovascular injuries need to be identified and managed. Parotid duct injuries may require repair.¹⁵

Scalp injuries require thorough irrigation and debridement. Defects reconstructed using are advancement, transposition, and rotational flaps. Local flaps are often used for reconstruction. Total avulsions require revascularization of the skull before reconstruction. (Fig. 4) 15



Fig.4: Scalp Injury

Pediatric trauma

Pediatric trauma is a major cause of mortality and disability among children worldwide. Motor vehicle crashes are the most common cause of pediatric injuries.¹⁷ Early identification and management of injuries is critical to reduce complications and improve outcomes for injured children. (Table 1)¹⁸

Clinical	Score				
Parameter	-2	+1	+2		
Weight (kg)	<10	10-20	≥20		
Airway	Unmaintainable	Maintainable	Normal		
Systolic blood pressure (mmHg)	<50	50-90	≥90		
Central nervous system	Coma or decerebrate	Obtunded/Loss of consciousness	Awake		
Open wound	Major/penetrating	Minor	None		
Skeletal	Open/multiple fractures	Closed fracture	None		

Table 1: Paediatric Trauma Score

The initial assessment and management of pediatric trauma patients follows the ABCDE approach - Airway, Breathing, Circulation, Disability and Exposure. Anatomical and physiological differences between children and adults require different techniques and equipment for airway management in pediatric patients. (Table 2) Establishing a patent airway is the highest priority. Orotracheal intubation is the most reliable method for definitive airway control in children.¹⁹

		AIRWAY AND BREATHING					
AGE AND WEIGHT	O ₂ MAŠK	ORAL AIRWAY	BAG- VALVE	LARYNGO- SCOPE	ET TUBE	STYLET	SUCTION
Premie 3 kg	Premie, newborn	Infant	Infant	0 straight	2.5–3.0 no cuff	6 Fr	6–8 Fr
0–6 mos 3.5 kg	Newborn	Infant, small	Infant	l straight	3.0-3.5 no cuff	6 Fr	8 Fr
6–12 mos 7 kg	Pediatric	Small	Pediatric	l straight	3.5-4.0 cuffed or uncuffed	6 Fr	8-10 Fr
1–3 yrs 10–12 kg	Pediatric	Small	Pediatric	l straight	4.0-4.5 cuffed or uncuffed	6 Fr	10 Fr
4–7 yrs 16–18 kg	Pediatric	Medium	Pediatric	2 straight or curved	5.0–5.5 no cuff	I4 Fr	I4 Fr
8–10 yrs 24–30 kg	Adult	Medium, large	Pediatric, adult	2-3 straight or curved	5.5-6.5 cuffed	I4 Fr	I4 Fr

Table 2: Paediatric Kit for Airway Management

Breathing should be evaluated to identify respiratory failure. Children have higher metabolic rates and are more prone to hypothermia, which can lead to coagulopathy and further complications.²⁰

Head injuries are common in pediatric trauma and can primary and secondary brain cause damage. Management focuses on preventing hypoxia, hypoperfusion and raised intracranial pressure to minimize secondary brain injury. Children with moderate to severe head injuries require imaging, intensive monitoring and specialist input.²¹

Geriatric trauma

The aging population is increasing worldwide, shifting the focus of trauma care to the elderly.²² Older adults have increased mortality from similar injuries compared to younger patients due to declining organ function and impaired physiological reserves.⁵

Pre-existing conditions like COPD, heart disease, and diabetes increase elderly patients' risk of death after trauma. Injury severity and host factors both influence outcomes. Traditional triage tools may miss high-risk elderly patients. Additional factors like shock index and age-specific blood pressure criteria can help identify atrisk geriatric patients.⁵

Falls are the most common cause of injury in the elderly, while motor vehicle accidents are also significant. Airway management in the elderly requires early consideration of intubation due to impaired reflexes. Medication doses may need to be reduced.⁵

Changes in heart and lung function place elderly patients at risk of respiratory and circulatory complications. Traumatic brain injury is common in the elderly due to a frail skeleton and use of anticoagulants. Hypothermia and immobilization are significant risks during exposure and examination of elderly trauma patients.⁵

Medications like beta blockers can complicate assessment and treatment of geriatric trauma patients. Elder abuse or neglect should be considered as a cause of injury in elderly trauma patients. A multidisciplinary approach including palliative care is often needed to determine goals of care and optimize treatment for elderly trauma patients.²³

Secondary survey

The secondary survey is a thorough head-to-toe examination performed after initial stabilization to identify any injuries that were missed during the primary survey. It involves a full history and physical exam, including reassessment of vital signs.⁵

A thorough history focusing on the mechanism of injury can provide clues to potential injuries. Details like seating position, airbag deployment, vehicle damage, and ejection from the vehicle are important for blunt trauma. (Table 3) For penetrating trauma, factors like the trajectory, velocity, and distance from the weapon are key.¹¹ Burn injuries may require checking for toxic chemicals still in contact with the patient.²⁴

MECHANISM OF INJURY	SUSPECTED INJURY PATTERNS	MECHANISM OF INJURY	SUSPECTED INJURY PATTERNS	
BLUNT INJURY				
Frontal impact, automobile collision	Cervical spine fracture Anterior flait chest Myocardial contusion Pneumothorax Traumatic aortic disruption Fractured spleen or liver Posterior fracture/dislocation of hip and/or knee Head injury Facial fractures	Rear impact, automobile collision	 Cervical spine injury Head injury Soft tissue injury to neck 	
 Bent steering wheel Knee imprint, dashboard Bull's-eye fracture, windscreen 		Ejection from vehicle	 Ejection from the vehicle precludes meaningful prediction of injury patterns, but places patient at greater risk for virtually all injury mechanisms. 	
Side impact, automobile collision	Contralateral neck sprain Head injury Cervical spine fracture Lateral flait chest Poneurophorar	Motor vehicle impact with pedestrian	Head injury Traumatic aortic disruption Abdominal visceral injuries Fractured lower extremities/pelvis	
Traumatic aortic disruption Traumatic aortic disruption Diaphragmatic rupture Fractured spleen[liver and/or kidney, depending on side of impact Fractured plevis or acetabulum	Fall from height	Head injury Axial spine injury Addominal visceral injuries Fractured pelvis or acetabulum Bilateral lower extremity fractures (including calcaneal fractures)		

PENETRATING INJURY		THERMAL INJURY		
Stab wounds Anterior chest 	Cardiac tamponade if within "box" Hemothorax Pneumothorax Hemopneumothorax Left diaphragm injury/spleen injury/spleen injury/spleen injury/hemopneumothorax Abdominal visceral injury pos- sible if peritoneal penetration	Thermal burns	 Circumferential eschar on extremity or chest Occult trauma (mechanism of burn/means of escape) 	
Left thoraco-		Electrical burns	 Cardiac arrhythmias Myonecrosis/compartment syndrome 	
Abdomen		Inhalational burns	 Carbon monoxide poisoning Upper airway swelling Pulmonary edema 	
Gunshot wounds (GSW) • Truncal	 High likelihood of injury Trajectory from GSW/retained projectiles help predict injury 			
Extremity	Neurovascular injuryFracturesCompartment syndrome			

Table 3: Mechanisms of injury and suspected injury patterns

The secondary survey starts with examining the head and eyes. The eyes are assessed for vision, pupillary response, and ocular mobility. Maxillofacial structures are checked for fractures and bleeding. The chest, abdomen, pelvis, and musculoskeletal system are all carefully examined for injuries. A full neurological exam is performed to identify spinal and peripheral nerve injuries.²⁵

Adjunct tests like imaging scans may be used to identify specific injuries. Pain management and anxiety relief are also important. Patients may require transfer to facilities with higher levels of care. Constant reevaluation is critical to detect any new or worsening injuries.¹¹

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