NEUROSURGERY

The Highlights

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PURPOSE

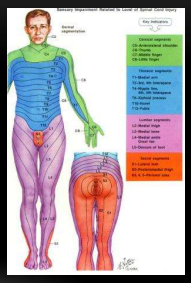
- Demystify neurosurgical topics for the primary care physician
- Give a basic "game plan" for what to do when patients requiring neurosurgical consult come in to your practice
- Provide a "lifeline" when management questions come up

WHEN CALLING A NEUROSURGEON

- Be able to define the clinical problem
- Have some test or imaging to back up your running diagnosis
- If someone has an urgent issue (brain tumor, hemorrhage cord compression or cauda equina) call us right away so we can get started on fixing the patient before the problem progre$$es

NEUROANATOMY

- Motor pathways cross in the Medulla at the Pyramidal Decussation
- Pain and temperature sensations are non myelinated at the nerve level & information crosses in the cord within 3 levels
- Joint position & light touch travel up cord to cross in Medulla, cephalad to PD
- Have a working knowledge of the dermatomes & myotomes



GLASCOW COMA SCALE

- Consciousness has 2 components: Arousal & Content. Impairment of arousal varies from somnolence to coma
- Coma is the inability to obey commands, speak or open the eyes to pain
- GCS helps follow consciousness & prognosticate outcome at 6 months from head trauma.
- Scale ranges from 15 to 3. Nobody with a GCS > 8 meets the definition of comatose.

Glasgow Coma Scale

Best eye response (E)	Spontaneous—open with blinking at baseline	4
	Opens to verbal command, speech, or shout	3
	Opens to pain, not applied to face	2
	None	1
Best verbal response (V)	Oriented	5
	Confused conversation, but able to answer questions	4
	Inappropriate response; words discernible	3
	Incomprehensible speech	2
	None	1
Best motor response (M)	Obeys commands for movement	6
	Purposeful movement to painful stimulus	5
	Withdraws from pain	4
	Abnormal (spastic) flexion, decorticate posture	3
	Extensor (rigid) response, decerebrate posture	2
	None	1

BRAIN BLEEDS

- Intraparenchymal hematomas
- Subdurals
- Epidurals
- Subarachnoid hemorrhage
- Contusions

Workup: Neuro exam, CT / CTA, coags & drug screen

Management: intubate if necessary, control hypertension, reverse coagulopathy & dialogue with NS or Neurology

INTRAPARENCHYMAL HEMATOMAS

- Roughly 12% of all strokes
- Hypertension, drugs, coagulopathy, tumors, & vascular malformations
- Symptoms: HA, N/V, paralysis, ataxia, altered LOC
- Workup: Neuro exam & CT. CTA to rule out AVM or tumor hidden in clot, coags, drug screen
- Management: Intubate in ER if necessary, reduce BP if elevated (Cardene), reverse coagulopathy, probably discuss with NS or Neurologist

ACUTE SUBDURAL HEMATOMA

- **Acute** – trauma, anticoagulants, elderly
- impact damage from trauma may be associated with contusions or depressed skull fractures
- CT shows crescentic white mass
- If small (< 10 mm) without neuro deficit it is ok to watch in the ICU. Otherwise, emergent surgical evacuation. Mannitol & hyperventillation (pCO2 32-35) may help buy time for an hour.

SUBACUTE SUBDURALS

- 4-21 days old blood clot. Vascularized "membranes" develop around the hematoma to help reabsorb it. Water from CSF is osmotically drawn to the high protein clot which can make an initially small acute SDH enlarge.
- History of progressive weakness, ALOC, HA, N/V & may not remember a specific traumatic event
- Twist drill, burr holes vs. crani for decompression

CHRONIC SUBDURALS

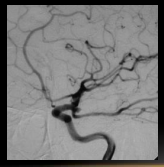
- 3 weeks and older. The clot is dark on CT
- Elderly & anticoagulated. Often don't recall any traumatic event
- May be found incidentally, but often have vague neurocognitive changes, weakness, HA, N/V, dysphagia, SZ
- Treatment for symptomatic or >10mm thick can include AEDs, reversal of anticoagulation, twist drill evacuation or formal craniotomy

EPIDURALS

- Head injury with lucid interval before ALOC; N/V, SZ & deficit / death.
- Initial CT is telling – lenticular.
- Emergent craniotomy for evacuation if hematoma > 15mm thick or neuro deficit present. Smaller EDH can be watched with serial CTs & frequent neuro checks in the ICU.

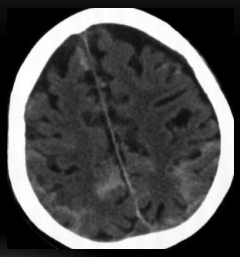
SUBARACHNOID HEMORRHAGE: VASCULAR

- Vascular – no history of trauma and the SAH will be in the parenchyma of the brain or in the basal cisterns. Aneurysms, AVMs, vasculitis & tumors are common, so CTA is warranted. It is a good idea to call the neurosurgeon when the initial CT suggests vascular etiology



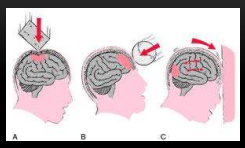
SUBARCHNOID HEMORRHAGE: TRAUMATIC

- Traumatic –SAH will be along the cortex and the patient will have a history of trauma. Common in ER. Most won't require calling a neurosurgeon if it is the only injury & GCS is 14-15.
- Consider giving a little decadron for the meningeal irritation and nausea



CONTUSIONS

- Traumatic. Frontal & temporal most common
- Workup: neuro exam. CT, coags, drug screen
- Management: if small & GCS 14-15, can street after observation. Contusions can "blossom" , so serial CTs warranted for the first 48 hours if kept in hospital. Discuss with NS or Neurology if considering whether to keep or discharge because initial CT & history help stratify risk



SKULL FRACTURES

- Head trauma
- Look for underlying acute subdural / epidural hematomas & contusions
- If the depression of the skull is greater than 1 cm or associated with deficit / seizure, take to OR for emergent elevation of depressed fragments and I & D of scalp
- Linear, nondisplaced skull fractures can usually be followed. Watch for fractures going across sinuses & MMA

BRAIN TUMORS

Mets > gliomas > meningiomas

Most tumors have a proclivity for a given location in the brain, so location and MRI appearance dictate pathology

Signs and symptoms vary by location

MR W / WO imaging of choice, CT is usually first imaging in ER

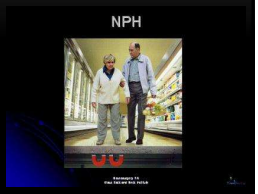
Treatment: call NS. Biopsy, craniotomy, SRS, WBRT, Chemo

HYDROCEPHALUS

- Communicating or non-communicating – is there something obstructing the flow of CSF within the brain?
- Congenital anomalies, tumors & blood clots cause obstructive, non communicating hydro
- Treatment: EVD emergent temporary fix in the ICU or ED. VP / VA shunt for longer term management. ETV for aqueductal stenosis

COMMUNICATING HYDROCEPHALUS: NPH

- NPH common cause of communicating hydrocephalus – not enough CSF being reabsorbed by arachnoid granulations
- Triad of magnetic gait, urinary incontinence and neurocognitive / personality changes in patients > 60 yo
- Common cause of dementia 10% -- memory impairment & slow thought
- Workup: brain MRI without contrast & high volume LP (30ml) with normal initial opening pressure. High volume tap may improve symptoms for a day or so



SPINE TRAUMA

- Clinical spinal stability – ability under physiologic loads to limit displacement so as to prevent injury or irritation of cord and nerve roots
- Spinal level = most caudal level with 3/5 strength and intact pain & temperature
- Spinal shock due to interruption of sympathetics and unopposed parasympathetics

SPINE TRAUMA

- Management considerations:
  - ABCDE
  - Immobilized in collar / board
  - Maintain BP with dopamine etc.
  - CT, CTA & MRI useful imaging
  - Steroids are an option, but not a standard or guideline
  - Dialogue neuro/spine surgeon

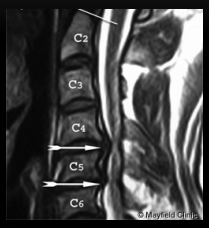
SPINAL INFECTIONS

Discitis – back pain more often seen in chronically ill, postop spine surgery or IVDA. Sed rate and CRP will be very high. MRI is impressive, but can get confused with other pathological entities. CT or fluro guided biopsy to identify organism. PICC line for 6-12 wks of ABX monitored by ID

Epidural abscess – workup & management similar to discitis. If the abscess compresses the cord or cauda equina, emergent decompression is needed. Large epidural abscesses or those that don't clear with ABX also need debridement.

HERNIATED DISCS

- Can cause nerve pain, numbness, weakness, axial spinal pain – or an incidental finding
- MR or CT myelogram useful. EMG/NCS
- Pts can tolerate conservative treatment for several weeks if it is pure radiculopathy
- Cord compression, myelopathy & deteriorating neuro exam require NS eval
- Treatment: PT, OMT, steroids, epidurals, pain & spasm Rx, surgical decompression – hopefully minimally invasive



SPINAL TUMORS

Location dictates pathology: Bony, extradural, intradural/extramedullary & intramedullary

S/S: axial, radicular or non-dermatomal pain. Numbness / paresthesias / weakness / incontinence

Workup: MR, CT, myelogram, bone scan, LP

Treatment may include steroids, biopsy, surgical resection and spinal reconstruction, chemo, radiotherapy or SRS

SPONDYLOSIS

Arthritis progressively compressing cord & nerve roots

Cervical spondylitic myelopathy is the most common cause of myelopathy in pts > 55 YO.

Imaging: > 30% of canal diameter is compromised, AP diameter <8mm, cord signal on T2 or bananna shaped cord

Treatment: anterior vs. posterior surgery

CONCLUSION

- Neurosurgical issues often require rapid workup because clinical condition can deteriorate
- Keep calm
- Neuro exam, CT & MRI go a long way towards the workup
- If you have any thought of calling a neurosurgeon, do it.
- I can be reached at Hawaii Brain and Spine (808) 744-6638. We have clinics in Kailua, Ewa Beach, Hilo, Kona and Kauai.

REFERENCES

- Greenberg M S, Handbook of Neurosurgery (5th ed), Thieme. New York. 2001
- Andrews B T (editor), Intensive Care in Neurosurgery, Thieme. New York. 2002
- Rengachary S S, Ellenbogen R G (editors), Principles of Neurosurgery (2nd ed), Elsevier Mosby. Edinburgh. 2005