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Improve Patient Outcome with Early Diagnose Head Injury on Maxilofacial Trauma : Serial Case

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Abstract: ***Introduction*: Studies have shown that facial fractures have a strong association with traumatic brain injury.Early diagnosis of these intracranial haemorrhage leads to prompt treatment which is essential to improve the outcome of these patients. An oral and maxillofacial surgeon should be able to suspect and diagnose head injury and also provide adequate initial management. *Objective*: To Prompt determination of head injury in these patients for improving patient survival and recovery. *Case Report*: Two different emergency cases patients with maxillofacial trauma associated with CSF leak and Epidural Hematoma of head injuries patients. *Discussion*: Presence of head injuries in patients with maxillofacial trauma is a life-threatening condition. Prompt determination of head injury in these patients is crucial for improving patient survival and recovery. Hence, the need to know about the incidence of head injuries associated with maxillofacial trauma becomes an important aspect. *Conclusion*: Any patient with maxillofacial injury irrespective of whether it is associated with fractures or not, is always at a risk of traumatic brain injury. We should be able to suspect and diagnose head injury and also provide adequate initial management. Moreover all maxillofacial injury patients should then undergo neurosurgical observation and follow-up.***

Keyword: maxilofacial trauma, head injury, life-theatening condition

1. Introduction

Trauma is a major cause of death and morbidity. Maxillofacial trauma is a trauma that affects both the hard and soft tissues of the face, most often accompanied by head injury. Many things can cause this trauma, ranging from traffic accidents, falling from height, fighting, and accidents while exercising. This report will present a case of maxillofacial trauma with minor head injuries.Injuries and violence are one of the leading causes of mortality worldwide. More than nine people die every minute from injuries according to the World Health Organisation. A substantial portion of these injuries involve the maxillofacial region. Moreover maxillofacial trauma itself may be associated with significant injuries elsewhere. Among the concomitant injuries, injury to the head and cervical spine (C-spine) are amongst those that demand due consideration on account of their life threatening behavior. Head injury can be divided into 3 groups as cranial bone fracture, concussion and intracranial injury. Traumatic brain injury (TBI) is defined "as evidence of loss of consciousness and / or post-traumatic amnesia in a patient with a non-penetrating head injury".

Head injury may be either primary or secondary in nature. Release of biochemical substances during a primary injury causes neural damage thus causing a secondary injury. Secondary injury also occurs due to hypotension or hypoxia. As opposed to injuries elsewhere in the body, brain injury is often difficult to predict initially. This is because the brain is enveloped in a rigid bony structure. The injury to the brain may be severe irrespective of whether the calvarium is intact or not. The severity of the brain injury will thus depend on the structural damage of the brain tissue and the extent of the haemorrhage. Early recognition of symptoms of intracranial damage is hence imperative.

Many times, facial fractures tend to distract our attention from more severe and often life threatening injuries. Usually conscious patients with a Glasgow Coma Scale (GCS) score of 15 with no clinical neurological abnormalities are not expected to have an intracranial pathology. However, high velocity impact can result in intracranial haemorrhage. 2.8% of neurologically "normal" patients suffer from intracranial haematomas. Hence intracranial haemorrhage cannot be excluded in these patients. Early diagnosis of these intracranial haemorrhage leads to prompt treatment which is essential to improve the outcome of these patientsTherefore as maxillofacial surgeons, we must be aware of the possible concomitant head injury. We must also have a thorough understanding of the pathophysiology of head trauma for initial recognition and management before the arrival of the neurosurgeon.

2. Case Report

Case 1

A 37 y.o female patient came with bleeding from mouth. ± 7 hours prior to admission, when the patient was riding motorcycle as a passanger with medium speed at Sapan area, suddenly another motorcycle came from her right side and hit her caused her lose balance and fell down with mechanism her head hit the asphalt first. History of using helmet (+) half face, history of unconsciousness (+) ± 5 minutes, nausea and vomiting (-), bleeding from mouth (+), bleeding from nose and ear (+). Then the patient was brought to Private hospital at Soekarno hatta area and was performed wound toilet, head x-ray, anti tetanus injection,

and situational suturing at left eyebrow. Then the patient was referred to Hasan Sadikin Hospital Emergency Department for further treatment.

Figure 1: Extraoraland intraoral presentation of the patient

From examination we fund asymmetrical face, oedemaand hematoma at left eye, and left cheek region and punctured wound at upper lip with 5x1 cm in size, irregular edge and multiple abrassive wounds at facial region.

Figure 2: Chest x-ray examination, fund discontinuity of 2^{nd} - 4^{th} right costae at posterior and lateral aspect and Traumatic wet lung bilateral

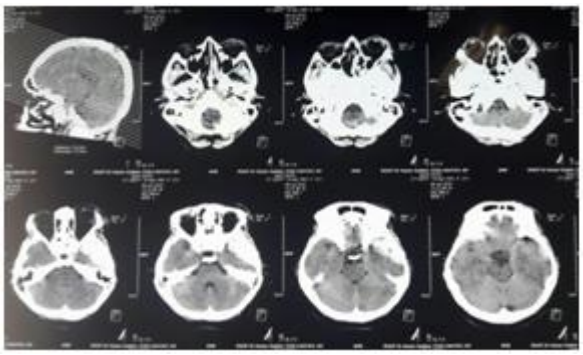

Figure 3: CT scan examination, soft tissue swelling at left temporal, discontinuity of left temporal bone, sylvian fisure, ventricle and cisterna are compressed and there was fund hiperden mass at left temporal (EDH).

Patient diagnosis with Moderate HI + EDH at left temporal region and closed linear fracture at left temporal, suspect right lung contusion and closed fracture of lateral aspect of costae 2, 3 and closed segmented fracture of right posterolateral aspect of costae due to blunt chest trauma and punctured wound at labiomentale region and lacerated wound at vestibule of teeth 33-43 region. Then the patient was perform chest tube insertion at left costea 4-5 region from General Surgery Department and perform craniotomy evacuation from Neuro Surgery Department and was perform primary suture lacerated wound extraoral and intraoral from Maxillofacial region.

Case 2

A 25 y.o male patient came with bleeding from mouth. ± 10 hours prior to admission, when the patient was climbing tree while harvesting clove at his farm, then the patient lost his balance and fell down with mechanism his head hitted the ground first. history of unconsciousness (+) 15 minutes, nausea and vomiting (-), bleeding from mouth (+), bleeding from nose (+) and ear (-). Then the patient was brought to Private Hospital at Purwakarta and was performed wound toilet, suturing, Xray examination and CT scan, then the patient brought to Hasan Sadikin Hospital Emergency Department for further treatment.

Figure 4: Extraoraland intraoral presentation of the patient

From examination we fund aymmetrical face, odema and hematoma at both orbital, post situational suturing at right face with 12 cm in size, post situasional suturing at right forehead region with 10 cm in size and multiple abrassive wound at facial region.

Figure 5: CT Scan 3D : Discontinuity of right temporoparietal, frontal, inferior aspect of orbital rim, nasofrontal, zigomaticomaxillary bone and discontinuity of right body of mandible bone

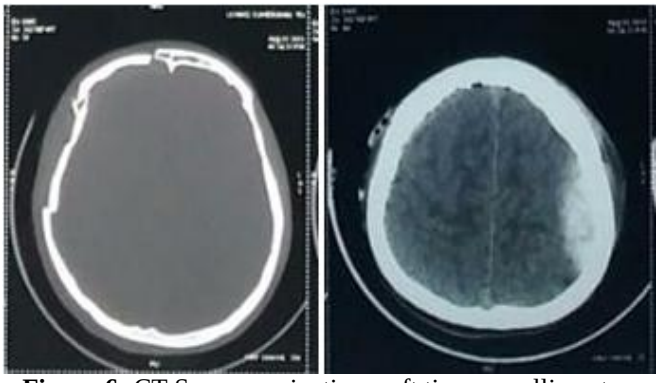

Figure 6: CT Scan examination, soft tissue swelling at right temporal, discontinuity of left temporal bone, sylvian fisure, ventricle and cisterna are compressed and there was fund hyperdense mass at right temporal.

Patient diagnosis with Moderate HI + Open depressed fracture > 1 tab at right temporoparietal, SDH at right parietal, Anterior skull base fracture, Panfacial fracture (right forehead, right zygoma, right maxilla, body of mandible)+ Fracture of palatum type 4+ Fracture segmented dentoalveolar at teeth 11 – 14 region. Then the patient was perform craniotomy debridemnt from Neuro Surgery Department and Primary suture lacerated wound extraoral and intraoral region and ORIF elective from Oral and Maxillifacial Surgery Department.

3. Discussion

There exists a threat to airway in the presence of maxillofacial trauma. Foreign bodies, blood and vomitus are commonly known to obstruct the airway. Apart from these, retropharyngeal haematoma may also cause a delayed airway compromise. Presence of retropharyngeal haematoma often indicates the presence of C-spine injury. Presence of head injury and facial injuries increases the likelihood of c-spine injury. Also, it has been suggested that patients with a GCS score below 8 have higher chances of sustaining a C-spine injury. ATLS suggests a complete immobilization of the patient with semi rigid collars, straps, tapes and backboard until the C-spine is cleared.

Glasgow Coma Scale is the most commonly used tool to assess the level of consciousness among the others. It is given by Jennet and Teasdale in 1974. The present 15 point scale was devised in 1976. It is used to assess the level of consciousness, aids in therapeutic and diagnostic decision making and also to assess the prognosis of TBI. The motor component of GCS alone is as sensitive as the total GCS score in predicting the severity of head injury. The association between TBI severity and GCS score is affected by age. In patients with similar TBI severity, the older patients have better GCS scores.

Table 1: GCS (Glassgow Come Scale)

EYE OPENING	SCORE
Spontaneous	4
To voice	3
To pain	2
None	1
VERBAL RESPONSE	**SCORE**
Oriented, normal conversation	5
Confused conversation	4
Words but not coherent	3
Incomprehensible sounds	2
None	1
MOTOR RESPONSE	**SCORE**
Obeys commands	6
Localizes to pain	5
Withdraws to pain	4
Abnormal flexion(decorticate posture)	3
Abnormal extension(decerebrate posture)	2
None	1

As a maxillofacial surgeon, these steps can we take to stabilise the airway

- High flow oxygen is given at15 litres/min.
- A jaw thrust should be performed.
- Chin lift or head tilt should be avoided if in case C-spine injury is suspected.
- An oropharyngeal airway is considered if the GCS<8.
- A nasopharyngeal airway should be avoided.
- If the patient is not breathing spontaneously but the airway is patent, manual ventilation should be provided with a self-inflating bag and mask.

- A laryngeal mask airway (LMA) should be introduced if GCS<8 and jaw thrust and manual ventilation are proving to be ineffective.
- Orotracheal intubation should be attempted only if one is confident of it, otherwise a cricothyroidotomy should be performed and the anaesthetist called for
- We should remember the dictum "Keep it simple- if intubation is not a skill you commonly perform, it is best not to attempt it"

To decrease the risk of raising the intracranial pressure (ICP) in head injury patients and to avoid secondary brain injury, Rapid Sequence Intubation is recommended. Following precautions are needed while intubating a patient with head injury:

- Positioning the patient in reverse Trendelenburg position at the time of intubation and immediately after intubation.
- Prevention of sympathetic response during intubation by liberal use of muscle relaxants and analgesics or sedatives.
- Avoiding aspiration.
- Avoiding hypoventilation as it can increase the intracranial pressure and hyperventilation as it may cause an increase in cerebral vasoconstriction.
- Avoiding hypoxaemia as it increases cerebral injury.
- Maintaining moderate hyperoxaemia (PaO_2 110–300 mmHg).
- Maintaining cerebral perfusion pressure (CPP) > 60 mmHg.

The frequency of cranial base fractures increases in proportion to the strength of the impact force on the cranium. Fistulas can also be found in maxillofacial trauma, also known as Le Fort III fractures without head trauma. Some fistulas can heal spontaneously. The most common cause of CSF fistula is the head trauma of patients due to motorcycle accidents. The reported incidence of cranial base fractures from non-penetrated head trauma is around 7% -24%, while those associated with CSF leakage are around 2% -20% after trauma.

Skull bones consist of Calvaria and cranial bases. Skull bones consist of several bones, namely frontal, parietal, temporal and occipital. Calvarium, especially in the temporal region, is thin and coated by temporalis muscle. The cranial base is uneven so it can injure the base of the brain while moving due to acceleration and deceleration processes. The base skull cavity is divided into 3 fossa; anterior cranii fossa, medium cranii fossa and posterior cranii fossa.

CSF Leak: CSF leak can happen because of trauma to ethmoid and its cribriform plate, frontal sinus, anterior skull base and orbital roof. Most of the times the patient presents with features like rhinorrhoea, otorrhoea, headache, decreased hearing sensation and a salty taste.CSF leak often occurs due to fractures of the anterior fossa and media from the cranial base. Sometimes fractures in the posterior fossa can extend through the os petrous to the middle ear, or through the clivus to the sphenoid sinus.

CSF identification can be carried out by several tests, including:

1. Glucose analysis

CSF must be examined immediately after being taken, to prevent fermentation. Nasal / lacrimal fluid, or mucosal secretion contains glucose <5 mg / dl. In conditions of meningitis or other pathological conditions glucose levels of 5-20 mg / dl, is also a false positive state between 45-75%.

2. Beta2-transferrin test

This test can only be done by electrophoresis and a minimum sample of 0.5 cc. Beta2-transferrin is only found in CSF and vitreous humor. Contraindications to liver and newborn disorders.

3. Test 'Hello sign

This test is used in the CSF condition which is mixed with blood. Drop the liquid on the linen, it will be found that the CSF will be outside and form a ring of blood or mucus that will be in the middle.

Possible complications in skull base fractures are infections. Meningitis is a serious complication of CSF fistula. In the untreated CSF fistula, the risk of meningitis is about 25%. The mortality rate for meningitis due to traumatic CSF fistula is around 10%. The risk of meningitis increases when delayed CSF leakage occurs and if CSF leakage is long or other infections occur simultaneously. The presence of basal bone fractures can connect between subarachnoid spaces and the outside world. The most common organisms found are Streptococcus pneumoniae and Haemophilus influenza. Provision of prophylactic antibiotics is still controversial. The prophylactic antibiotic that can be given is a combination of cotrimoxazole (trimethoprim-sulfamethoxazole) which will work in CSF and amoxicillin or penicillin which will work on the nasal mucosa.

Epidural Hematoma (EDH):

Epidural hemorrhage is focal head trauma which is most commonly found in the young adult age group, with an incidence of 2.7-4%. Epidural hemorrhage includes emergencies in the field of neurosurgery. The mortality rate due to epidural hemorrhage is 7-12.5%. Craniotomy in epidural bleeding is the most effective with a drastic healing rate.

The main factors causing epidural bleeding:

1) Rupture of the meningea media
2) Release of dura mater
3) Differences in pressure between bleeding pressure and intracranial pressure, and dura mater attachment around injury. In epidural hemorrhage, the blood coming out will clot and give a mass effect that increases intracranial pressure.

Some clinical features that can be found in epidural bleeding include:

1) Decreased awareness
2) Headache, nausea and vomiting
3) Patients with GCS <8, have an incidence between 22-56%
4) Patients who remain aware during a trauma before the operation, the incidence is around 12-42%
5) The prognosis is determined by the degree of decrease in patient awareness at the time of admission. Patients with GCS <5 have a mortality rate of 36%. This figure is much higher than patients with GCS 6-8 whose mortality is 9%.
6) Lucid interval is the condition of a patient who experiences a conscious episode between two unconscious episodes, which is a classic sign of epidural bleeding.
7) Asymmetric pupils and decreased light reflexes show signs of ota herniation. There is suppression or distortion of the oculomotor nerve which supplies the pupil on the ipsilateral side due to pressure of the uncus.
8) The asymmetrical location of the pupil is usually the same as the location of epidural bleeding
9) Hemiparesis usually occurs on the contralateral side due to uncus suppression and herniation of the cerebral peduncles. Under certain conditions, ipsilateral hemiparesis can be found and called the Kernohan phenomenon. This phenomenon occurs because the herniation of the uncus does not suppress the pedunculus structure beneath it, but pushes the brain stem contralaterally, so that the contralateral side of the cerebral pedunculus is pressed towards the edge of the tentorium.

Indications for epidural bleeding surgery

1) EDH> 30 cc Volume must be evacuated immediately, regardless of the GCS value
2) The characteristics of EDH below do not need surgery, and conservative actions can be taken:
   a. Volume <30 cc
   b. EDH mass thickness <15 mm
   c. Midline shift> 5 mm
   d. GCS value> 8
   e. There are no focal neurological deficits
3) Surgical time is immediately possible, especially if the patient presents with GCS <9 and anisocorous pupil is found

Subdural Haematoma (SDH): Around 30% of all TBI accounts to subdural haematoma. It can be acute, subacute or chronic based on the duration. Acute SDH are those that occur within 1-2 days of injury because of damage to the bridging veins, contusions, or penetrating brain injury. Subacute are usually 3-14-day-old. Any SDH older than 15 days are considered as chronic SDH. It occurs due to the rupture of the cortical veins. Long duration causes the haemoglobin and other proteins to break down. This attracts fluid because of the increased osmotic pressure, resulting in the displacement of the brain, thus leading to coma or death. A 50% of patients have a history of trauma. SDH shows crescent shaped appearance in the CT. Chronic SDH appears as isodense or hypodense in CT and acute SDH appears hyperdense. Patients with low GCS and neurological deficits should undergo surgery. Surgical options include burr-hole drainage, mini craniectomy or twist drill craniostomy.

Cerebral Contusions: Contusions within the brain substance are frequently associated with acute subdural haematomas. It accounts for around 40% of the total TBI. They may occur as a result of delayed bleeding. In CT, it appears as round hyper dense areas with some amount of oedema and a mild mass effect. It has to be operated if the ICP cannot be controlled or if there is worsening of the clinical conditions. Mortality associated with cerebral contusions is around 75%. Prognosis is worse if it is associated with subdural haematomas, or if it is bilateral.

Skull Fracture: Patients with cranial bone fractures with associated loss of consciousness have a high risk of intracranial haematomas. The term “Bursting fracture” is used when there is a complex fracture with radiating fracture lines with comminuated fragments and associated soft tissue laceration. In young patients with soft and malleable bone, the so called “ping pong fractures” are seen. Here the bone becomes dented without any laceration of the skin and the dura. Depressed skull fractures have a high chance of infection which is around 1.9-10.6%. A 90% of depressed fractures are open fractures. Temporal bone fractures have a risk of sensorineural hearing loss or vestibular symptoms. An 80% of these are longitudinal and 50% involve facial nerve. Cranial bone fractures are often associated with Cerebrospinal fluid (CSF) leak.

4. Conclusion

Many times, as maxillofacial surgeons, we encounter patients with maxillofacial trauma with concomitant head injury. Any patient with maxillofacial injury irrespective of whether it is associated with fractures or not, is always at a risk of traumatic brain injury. We should be able to suspect and diagnose head injury and also provide adequate initial management. Moreover all maxillofacial injury patients should then undergo neurosurgical observation and follow-up.

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