MANAGEMENT OF SEVER HEAD INJURY ASSOCIATED WITH POLYTRAUMA

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INTRODUCTION

Injury to the head may damage the scalp, skull or brain. The most important consequence of head trauma is traumatic brain injuries. Head injuries may occur either as a closed head injury. Or as a penetrating head injury. Both may cause damage that ranges from mild to severe head injury can be fatal because of performed brain damage.

Poly trauma is a medical term describing the conditions of person who has been subjected to multiple traumatic injuries such as a serious head injury and a serious chest trauma or abdominal trauma.

Trauma is the leading cause of death in individual younger than 45 years of age, injury related death account for 78% in all mortality in persons aged 15 to 24 years.

In civilian life, poly traumas are often associated with motor vehicle accident. This is because can accident usually occur at high velocity and subsequent injury is usually severe and consists of multiple damages.

Assessment of patient from head to toe repeatedly (vital signs, head, neck, chest, abdomen and extremities) and can be performed in less the 2 minutes allows placement of patients into management protocols according to severity of injury during early resuscitation.

On admission to hospital any trauma patient should immediately under go x ray diagnosis of cervical spine, chest and their pelvis. Commonly known as (trauma series) to ascertain possible lift threatening injuries. Once intial survey is complete, x ray can be taken on the limb to assess for other possible fractures. It is also quite common in sever trauma for patient to go straight to C.T. or surgery theater if they require emergency treatment.

Combination of major head and abdominal injuries are very serious, fatality was distinctly higher when surgery was anticipated in both region.

If the neurological condition of the patient is stable and there is small haematoma with no significant midline shift, the priority is paid first to the systemic injury which endangers his life.

If the neurological condition is unstable and C.T. shows large haematomas with midline shift and the condition is deteriorating, simultaneous operative procedures are performed. Cases of respiratory impairment due to haemothroax need urgent thoracotomy, also acute bleeding due to major abdominal trauma with rupture large vessels, liver , spleen are managed urgently either before or concomitant with operative evacuation of intracranial haematomas.

Rapid evaluation, resuscitation and prompt definitive surgical intervension is needed in polytraumatized patients to improve their survival, the efficiency of any trauma center to optimize care of multiple injured patient, depend on the following, early resuscitation and stabilization either at the scene or in the hospital, rapid transportation of victim to an appropriate trauma care facility. Rapid surgical intervention on team approach to both resuscitation and definitive care.

Aim of the work

The aim of this work is to study the management in head injury patients when associated with multiple trauma and the factors that affect such prognosis to avoid the deleterious affect of these combined injuries.

Biomechanics of Sever Head Injuries associated with multiple trauma

Understanding of the biomechanics of specific injuries is important to predict certain injuries pattern for specific types of trauma and subsequent management of these patients**.**

Brain damage can be classified by pattern and by time course, the pattern of damage one essentially separated into focal and diffuse varieties, it must be accepted that in many patients, the most accurate description may be a multifocal distribution. In the time course the differentiation is between primary damage developing at the moment of impact and secondary damage, due to subsequent complication, which may be intracranial or systemic insult.

Classification of injury for example, missile or non missile and open or closed injury:

First changes in speed. (acceleration deceleration) create shear strain injuries. Second deformity changes (stretch or compression) create tensile strain.

Two main mechanisms are responsible for damaging the brain, these are referred to as inertial or contract mechanisms. Inertial injury one commonly called " acceleration" or "deceleration" injuries. Which biomechanically can be considered as the same phenomenon.

The brain is damaged by one of two mechanisms:

1) Through strains produced within the brain tissue itself.

2) Through differentiation movement between the brain and the skull.

Three types of acceleration are recognized the most common and the most serious is angular acceleration (e.g. anterior to posterior) does not

produce diffuse brain damage but may cause a variety of focal and surface lesions.

Rotational acceleration in the horizontal place is a very damaging mechanism, producing both high surface forces and intracerebral damage, but it usually occur in association with angular acceleration. Contact injuries occur both at the site remote from the paint of impact an the head and result in skull fracture, and contusions.

Shear strain injuries can cause, fractures of the skull bone, brain contusion and intracranial bleeding.

Tensile strain injury can cause external chest compression leads to fractures of ribs, flail chest, pneumothorax, haemothorax, haemopneumothorax, pulmonary contusion and cardiac contusion.

Shear strain injury can cause aortic tear by differential acceleration cause mobile proximal aorta moves in relation to fixed distal aorta leading to aortic tear. Shear strain injury case tear of organs at the site of attachment or vascular pedicles secondary to deceleration injuries, spleen and liver is the most frequent, next kidney, small intensive, large intensive and mesentery. **.**

Direct compression forces to the abdomen can cause injuries to intra-abdominal organs by following mechanism :

1) Sudden, rise of intra abdominal pressure create by out wounds forces can cause rupture of hallow viscous and burst injury of a solid organ, the diaphragm may also rupture.

2) Compression of abdominal viscera between the applied forces to the anterior abdominal wall and the posterior thoracic cage or then vertebral column can produce crush injury to liver, spleen, pancreas and retro peritoneal structures.

3) External compression of pelvis is associated with fracture of bony pelvis and rupture of bladder or other pelvis viscera.***).***

Pathology and pathophysiology of sever head injuries associated with polytrauma:

I- Primary Head Injuries:

1) **Skull fractures**:

- **Vault**

x Linear

x Depressed

- basilar

2) **Focal Brain Injuries**:

- **Contusion**

Coup

Countercoup

Intermediate

- **Hemorrhage / haemotoma**

Epidural

Subdural

Intracerebral

petechial

3) Diffuse Brain Injuries:

- **Concussion**
- Diffuse axonal injury

II- Secondary damage:

1) Systemic Insult

2) Brain Swelling

Skull Fractures:

A skull fracture is a break in one an more paint of the bone in the skull caused by a head injury, isolated skull fracture are not very serious injuries,

but usually the presence of skull fracture indicates that significant enough impact occurred to cause brain trauma, which is quite serious.

Broken fragments of skull can lacerate or bruise the brain or damage blood vessels. If the fracture occurs over a major blood vessel, significant bleeding can occur within the skull, so head injury patients with skull fracture have many intracranial haematomas (especially epidural haematomas) than those without fractures. Another complication of skull fracture is dissection of cerebral arteries, which can limit blood flow to the brain. A fracture is which the skin also broken is called ancipen fracture or compound fracture,

Penetrating head injuries are those that cause a fracture in the skull an breach the dura mater, the outermost membrain of the brain's meninges**.**

Fracture of skull can be linear comminuted and basilar skull fracture.

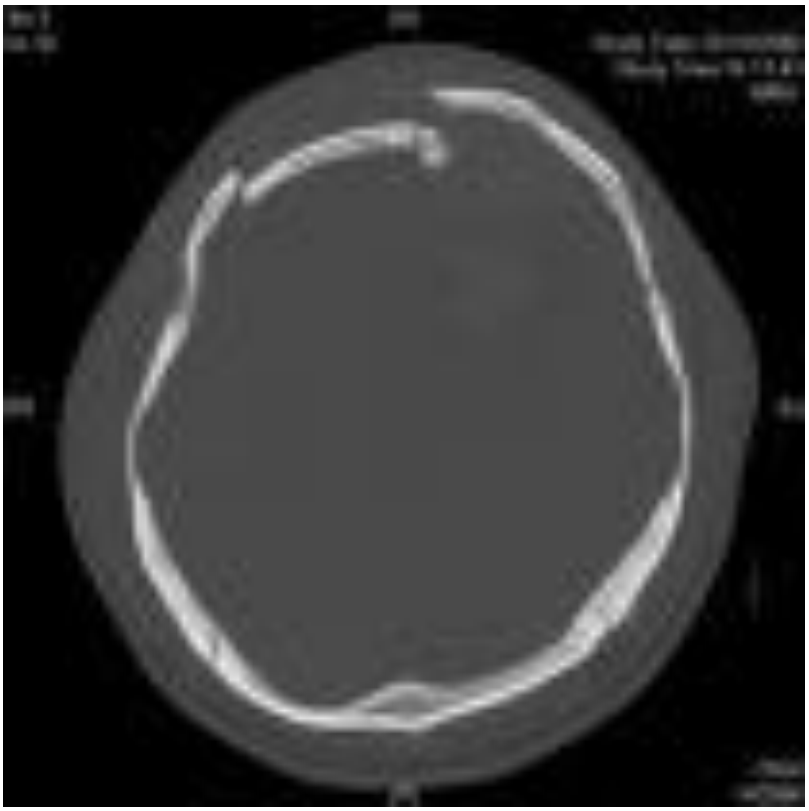
Linear skull fracture the most common type of skull fracture, occur in 69% of patients with sever head injury usually caused by widely distributed forces, linear fractures often occur when the impact cause the area of skull that was struck to bend inward, making the area around it buckle out wound. ***(Gilbert S. 2003).***

Comminuted skull fracture :

Those in which a bone is shattered into many pieces, can result in bits of bone driven into the brain, lacerating it depressed fracture a very serious type of trauma occurring in 11% of sever head injuries, are comminuted fracture in which broken bones are displaced inward. This type of fracture carries a high risk of increasing pressure on the brain, crouching the delicate tissue & in addition to infection.

Complex depressed fracture are those in which the dura mater in tern.

Depressed fractures can cause injury to the underlying brain, resulting in haemorrhage, focal deficits, post traumatic epilepsy.***(Shepherd S., 2004).***



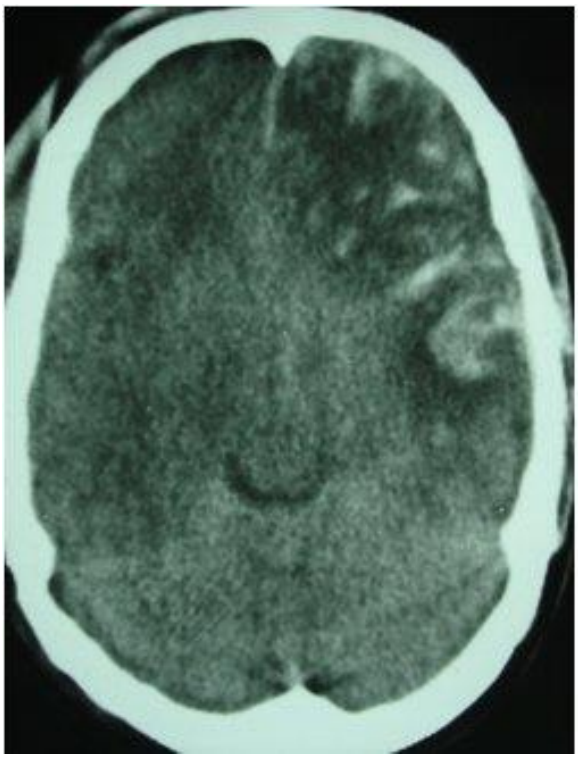
Basilar Fracture:

Most commonly result from extension of vault fracture but may arise from transmission of the force of a blow directly to a skull base. Common import paint far producing basilar skull fracture include occiput, mastoid, supraorbital area, facial or mandibular bones, and remote skull import points. Basilar skull fracture associated with infection and injuries to cranial nerves and blood vessels at skull base. ***(Dawnie A., 2001).***

Focal Brain Injuries:

Brain contusion:

A form of traumatic brain injuries like bruises in other tissues, cerebral contusion can be caused by multiple microhaemorrhage, small blood vessel leaks into brains tissue. Most frequently at the base of frontal and temporal lobes, as a result of surfaces of brain being "slapped" against the base of skull. Head C.T. of unconsciousness patients reveal that 20% have haemorrhagic contusion. ***(Boan R. and de Mantfor G.J., 2002).***



Coup contusions:

Occur immediately under the impact point caused by local skull bending or fracture caused by impact from a relatively small, hard object. These phenomena in turn subject the underlying cortical and pial vascular network to strains, cause bleeding at or near the brain surface.

Damage is likely to occur when the skull is " rebounding " from the impact and the vessels are under tensile strain. ***(Veber JT., Muas AIR., 2007).***

Counter Coup Contusions:

Occur by two mechanisms impact effect " cavitation effect " or impact is not necessary " inertial loading " . angular head motion are capable of producing tensile strains in regions throughout the brain. It the tensile strains that result are greater than the vascular tolerance in a given region, contusion occurs, or occur on impact the brain moves toward the impact site creates an area of negative pressure directly opposite the point loading, this negative pressure directly opposite the point loading, this negative pressure may in turn case damage by exceeding the tensile strength of fluid component of the brain. This phenomenon, termed cavitation, with high incidence in frontal and temporal lobes. ***(Suatman KE, Duhaime AC et al., 2008).***

Intermediate Coup Contusions:

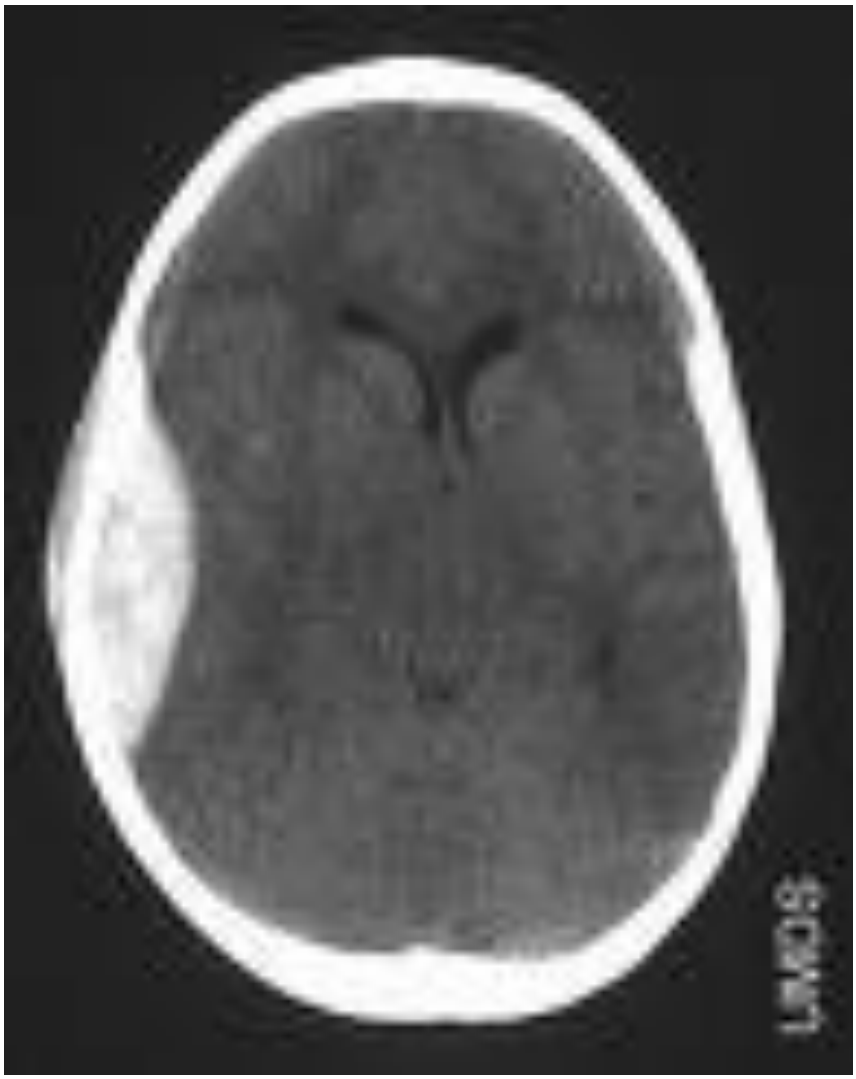
Although the mechanism of these lesions has not been studied extensively, it is likely that they are due to strain concentrations resulting from impact-generated stress waves or from inertial generated brain movements resulting in focal compression or tensile strains respectively leading to vascular disruptions of brain surface that are not adjacent to the skull. ***(Soatman KE, Duchaime, et al., 2008).***

Epidural haematoma:

Is build up of blood occurring & located between the dura mater & skull. The condition is potentially deadly because the build up of blood may increase

pressure in the intracranial space and compress delicate brain tissue. 15 to 20% of patient with epidural haematoming die due to injuries. ***(Singh J and Stack A., 2006).*** Usually result from tear in a meningeal artery, most commonly the middle.

They also result from fractures occurring the remains sinuses. Most common sites temporal or frontal region and are associated with an overlying skull fractures, the association of skull fractures, the association of skull fracture with an epidural haematoma occurs in 65 to 90% of patients. ***(Sanders Mjaud Mckema K., 2001).***



The size of those haematomas depends on several variables including, have tightly the dura adhera to the inner table of the skull, have deeply meningeal arteries are incorporated into the inner table of skull and have large the lacerated meningeal artery. Associated traumatic brain lesion include Subdural haematomas and cortical contusion in about anethird of many cases. ***(Shepherd S., 2004).***

There are two special types of epidural haematomas should be briefly maintained those that are located in the posterior fossa and those bilaterally.

Posterior fossa epidural haematoma seen to be more common in infants and children than in adult.

Bilateral haematomas. Which are typically bifrontal, also more commonly in children and are venous origins.***(Singh J and Skock A., 2006).***