



Neurotrauma Care, “Golden Hour” or “Golden Sixty Minutes”

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The golden hour is the time following an injury during which appropriate medical attention carries the highest likelihood of a better outcome. The concept of a golden hour was probably derived from the French Military's World war I data for the care of trauma victims, but it is suitable for all types of acute emergencies. During these golden sixty minutes, the health care providers must focus on eliminating or mitigating the effect of critical events. If not timely addressed, these essential steps carry a maximum threat to the victim's life by causing irreversible damage to vital organs. The major challenge in applying intervention during the golden hour is correctly identifying the correctable step in the victim at the earliest. Training individuals about basic life support is the first challenge to delivering care at the scene of an accident/ or event or during transport. The advances in the diagnostic modality and the faster means of transportation have been a major driving force in decreasing mortality during the early hours following the incident. In the present review, we attempt to draw attention to the importance of golden hour and emphasize that team-building and quality improvement are crucial to providing better outcomes.

Keywords: Traumatic brain injury; Emergency; Secondary damage; Intracranial hypertension; Hypothermia

INTRODUCTION

R. Adam Cowley coined the term "golden hour", which denotes the first 60 minutes after a patient sustains traumatic injury in the early 1980s (in broader perspective, any critical event related to health)^{1,2}. If the patient can get the desired or recommended interventions during this period, these will increase the chances of improved outcomes^{3,4}. The concept of the "golden hour" is widely

reported in the management of trauma victims and the current trauma system concepts are primarily based on this concept of the "golden hour"³. In trauma care, more so in neurotrauma care (more specifically in traumatic brain injury cases), the concept of the first 60 minutes or "golden hour" has been crucial as it determines the entire framework of trauma care which include pre-hospital care, patient transport, emergency room management and subsequent management protocols. This sequence of events is in-

fluenced by the "golden hour" concept and thus tries to reduce the injury to definite intervention times to the least^{3,5,6}. In literature, it is widely acknowledged that early management intervention can help to improve outcomes in a spectrum of disorders and disease conditions⁷. We try to understand the scope and implications of the concept of "Golden Hour" or "Golden sixty minutes" about imparting neurotrauma-related critical care.

"GOLDEN HOUR" OBJECTIVES AND SCOPE

Over a while, the concept of "golden hour" has been extended to develop and support management protocols to improve outcomes in various clinical conditions. These clinical scenarios include a few acute left ventricular failure, acute right ventricular failure, diabetic ketoacidosis, haemorrhagic as well as ischemic stroke^{8,9}, myocardial infarction, perinatal and neonatal care^{5,7,8,10-19}, poisoning²⁰, seizures (non-eclamptic), sepsis^{14,15,21} and thyroid storm¹⁰. Across the disease conditions of clinical scenarios, the basic concepts and issues addressed largely remain the same. The basic idea is early identification of potential factors leading to irreversible damage (e.g., hypoxia, hypotension, hypertension, hyperglycaemia, hypoglycaemia, hypothermia or hyperthermia) and taking measures to interrupt the cascade of injuries and thus preventing or reducing the secondary damage^{3,8,12,16}.

The neuro-critical care of traumatic brain injury patients carries a considerable value in initial management, especially in the golden hour. Sedation and analgesia are the initial steps to relieve the anxiety and pain in these patients, which in turn will help decrease the ICP. Preferred medication should have a rapid onset and offset, predictable pharmacokinetics with minimal alteration in cerebral metabolism and intracranial pressure²². BTF recommends seizure prophylaxis with Phenytoin to prevent early post-traumatic seizures²³. Clinical monitoring (with GCS-P) and CT findings are reliable measures to initiate the treatment for elevated ICP²⁴. Ensuring head end elevation, proper neck position, patent endotracheal tube and urinary catheters, and intracranial hematoma must be ruled out before initiating treatment for elevated ICP. Initial medical treatment includes intravenous mannitol 20% or hypertonic saline (cerebral decongestant) and sedation. For refractory intracranial hypertension, intubation and mechanical ventilation with administration of neuromuscular paralytic agents are recommended. According to brain trauma foundation guidelines, the role of aggressive hyperventilation has been questioned, but transient hyperventilation is useful. Elevated ICP significantly compromises cerebral perfusion, and urgent measures to alleviate the ICP are mandatory. ICP monitoring and drainage of CSF are helpful

tools in managing severe head injuries during golden hour²⁵. Hence ICP monitoring has therapeutic and prognostic value in traumatic brain injury.

CHALLENGES

The foremost challenge in applying the "golden hour" concept is identifying the crucial steps and events that can result in adverse outcomes. For example, in a trauma victim, the airway can be compromised if the person is unconscious, a foreign body is in the mouth (like a broken tooth), or a person develops seizures leading to airway compromise. These examples can be many and may require minor (jaw thrust or removal of vomitus or foreign body) to major interventions (endotracheal intubation to surgical airway) but, if not addressed, can negatively impact the outcome. Additionally, the extent and combination of injuries (i.e., traumatic brain injury with spine or chest injury) can further influence the number of crucial steps and measures to be looked after in the "golden hour"^{26,27}.

Although the transport duration to the nearest trauma centre is critical in managing traumatic brain injury patients²⁷⁻³², it becomes crucial that there will be a need to develop trauma centres if not well advanced, at least with essential trauma care facilities. The transfer timings can be influenced by the availability of resources and many other factors like civilian or military conflicts^{33,34}. Additionally, the role of reduction in time delay is controversial^{4,35} and needs further studies on the subgroups of patients who will benefit from early transport thus to allocate the resources. Availability of basic and essential investigations at the scene of injury like detection of hypoglycaemia and availability of point-of-care tools like portable ultrasound to detect haemorrhages in hemodynamically unstable victims can provide a drastically improved outcome³⁶. Similarly, measures to facilitate intubations can be rewarding. However, they will need resources and efforts to train the individual to use these tools.

CONCLUSIONS

In broader terms, the "golden hour" concept requires the injured person to receive the intended intervention at the earliest to avoid secondary injury. These corrective measures may prevent hypoxia, hypotension, hypothermia and so on. The interventions can be as simple as just clearing the airway to jaw thrust to maintain the airway, applying tourniquets to stop the bleeding to more complex like neurosurgical interventions requiring evacuation of intracranial hematoma to address the raised intracranial pressure and thus prevent secondary brain damage and its sequel. In this direction,

future research needs to focus on identifying the possible scenarios where there is a need to take corrective interventions (from simple to complex), specify the available resources, and judiciously allocate the available resources to improve outcomes.

NOTES

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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