HEAD INJURY

- Presented by Dr.Pravin Verma

HEAD INJURY- SCALP, SKULL, BRAIN

SCALP→
SURGICAL ANATOMY→

SKIN→ dense, many sebaceous lands

CONNECTIVE TISSUE→ binds skin with aponeurosis, contains nerves & vessels-anchored to dense fibrous septa cross it- so profuse bleeding as no retraction of vessels

APONEUROSIS (GALEA APONEUROTICA)→ dense
Ant- cont with frontalis muscle, atttached to eyebrow & nasal bridge
Post- cont with occipitalis muscle, attached to occipital bone
Lat- cont with temporalis fascia, attached to zygomatic arch

LOOSE AREOLAR TISSUE→ emissary veins connecting scalp veins to dural venous sinuses- dangerour layer of scalp for chance of spread of inf from scalp to meninges & brain

PERICRANIUM→ loosely attached to bones except at sutures, so cephalohaemattoma takes shape of underlying bone

SCALP WOUNDS

- Profuse bleeding
- Cellulitis
- Examine with gloved hands thoroughly, scrub with savlon/ soap water, shave half of scalp or at least 5-7 cm around wound, look for
- Extent of wound, bruise, laceration, fracture, neurological examination, X- ray- to rule out depressed X
- Turniquet circumferentially, & pressure
- Debridement under LA/ GA, arrest bld with cocker's, ligate with chromic catgut
- Vertical icision as vessels run vetically
- Suturing- upper three as single & aponeurosis sep for larger otherwise single layer, interrupted non absorbable
- INF OF SCALP→ cellulitis, tetanus, gas gangrene, subperiosteal pus collection- pott's puffy tumour, osteomyelitis, sinusitis, meningitis, subdural abscess, intracerebral abcess

FRACTURE OF SKULL-VAULT

- VAULT→
- CLOSED→ Scalp intact, bruised or grazed
- OPEN→ scalp lacerated- inf meningitis, brain abscess
- MECHANISM→
- COMPRESSION OF SPHERE→ skull compressed against flat surface- spherical skull becomes more ovoid- linear x starts at point of maximum convexity through thin area of bone- may extend to base also
- LOCAL INDENTATION→
- LARGE OBJECT- close pond depressed x –scalp bruised, skull indented, but no damage to dura, bruising of brain but no laceration
- SMALL OBJECT- Compound/ open depressed x, scalp lacerated, x depressed > inner table lacerating dura & brain. Risk of inf & epilepsy from scar
- TANGENIAL INJ→ Horse- shoe x, rare

FRACTURE OF SKULL-VAULT

- TYPES→

1. LINEAR X- CRACK FISSURE→
- By compression of sphere- distortion of skull
- Very common
- May extend base of skull to ACF, MCF,PCF
- Linear x of squamous temp bone-EDH from MMA

2. SIMPLE & COMMINUTED LINEAR X, closed→
- X itself is not a problem as it is closed
- p/o EDH/ SDH
- Ass accelerating/ decceleraing 1* brain inj

3. DEPRESSED X→ open- inf, closed risk of
- Dural tear
- Pressure on cerebral cortex
- Intracerebral h'hage- ^ ICT- cerebral compression
- Epilepsy by laceration healing by scarring
- Pressure on dural venous sinuses- ^ ICT- cerebral compression
- Risk of h'hage while elevation

FRACTURE OF SKULL-VAULT

- Rx→
- LINEAR X WITHOUT DISPLACEMENT→ No Rx, only search for EDH, Brain inj-acc/ decc
- LINEAR X COMMINUTED- WITH X FRAGMENTS→ Absolutely detached & contaminated fragments removed, otherwise not disturbed if not digging & causing brain damage
- COMPOUND X→ Prophylactic Abs for 10 days

- DEPRESSED X→

- CLOSED/ OPEN
- Shave scalp, exclude neurological deficit

- LACERATED SCALP→ debridement least necessary (needed to cover)

- DEPRESSION→> inner table- neeed to elevate x= Burr hole in nearby N skull- adson's elevator- remove completely detached/ contaminated fragment- look for dural inj, dural sinus inj & brain inj

- DURAL TEAR→torn or bulged & plum coloured=SDH– incise dura- stop SDH– remove ragged duralmargin if any– interrupted non abs suture closer

- DURAL LOSS→ repair by transplant from pericranium/ fascia lata if not contaminated, 2* healing if contaminated

FRACTURE OF SKULL-VAULT

- H'HAGE FROM DURAL VESSELS→ Catch with artery forceps ligate/ diathermy cauterize. Larger vessels under run with suture. Still oozing- temporalis muscle graft

- DURAL TEAR INVOLVING DURAL VENOUS SINUS→ Small- pericranium sutured over it. Large- temporalis muscle graft, oxyseal

- ASSOCIATED WITH BRAIN INJ→ wide exposer to see extent of brain damage. debridement to remove all devitalized erebral tissue, extravaseted blood, foreign body, detached fragment of bone. Irrigation & suction to clean

- SKULL RECONSTRUCTION→ Skull fragment cleane & replaced or mouleded tantalum plates/ acrylic inlays after 3-6 months

FRACTURE OF SKULL-BASE

- Linear x from vault may extend to base
- ACF→

- epistaxis, CSF/ brain mater rhinorrhea
- H'hage in orbital cavity- black eye= lower & upper eyelid echhymosis. subconjunctival h'hage with no post limit. Proptosis
- I nerve tear- partial/ otal anosmia if bilat
- No damage to II Cranial nerve
- III CN tearing/ damage-pupilary dilatation
- IV nerve damage- impaired upward mov of eyeball
- V nerve ophthalmic division damage- anaesthesia in eyelid area
- VI CN damage- internal srabismus

MCF→

- CSF/ brain mater otorrhea
- Bleeding from mouth
- Epistaxis if nasal sinnus affected
- VII & VIII CN inj
- Occ VI CN inj

FRACTURE OF SKULL-BASE

- PCF→
- subоccipital h'hage- swelling in nape of neck
- Echhymosis of tip of mastoid process= battle's sign
- IX, X & XI CN damage at jugular foramen
- XII CN escapes

IMP OF X→

- linear x of squamous temporal bone- inj to MMA- EDH
- Compound x- inf
- Depressed x- dural in & rain inj
- X base skull- inj to CNs except II & XII. Complete tear- immediate, permanent. Compression by clots- after few days, temporary. Scar/ callus- after a weak, permanent. Ass with bleeding & CSF leakage
- Intracranial aerocele

BRAIN INJURY

- PRIMARY→ At the of impact- diffuse neuronal lesion

- SECONDARY→ contusion, laceration, oedema, congestion, intracranial haematomas- ICH, SDH, EDH, IVH→blockade of CSF→ ^ ICT→ cerebral compression

- MECHANISM OF 1* BRAIN INJURY→

- Brain in skull is tightly packed, falx & tentorium. So distorsion or displacement of brain in calverium causes inj

- 1. Movement of brain in skull- accelerating= assault/ deccelerating= RTA
- 2. when blow is from front- post displacement of cerebral hemisphere against brainstem
- 3. when head struck from behind / side of front- cerebral hemisphere of one side moves against another- inj to corpuss callosum, junctional tissue of commissure
- 4. grey mater moves over white mater- tearing nerve cells & axons- inj is diffuse & far from site of impact

BRAIN INJURY

- MECHANISM OF 2* BRAIN INJURY→
- CONTUSION & LACERATION→ by rough inner surface of skull & edges of falx & tentorium

1. inf surface of rontal lobe- by floor of ACF
2. Temporal lobe- by sharp sphenoid ridge
3. Occipital lobe- by meeting point of falx & tentorium
4. Corpus callosum- against falx
5. Cerebral peduncles- against tentorium

- EFFECTS OF CONTUSION & LACERATION→
- PTA- post traumatic amnesia. Mild- < 4 hrs,. Mod- 1-24 hrs. Seve- 1-7 days. RTA also seen
- Cerebral irritation
- Post contusional syndrome- headache, nausea, vomitting, delirium, depression, lack of concentration
- Jacksonian type post traumatic epilepsy
- Focal center damage- anosmia,- lower frontal lobe, hemianopia & blindness- occipital lobe, ataxia & nystagmus- cerebellum
- H'hages- SAH, ICH, IVH, SDH, congestion oedema, swelling→ ^ ICT→ Cerebral compression

- ICH- SDH, EDH, ICH

BRAIN INJURY- STAGES

CEREBRAL CONCUSSION→

- brief temp loss of fn, no organic damage
- Impaired concentration, confusion, dizziness, fall down, cold clammy skin, pale, imperceptible pulse. lasting from 1 min to half an hr, hrs to days
- Causes- not known theories are-
- 1. pressure transmission through CSF to floor of 4th ventricle
- 2. abrupt stretching of delicate ant & pos perforating arteries
- 3. compression of brain causes emptying of vessels
- 4. molecular change in brain stem & hypothamus

CEREBRAL CONTUSION→

- sheering damage to the nerve cells & axons sup in cortex or deep beween grey & whit mater
- Bruising & haemorrhage due to tearing of small blood vessels in brain substance
- Brain oedema & congestion- swelling

CEREBRAL LACERATION→

- brain surface is lacerated/ torn with effusion of blood in CSF by inj by depressed x, bony ridges or dural folds
- Other thing contusion, oedema, sheering of nerves are also +nt
- Laceration is more sever in opposite to impact- counter coup inj
- Effects- necrosis, gliois, fibrosis, scar, post traumatic epilepsy

BRAIN INJURY- STAGES

- CEREBRAL COMPRESSION→

CAUSES-

1. contusion, laceration, SAH, ICH, IVH, (oedema, congestion)— brain swelling-- ^ ICT
2. ICH- EDH, SDH-- ^ ICT
3. Compression of lat ventricle-- < CSF removal

EFFECTS→ coning of brain= herniation of brain through tentorial hiatus- supratentorial, through foramen magnun- infratentorial

SUPRATENTORIAL CONE→ compression of contralateral uncus (medial part of temporal lobe)

- Ipsilateral III nerve irritation then palsy- hutchinson's pupil
- Compression of contralateral motor pathways- contralateral hemipareses
- Compression of RAS- unconciousness

INFRATENTORIAL CONE→ complete paralysis

CEREBRAL CONCUSSION VS COMPRESSION

- Unconsciousness from the time of inj
- Temp low
- Pulse- rapid, thready
- BP- normal, slight low
- Resp- slow, shallow
- Pupils- slighly dilated, equal, reacting to light

- two periods of unconciousnes with lucid interval
- Temp- raised
- Pulse- slow, bounding
- BP- raised
- Resp- slow, deep, chyene stokes
- Pupils- hutchinson’s pupil
- Last
- Contralateral hemiparesis

ICH- INTRACRANIAL HAEMATOMA

- May result from artery, vein, venous sinuses
- Supratentorial-ICH, SDH, EDH
- infratentoriaL
- ICH→

- Less common, less imp
- Causes→
- 1. surface laceration of brain
- 2. central artery rupture- IVH- hyperthermia, epileptic fits, localized paralysis
- 3. aneurysm/ a-v malformation rupture- alarming h'hage
- 1-10 days lucid interval
- Small haematomas mimic tumours
- CT scan & angiography
- Removal necessary if in ant part of frontal/ temporal lobe

SDH- SUBDURAL HAEMATOMA

- 6 times more common than EDH
- Common in elderly- brain atrophy, so more space for brain movement in skull

- CAUSES→
- 1. Laceration of cortex with arterial or venous bleeding
- 2. rupture of superior cerebral veins in subdural space (as they are anchored inf to arachnoid mater & sup to dura. In between free
- Impact from front or back
- In elderly trivial trauma
- 50 % bilateral

- S/S→
- Often ass with sever 1* brain damage, so no clear lucid intrval. Concussion followed by deep unconciousness early
- Level of unconciousness deepens quicker
- s/s more evident, may be bilateral
- Subacute SDH- headache- ever & unduely prolonged, mental apathy, slowness to respond, coma
- Chronic SDH- too late, when pt forgets head inj

- Rx→ immediate surgical evacuation
- Burr hole has no role
- Exploratory craniotomy

EDH- EXTRADURAL HAEMATOMA

- Blood in extradural space
- Usually unilateral
- In children & young
- Clear cut lucid interval

- CAUSES→
- 1. MMA or ant or post branch of it rupture- bld in MCF
- 2. MMV- MCF bld
- 3. PMA- bld in PCF
- 4. AMA or Internal maxillary artery- bld in ACF

- MECHANISM→ MMA leaves bony canal of squamous temporal bone at pterion & enters extradural space, then pierces dura
- - trivial inj to temporal sq (by cricket, foot ball) – X/ without X of bone – dura driven inside– stretches MMA- rupture– bld– goes to
- 1. outwards- subtemporal haematoma= boogy swelling beneath temporalis muscle
- 2. below- MCF
- 3. upwards- seperating dura from skull- EDH-- ^ ICT—cerebral compression

EDH- EXTRADURAL HAEMATOMA

- SYMPTOMS→
- h/o lateral blow
- Children or young
- h/o concussion then N concious
- Lucid interval. Absent in c/o sever prim brain inj or too rapid bld
- Pt becomes again unconcious
- h/o alcoholism, opiod poisoning, uremia, DM should be ruled out

EDH- EXTRADURAL HAEMATOMA

- SIGNS→
- Temporal swelling
- two periods of unconciousnes with lucid interval
- Temp- raised
- Pulse- slow, bounding
- BP- raised
- Resp- slow, deep, chyene stokes
- Pupils- hutchinson's pupil→ ipsilateral pupilary contriction, floowed by dilatation. Later with cerebral compression contalateral pupil constricts, late- both puils dilate & fixed
- Hemiparesis-
- 1. contralateral hemiparesis from above downwards (comp occuring below upwards, body represented in reverse manner
- 2. ipsilateral paresis when coning as crus is compressed as decussation in medulla
- 3. decerbrate rigidity when both crus compressed

EDH- EXTRADURAL HAEMATOMA

- POST BRANC OF MMA BLD→ no initial paralysis, all others same
- VENOUS EDH→
- - sss bld
- - unilat/ bilat leg weakness due to compression of both motor cortex
- Rx→ surgical evacuation of haematoma
- How to decide side of surgery
- 1. temporal haematoma side
- 2. x side
- Pupil dilating first side
- opp to shift of calcified ppineal glad shift on x- ray

BURR HOLE

- DISADV→
- Uselee in SDH, blind in EDH
- Exact side difficult to decide
- Countre- coup inj
- STEPS OF TEMPORAL BURR HOLE→
- Verticle incision at pterion- 3 cm in size between external angular process & external auditary meatus, 2'' above zygomatic arch
- Skin, ct, ga, temporalis fascia, tem muscle, temporal bone
- Burr hole
- Black currant jelly- EDH
- Craniectomy- enlarge burr hole with bone nibbler
- Evacuate EDH
- Search for bleding- cauterize/ under run suture/ plug bony canal by bone vax
- If dural sinus torn- temporalis muscle graft
- PARIETAL BURR HOLE→ 4 cm behind & above EAM
- FRONTAL BURR HOLE
- OPP SIDE BURR HOLE- COUNTRE COUP INJ

CRANIOTOMY WITH OSTEOPLASTIC FLAP

- Wider exposer with less time
- U shaped flap in scalp with base downwards
- Make 5 or more burr holes in imaginary line
- Lift osteoplastic flap
- Use curved deceptor to separate dura from skull
- Make outward bevel, so no slipping in

Mx OF HEAD INJURY PT

- CASUALTY Mx→
- Short h/o injury mech, concussion, unconciousness, ent bleeding, fits, paresis
- G/E→ conc status, TPR, BP, neck inj, chest inj, abd inj
- Mx of ABC, D
- Detailed neurological examination with GCS-glassgow coma scale

GCS-GLASSGOW COMA SCALE

EYE OPENIG→
Spontaneous-4
To speech-3
To pain-2
Nil-1
VERBAL RESPONSE
Oriented-5
Confused conversation-4
Inappropriate word-3
Incomprehensible sounds-2
Nil-1
BEST MOTOR RESPONSE
Obeys-6
Localises-5
Withdraws-4
Abnormal flexion-3
Extention respose-2
Nil-1
3-6- sever
7-11- mod
12-15- mild

Ix

- X-RAY SKULL→ AP, LAT BOTH RT & LEFT
- X- ind for admission
- Depressed x- sx
- Linear x in sq temp- EDH
- Calcified pineal gland-midline shift-ICH
- Intracranial FB/ air
- Ass face inj
- CT SCAN→
- ICH ALL WITH EXACT LOCATION
- Bone, clot, tumour- white
- Brain- grey
- Oedema-dark motteled
- Air, ventricular fluid- black
- CARTID ANGIOGRAPHY→ to find bleeder, av malf
- USG→ HAEMATOMAS, MIDLINE SHIFT
- ICT- ci in > ict

INDICATIONS FOR ADMISSION

- Pt requiring obsevation for 24 hrs
- Pt may need neurosurgery
- Unconscious pt
- h/o vomitting/ headache/ ent bld/ convulsions
- Skull x
- Focal neurological signs
- Pt with alcohol intoxication or ass medical conditions-DM, uremia

GENERAL NURSING CARE

- POSTURE- to prevent bed sore
- Mouth care
- Bladder
- Bowel
- Nutrtion
- w/f TPR, BP 4 hrly, I/O chart, temp chart, unconciousness level

DETERIORATION OF LEVEL OF CONCIOUSNESS

- SEARCH FOR causes of cerebral compression- EDH, SDH, Cerebral oedema
- Hypovolemic shock
- Inadequate ventilation
- Meningitis

MEDICAL Mx

- OSMOTIC AGENTS→Osmotic diuresis—lower ICT
- 1. mannitol- 20% 250 ml in 20-25 min IV
- 2. frusemide 40-80 mg IV
- STEROIDS→ no clear role, reduce ICT, dexa/ betamethasone 60 mg/day
- HYPERVENTILATION→ to keep PaCo2 20-25 mmHg– vasoconstriction- < ICT
- BARBITURATES→ < cerebral blood flow, < met demand, supress EEG changes. Probl- CV supression

INDICATIONS FOR SURGERY

- CEREBRAL COMPRESSION IMPENDING/ ESTABLISHED