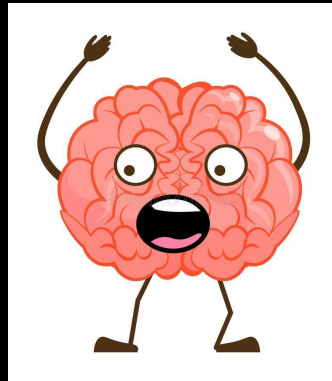


Neurosurgical Emergencies for the Hospital Provider

Step 1: Don't Panic!



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Austin, TX Metro Area

Disclosures

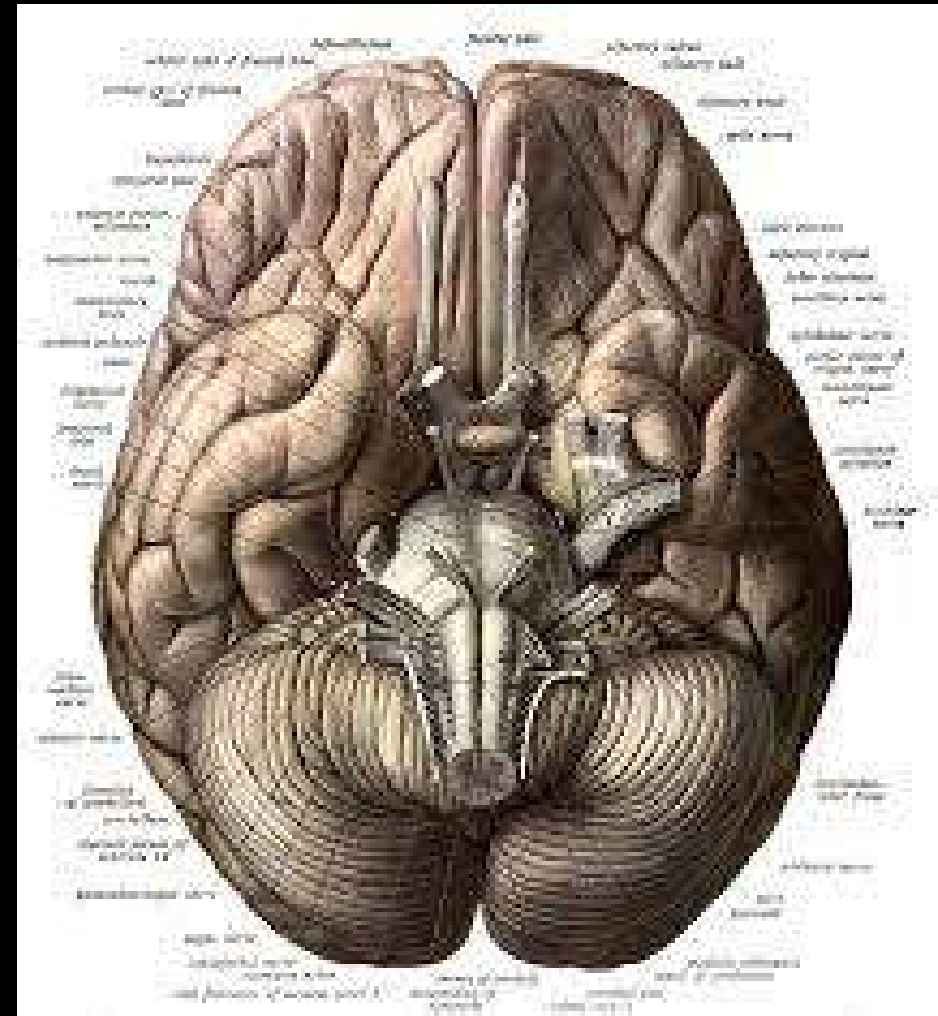
- I have no relevant relationships with ineligible companies to disclose within the past 24 months.

Educational Objectives

- Identify and work up common neurosurgical emergencies/urgencies
- Be comfortable performing and communicating a basic neurological exam
- Communicate effectively with neurosurgery providers

Overview

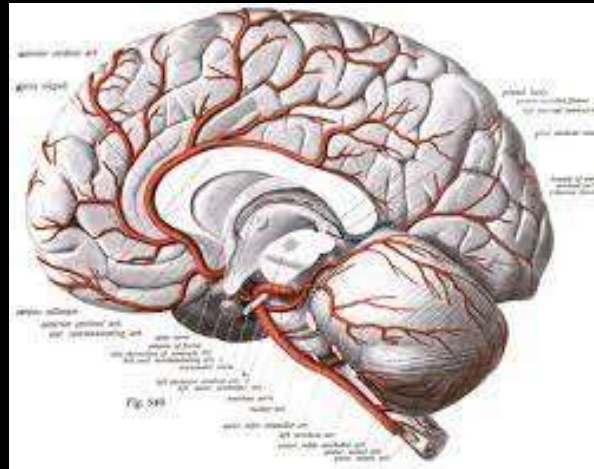
- What is neurosurgery?
- Goals of neurosurgical operations
- The neuro exam
- Common neurosurgical emergencies
- Falls in hospital
- High-Yield Imaging Review



What is neurosurgery?

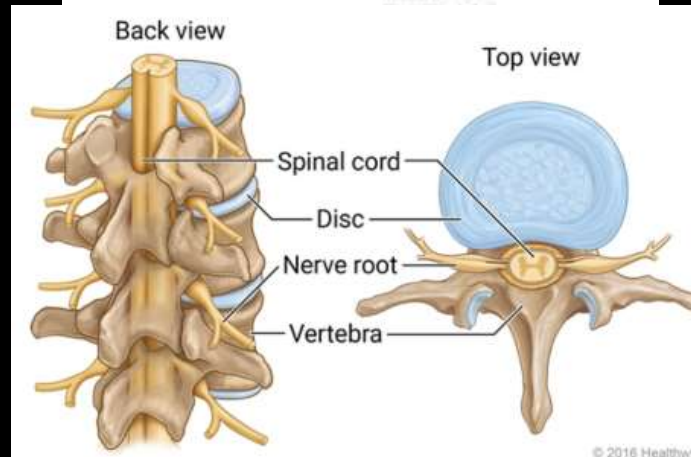
- Brain/head

- Trauma
- Tumors
- Hydrocephalus
- Vascular lesions
- Chiari malformation
- Cranial nerve compression
- Stimulators (DBS, RNS)



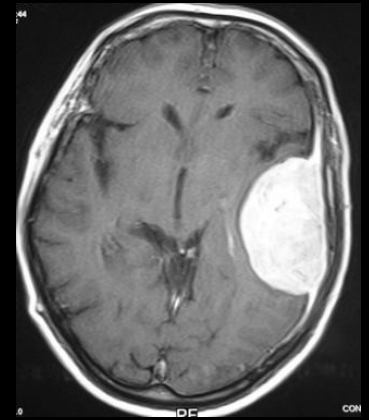
- Spine

- Trauma
- Degeneration
- Nerve compression
- Tumors
- Mis-alignment (scoliosis, kyphosis)
- Stimulators (Spinal cord stim)
- Vascular lesions (rare)



Major Goals of neurosurgical operations (simplified)

- Take out a bad thing
 - Tumors, hematomas, vascular lesions
- Decompress a good thing that's being compressed
 - Like the brain (hematoma, tumor, Chiari)
 - Spinal decompression (of the cord, or spinal nerves)
 - A cranial nerve (as in trigeminal neuralgia)
- Fix a broken thing
 - Skull and spine fractures

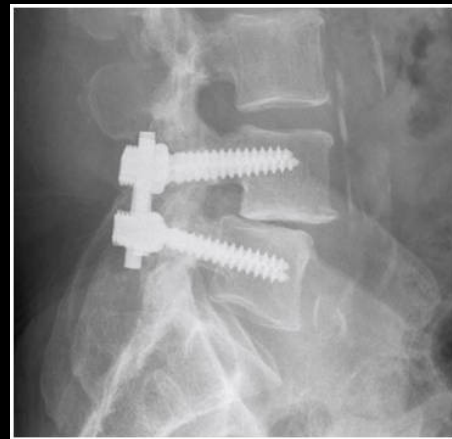


Major Goals of neurosurgical operations (simplified)

27



W 89 : L 55



- Wash out a dirty thing
 - Infections; skull fractures through a sinus; foreign objects
- Fix the plumbing
 - Hydrocephalus, CSF leaks
- Implant a good thing
 - Spinal instrumentation (screws, rods)
 - Spinal cord stimulators
 - Deep brain stimulators (DBS)

Pupils reactive?

Hemiparesis?

Alert/oriented?

Facial droop?

Normocephalic?

Leg weakness?

The neurological exam

Arm weakness?

Aphasia?

Foot drop?

Ptosis?

GCS?

Confusion?

Go from head to toe!

****Sedation/pain meds on board?****

- Mental status
- Cranial nerves
- Extremities



Go from head to toe!

****Sedation/pain meds on board?****

- Mental status
- Cranial nerves
- Extremities



**** No sedation or pain meds****

- OE, R, F/C
- PERRL EOMI TML F=
- MAEW 5/5

Usually only need to communicate a **focused** exam, based on the patient's history

Examples of neurosurgical issues to call about

- Cranial patients

- A new brain mass/lesion (w/o new deficit)
- Incidental findings (aneurysm, Chiari, arachnoid cyst, meningioma)



Notify surgical team, can usually wait till morning.
(*hold dexamethasone*)



- Spine patients

- Back or leg pain (in isolation is not an emergency)



Notify surgical team, can usually wait till morning.

Examples of neurosurgical issues to call about

- Post-op cranial surgery

- Oozing of wound
- Sudden high drain outputs (was the pt mobilized?)
- Suspected CSF leak



Notify surgical team,
consider waiting till
morning.



- Post-op spine surgery

- Uncontrolled pain
- New limb pain
- Positional headaches (?CSF leak)



Notify surgical team,
consider waiting till
morning.

Examples of neurosurgical emergencies

- Cranial issues

- Acute hematomas
- Mass lesions with new deficit
- Infections (brain abscess)
- Hydrocephalus with new deficit/MS change
- Stroke with potential need for decompressive surgery



Call surgical team ASAP!

- Spine issues

- Cauda Equina syndrome
- Fractures with new neuro deficit
- Epidural abscess with new neuro deficit
- Epidural hematoma



Call surgical team ASAP!

* Pain is NOT a neurological deficit!*

Examples of neurosurgical emergencies

- Post-op cranial surgery
 - Acute change in mental status
 - Seizure
 - New major weakness/hemiparesis



STAT non-con CT scan
(rule out **bleeding!**)

- Post-op spine surgery
 - New major limb weakness (not subtle)

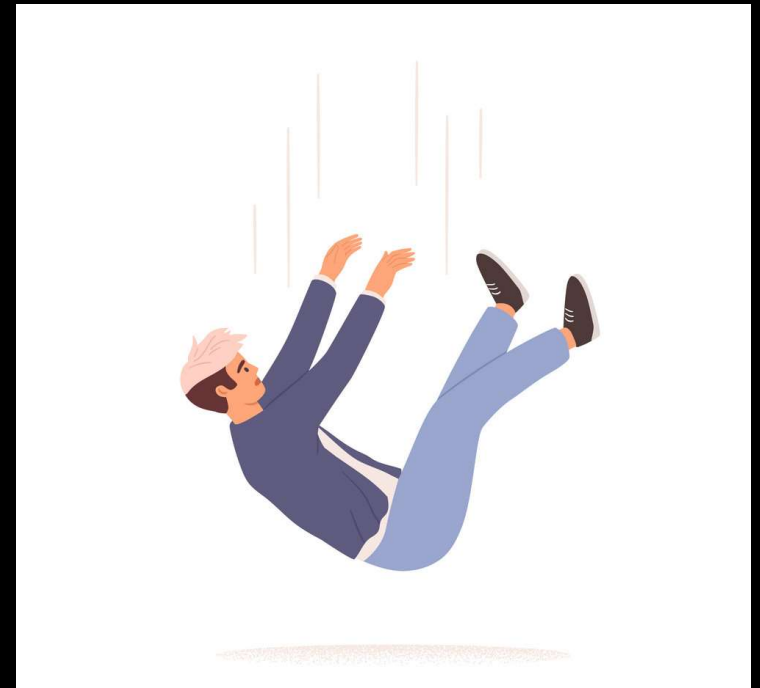


May be STAT CT or MRI
(discuss with surgical
team)

Falls – a *potential* neurosurgical emergency

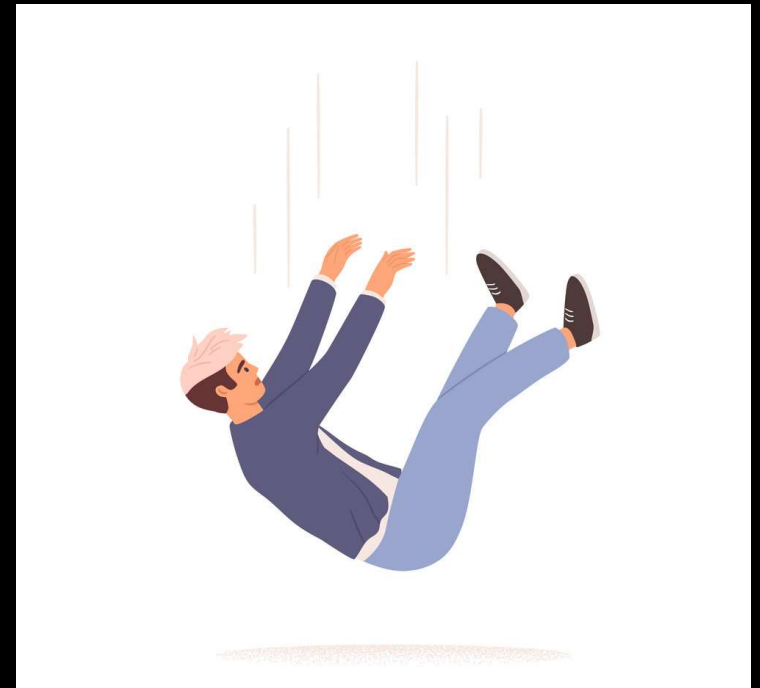
If a patient falls while in the hospital, find out:

- Head strike?
- LOC?
- How exactly did they fall?
- Complaining of pain anywhere?
- Lacerations (examine their head!)
- Blood thinners? (hold!)



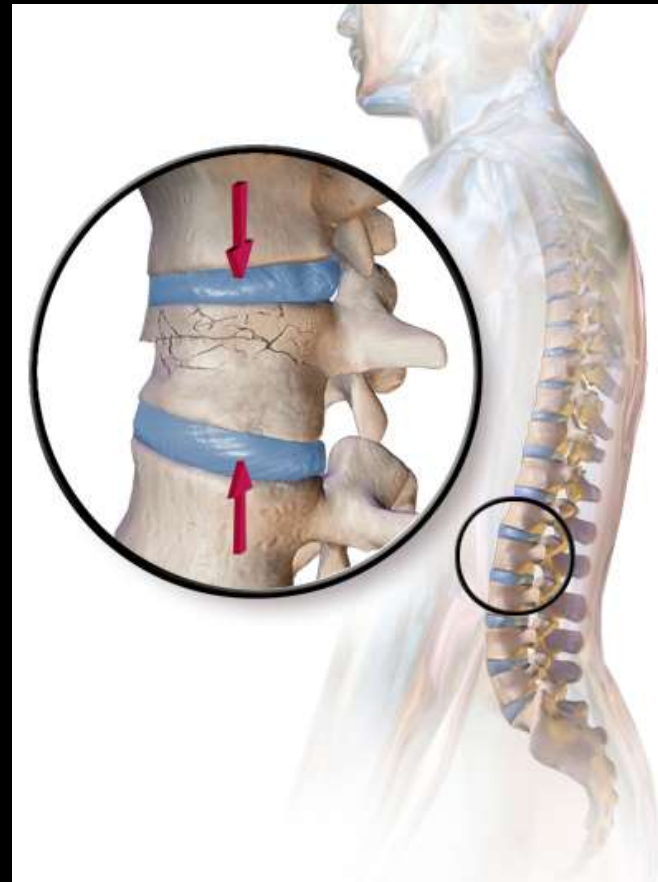
Falls – a *potential* neurosurgical emergency

- STAT Head CT if
 - Head strike
 - LOC
 - New signs of trauma (black eye, lac)
- Spine X-rays (AP/Lateral) if
 - Recently post fusion
- Spine CT if
 - C/o pain in neck or back
 - Point tenderness



Falls – a *potential* neurosurgical emergency

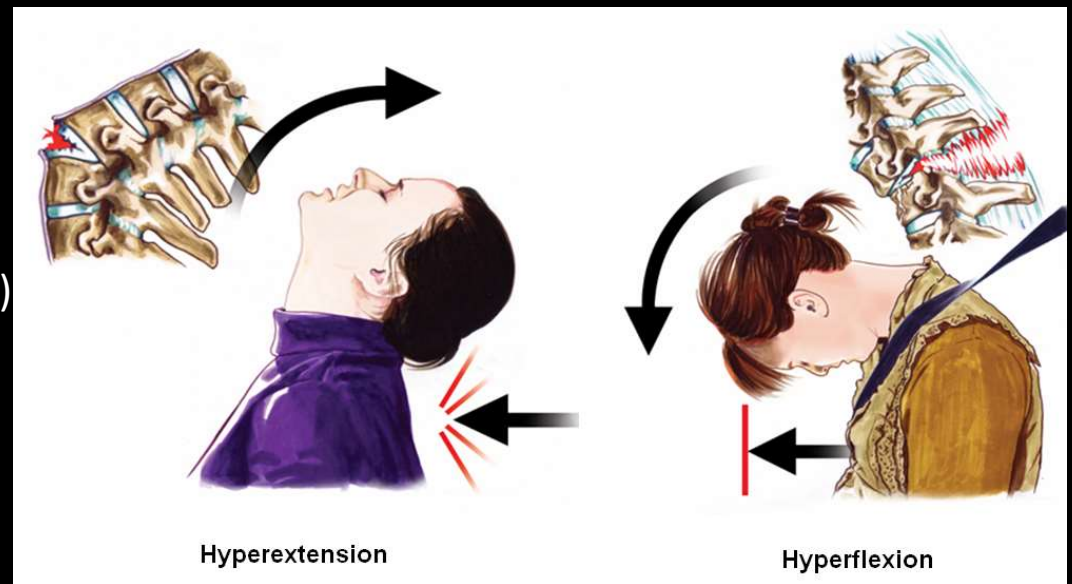
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Axial loading injury (ex: fall onto buttocks) in elderly pts with brittle bone can lead to a compression fracture

Falls – a *potential* neurosurgical emergency

- STAT Head CT if
 - Head strike
 - LOC
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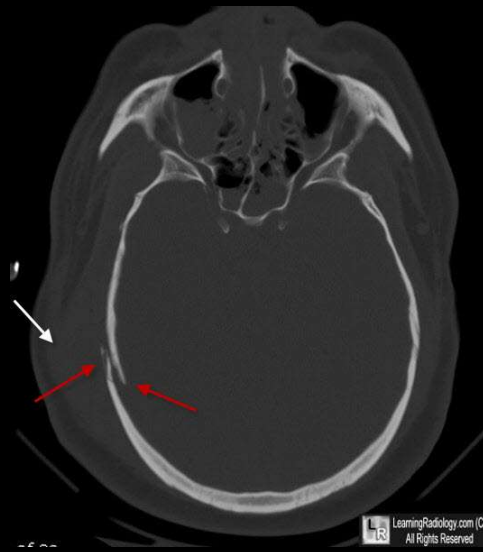


Mechanism is important – these mechanisms can cause fractures in elderly or sick patients with brittle bone

Head Strike



Traumatic subarachnoid hemorrhage



Skull fracture



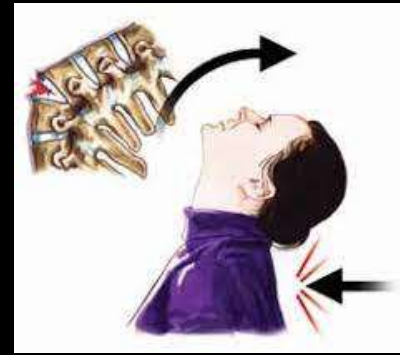
Subdural hematoma



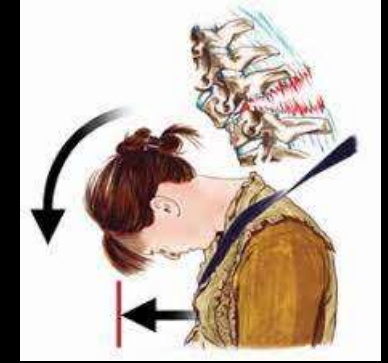
Epidural hematoma



Axial load (fall onto buttocks)



Neck hyperextension



Neck hyperflexion



Compression fracture



Burst fracture



Odontoid fracture



Teardrop fracture

Falls and Cervical Collars

After a fall, if the patient has:

- ✓ No intoxication
- ✓ No focal neuro deficit
- ✓ No painful distracting injuries
- ✓ Normal level of consciousness
- ✓ No midline posterior tenderness to palpation



C-collar is not needed, and further imaging is not needed.
(NEXUS Criteria for cervical collar clearance)

Falls and Cervical Collars

After a fall, if the patient has:

- New neck pain
- New neuro deficit
- Tenderness to palpation
- Neck pain on range of motion



Place collar, and obtain a cervical spine CT scan!

High-Yield Imaging Review – CT

- Head CT (non-con) is the standard for quick imaging of the head in an emergency



Normal head CT

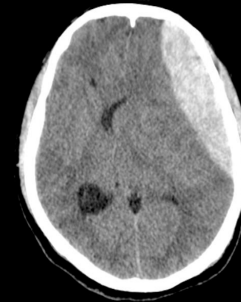
High-Yield Imaging Review - Head



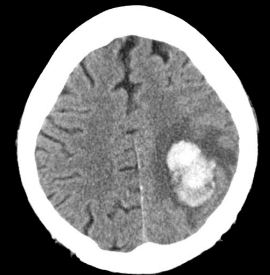
Normal



Subdural hematoma



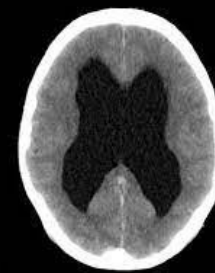
Epidural hematoma



Intraparenchymal hematoma



Intraventricular hematoma



Hydrocephalus



Stroke *

High-Yield Imaging Review - Head



Initial head CT can be **NORMAL**
in acute ischemic stroke!



MRI shows ischemic stroke
(Diffusion sequence)

High-Yield Imaging Review - Spine



MRIs showing
spinal epidural
hematomas
(emergencies!)

High-Yield Imaging Review – Spine



Compression fracture (XR)

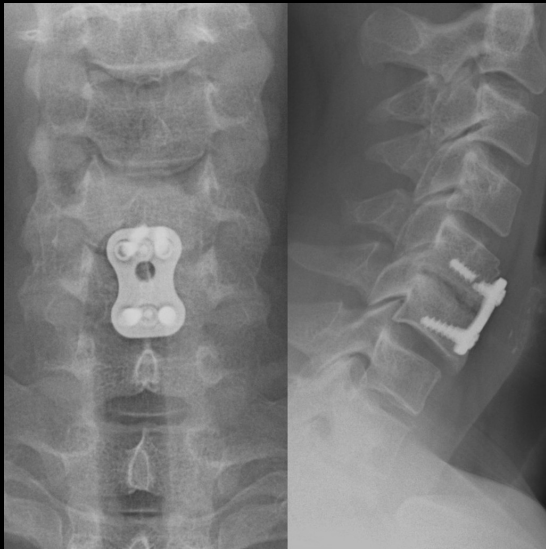


Compression fracture (CT)

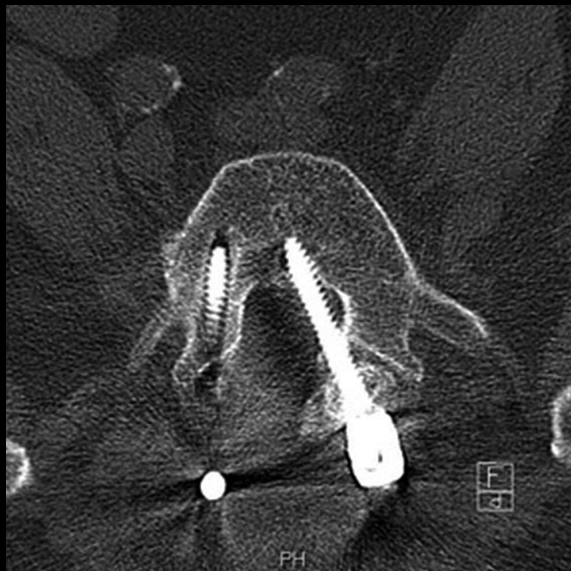


Odontoid fracture (CT)

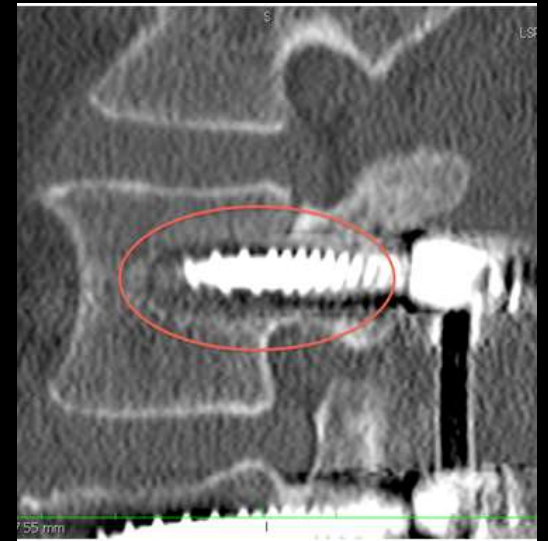
High-Yield Imaging Review – Spine (post ops)



Broken screw (XR)



Misplaced screw (CT)



Loosening screw (CT)

Summary

- A **focused neuro exam** is key to identifying neurosurgical emergencies on the hospital floor.
- For the post-op neurosurgical patient, **bleeding** is often the thing to worry about first
- Falls can be minor or major; try to find out how they fell, head strike?, and what imaging is needed (can be in conjunction with surgical team)
- Review NEXUS criteria to know who needs a C-collar
- Head CT (non-con) is the imaging of choice for cranial emergencies (except sometimes for ischemic stroke)
- Spine imaging - X-rays, CT, or MRI may be appropriate depending on situation
- Pain (by itself) is not an emergency

References/Further Reading

- 1) <https://radiopaedia.org/articles/intracerebral-haemorrhage?lang=us>
- 2) <https://radiopaedia.org/articles/intracranial-haemorrhage?lang=us>
- 3) <https://www.ahajournals.org/doi/10.1161/strokeaha.113.003701>
- 4) Shahrokhi M, Asuncion RMD. **Neurologic Exam**. [Updated 2022 Jan 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557589/>
- 5) Hoffman JR, Wolfson AB, Todd K, Mower WR. **Selective cervical spine radiography in blunt trauma: methodology of the National Emergency X-Radiography Utilization Study (NEXUS)**. Ann Emerg Med. 1998 Oct;32(4):461-9. doi: 10.1016/s0196-0644(98)70176-3. PMID: 9774931.
- 6) Moeri M, Rothenfluh DA, Laux CJ, Dominguez DE. **Cervical spine clearance after blunt trauma: current state of the art**. EFORT Open Rev. 2020 Apr 6;5(4):253-259. doi: 10.1302/2058-5241.5.190047. PMID: 32373348; PMCID: PMC7197104.
- 7) McMordie JH, Viswanathan VK, Gillis CC. **Cervical Spine Fractures Overview**. [Updated 2022 May 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-
- 8) Rajashekar D, Liang JW. **Intracerebral Hemorrhage**. [Updated 2022 Feb 10]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK553103/>

Thank you!



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