Diagnosis & management
Of
Pediatrics head injuries

A thesis submitted for complete fulfillment of master degree in general surgery

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ABSTRACT

Injury is the leading cause of death for children and adolescents in the United States and most developed countries. Of these deaths, about forty percent are the result of traumatic brain injury (TBI). (*Monica S, et al., 2010*)

Although most pediatric head injuries are mild and involve only evaluation or brief hospital stays, CNS injuries are the most common cause of pediatric traumatic death. (*Ward J D., 1996*)

Single most reliable examination for evaluating the outcome in children less than 3 years of age is ocular examination, as ocular functions are fully developed by two months of age. (*Praveen khilnani., 2004*)

Key words:

Head injuries-pediatrics-diagnosis & management-the outcome

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ABBREVIATIONS

EMS: Emergency Medical Services

CNS: Central Nervous System

PNS: Peripheral Nervous System

CSF: Cerebrospinal fluid

ICP: Intracranial pressure

MmHg: Millimeters of mercury

CPP: Cerebral Perfusion Pressure

CBF: Cerebral Blood Flow

CVR: Cerebro-Vascular Resistance.

MAP: Mean Arterial Pressure

JVP: Jugular Venous Pressure

TBI: Traumatic Brain Injury

MV: Motor Vehicle

DAI: Diffuse Axonal Injury

GCS: Glasgow Coma Scale

PCS: Pediatric Coma Scale

PTA: Post-Traumatic Amnesia

LOC: Loss Of Consciousness

Mins: Minutes

GSF: Growing skull fracture

aka: Also known as

EDH: Epidural hematoma

SDH: Subdural hematoma

PTSDH: Posttraumatic subdural hematoma

SAH: subarachnoid hemorrhage

TAI: Diffuse (traumatic) axonal injury

CT: Computed Tomography

NMDA: N-methyl-D-aspartate

ABG: Arterial blood gases

ED: Emergency Department

AMPLE: Allergies, Medications currently used, Past illnesses, Last meal, and Events/environment related to the injury

ABC's: Airway, Breathing, Circulation

OCR: oculocephalic (doll's eye) reflex

OVR: oculovestibular (caloric) reflex

DTR:Deep tendon reflexes

CBC: Complete Blood Count

MRI: Magnetic Resonance Imaging

BVM: Bag-valve-mask

RSI: rapid sequence induction

IOP: Intraocular pressure

OR: Operation Room

IV: Intravenous

PICU: Pediatric ICU

PGCS: Pediatric Glasgow Coma Scale

CSIs: Cervical spine injuries

ICU: Intensive Care Unit

Pediatric Definitions:

The definition of a pediatric patient for the purposes of San Mateo County EMS (emergency medical services) protocols is age less than 15 years or a length-based weight (per Broselow Tape) of 36 kg or less. Patients who are known to be less than 15 years of age but whose weight exceeds 36 kg may still be considered pediatric patients given their chronological age; however weights will then need to be estimated and adult dosages should be used. [1]

The following are age classifications of pediatric patients that may assist in assessment and management of pediatric patients:

- Neonate: newborn up to first 28 days of life
- Infant: comprises neonatal period up to 12 months
- Toddler: 1-3 years
- Pre-school: 3-5 years
- School-age: 6-10 years
- Adolescent: 11-14 years

Anatomical considerations

Anatomy of pediatric head differs from that of adult so knowledge of the basic anatomy of the pediatric head, brain & its coverings is essential to understand the mechanism & types of traumatic brain injury in pediatrics. [2]

The scalp is the outermost covering and is highly vascular, tending to bleed profusely when lacerated. Under the scalp is a tendentious sheath extending from frontal to occipital regions called the galea. The potential space beneath the galea is the subgaleal compartment which an occasional site of bleeding after head injury. [3]

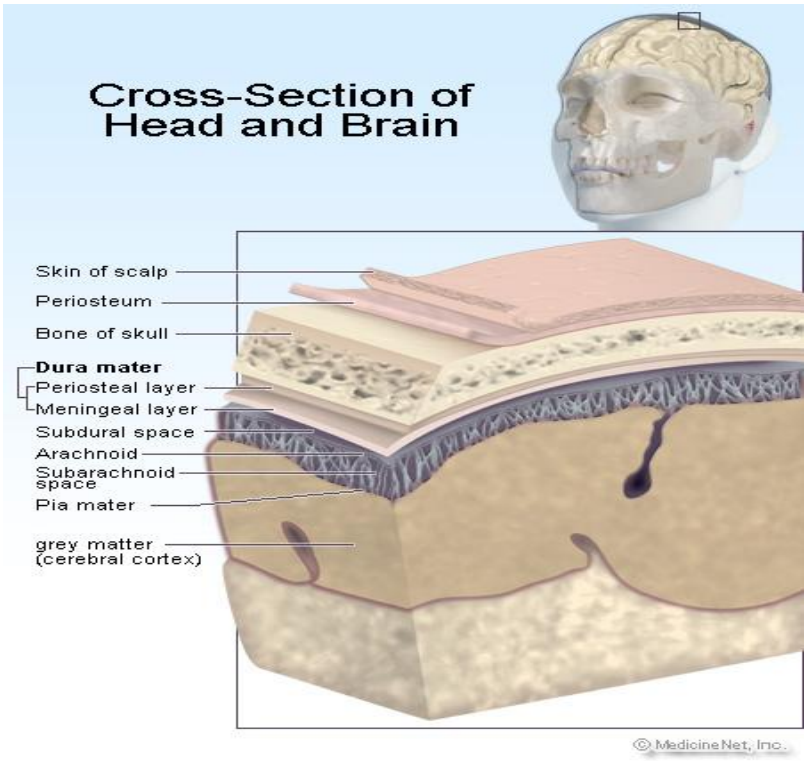
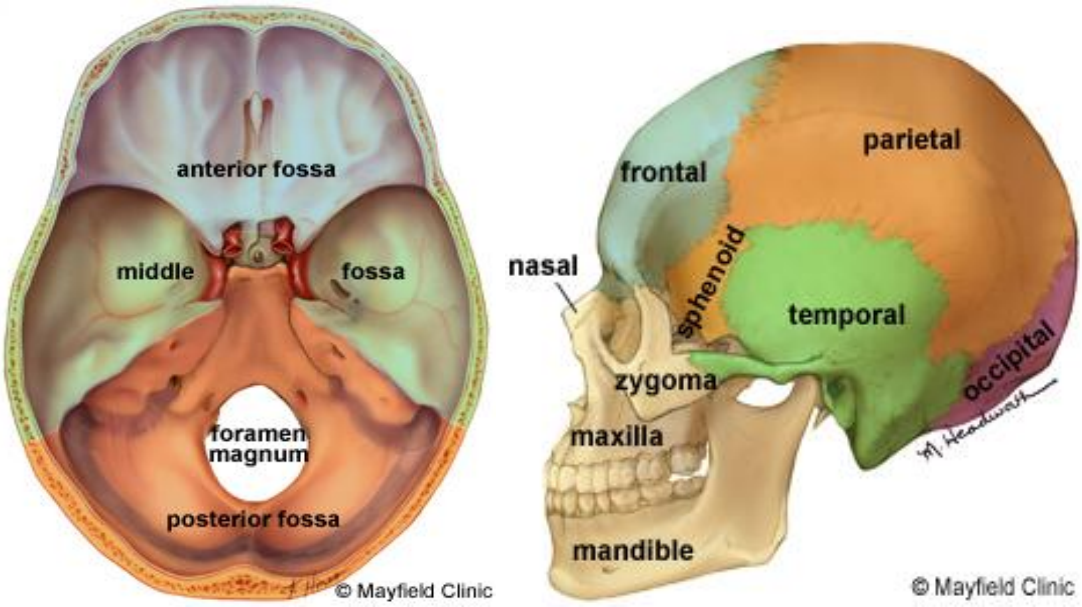


Figure 1-1: Cross section of head and brain [4]

Skull

The purpose of the bony skull is to protect the brain from injury. The skull is formed from 8 bones that fuse together along suture lines. These bones include the frontal, parietal (2), temporal (2), sphenoid, occipital and ethmoid (Fig. 1-2). The face is formed from 14 paired bones including the maxilla, zygoma, nasal, palatine, lacrimal, inferior nasal conchae, mandible, and vomer.



Inside the skull are three distinct areas: anterior fossa, middle fossa, and posterior fossa (Fig. 1-2). [5]

Anatomy of the newborn skull:

The skull at birth is large in proportion to the other parts of the skeleton, the bones of the cranial vault are smooth & unilaminar and no diploë is present, the two tables & intervening diploë appearing about the fourth year.

The lines along which the individual bones meet one another are, for the most part, very irregular & are frequently serrated like the edge of saw. These immovable joints are termed sutures. [6]

Sutures allow the bones to move during the birth process. They act like an expansion joint, allowing the bone to enlarge as the brain grows and the skull expands, resulting in symmetrically shaped head. However if any

of the sutures close too early (fuse prematurely), there may be no growth in that area. This may force growth to occur in another direction, resulting in an abnormal head shape.

Some sutures extend to the forehead, while others extend to the sides and back of the skull. One suture in the middle of the skull extends from the front of the head to the back. The major sutures of the skull include the following:

- Metopic suture: extends from the top of the head down the middle of the forehead, toward the nose. The two frontal bone plates meet at the metopic suture.
- Coronal suture: extends from ear to ear. Each frontal bone plate meets with a parietal bone plate at the coronal suture.
- Sagittal suture: extends from the front of the head to the back, down the middle of the top of the head. The two parietal bone plates meet at the sagittal suture.
- Lambdoid suture: extends across the back of the head. Each parietal bone plate meets the occipital bone plate at the lambdoid suture. [7]

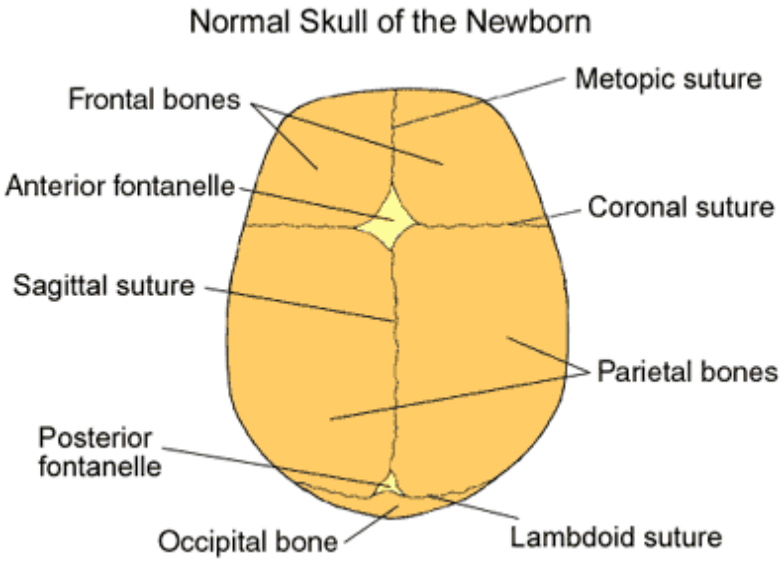


Figure 1-3: the normal newborn skull [8]