

FEx Net 2022 Collated SAQs- Head, Face + Neck Trauma

Answers

- | | |
|--------------------------------|-------------------------------|
| 1. <u>Blast Injuries</u> | 26. <u>Neck Injury</u> |
| 2. <u>Cental Cord Syndrome</u> | 27. <u>Neck Injury</u> |
| 3. <u>Dental Injury</u> | 28. <u>Spinal cord Injury</u> |
| 4. <u>Dental Injury</u> | 29. <u>Spinal cord Injury</u> |
| 5. <u>Dental Injury</u> | 30. <u>Spinal cord Injury</u> |
| 6. <u>Facial Burn</u> | |
| 7. <u>Facial fracture</u> | |
| 8. <u>Facial Fracture</u> | |
| 9. <u>Head Injury</u> | |
| 10. <u>Head Injury</u> | |
| 11. <u>Head Injury</u> | |
| 12. <u>Head Injury</u> | |
| 13. <u>Head Injury</u> | |
| 14. <u>Head Injury</u> | |
| 15. <u>Head Injury</u> | |
| 16. <u>Head Injury</u> | |
| 17. <u>Head Injury</u> | |
| 18. <u>Head Injury</u> | |
| 19. <u>Head Injury</u> | |
| 20. <u>Head Injury</u> | |
| 21. <u>Head Injury</u> | |
| 22. <u>Mandibular injury</u> | |
| 23. <u>Neck injury</u> | |
| 24. <u>Neck Injury</u> | |
| 25. <u>Neck Injury</u> | |

Question 1

i) In the following table state how the four (4) types of blast injury are caused (4 marks)

	Description
Primary	DIRECT FROM BLAST SHOCKWAVE
Secondary	FRAGMENT IMPACT (SHRAPNEL)
Tertiary	BODY THROWN INTO AIR BY WAVE/BLAST
Quaternary	ENVIRONMENTAL CONTAMINATION FROM DEVICE

ii) List four (4) important actions you would take, prior to arrival of the victims. (4 marks).

1. Activate "External Disaster" Code.
2. Inform hospital administration/ director/ public relations department
3. Clear all non-urgent patients from the waiting room
Admit all stable ED patients to wards
4. Set up a casualty reception triage area outside of the ED
5. Have decontaminating showers ready for no-urgent walking casualties.
6. Prepare Resus bay for urgently injured patients
Remove all unnecessary equipment
Plastic lining for floors
Plastic waste bags - double and labelled radioactive
7. Have ready personal protective equipment
8. Notify Hospital Radiation safety officer
9. Brief all staff on specific roles.

This is asking them to consider that there could be the possibility of a dirty bomb which is of course essential

1. Activate external disaster to notify all staff members / groups e.g. anaesthesia, icu, surgery, blood bank, pathology, radiology, theatres, media unit, executive
2. Prepare the ed for the influx of patients (send admitted patients to the ward, consider the waiting room patients, brief staff, allocate roles, create teams, request equipment, prepare the resus bay)
3. Consider that there may be chemical or radiological contamination of the bombs which will require, lockdown of ed, one way traffic flow, decontamination of patients, storage and handling of waste with double bagging and labelling, line floors with plastic
4. Triage the patients using disaster triage, with consideration of who will be performing the triage, where it will take place and what system will be used. The same triage system will be used for all patients presenting at the same time

iii) List the MOST likely injuries expected for each category of blast injury (4 marks)

	Likely Injuries
Primary	BLAST LUNG, EARDRUM RUPTURE, ABDOMINAL INJURY/PERFORATION, EYE INJURY
Secondary	PENETRATING BALLISTIC, EYE INJURY
Tertiary	FRACTURE, AMPUTATION, TBI,
Quaternary	BURNS, INHALED GASES

Question 2

You are a consultant working in a regional ED without speciality services or advanced imaging.

An elderly man is brought to your ED after a fall the day prior. His daughter reports he tripped over whilst walking, was unable to break his fall, and landed chin-first on the ground. She reports he has had difficulty mobilising since the fall and is now “struggling to even lift a tea cup he’s so weak”. Your RMO has initially assessed the patient and ordered X rays of the C spine which show only ‘degenerative changes’. You are concerned about central cord syndrome.

a) List the 3 MOST COMMON findings on physical examination in this condition?

1. **Incomplete paralysis** (upper limb weakness **greater than** the lower limb)
2. **Incomplete sensory loss** (upper limbs **greater than** the lower limbs)
3. **Urinary retention**/bladder dysfunction

/5

b) State your plan for safe disposition of this patient?

1. Apply **C spine precautions**/immobilise
2. Arrange immediate **transfer to** closest referral centre with **MRI**
3. Notify **neurosurgical team** at referral centre of transfer

/3

c) The daughter is distraught and asks you what the prognosis for this condition is – what will you tell her?

1. **Good prognosis** – most patients will ambulate and have some return of hand movement

/1

d) List 2 other cause of central cord syndrome besides trauma?

1. **Tumour** (eg syringomyelia or intramedullary tumor)
2. Cervical **spondylosis**

/2

Question 3

This 23 year old man sustained isolated dental trauma in a fall.

A CLINICAL IMAGE IS SHOWN IN THE PROPS BOOKLET, PAGE 10

- i. Briefly describe two methods of anaesthetising the affected teeth (4 marks)

- Local infiltration = suprapariosteal infiltration. 2mL of lignocaine injected approx 2mm deep into the deepest part of sulcus formed by reflection of the buccal & gingival mucosa directly opposite affected tooth.
- Infra-orbital nerve block. Palpate infraorbital notch, slide finger just below orbital rim. Infiltrate 2mL of lignocaine at that site. Could also use the intra-oral approach through mucosal sulcus up to foramen
- Anterior superior alveolar nerve block. Use intra-oral approach like for infra-orbital n block

- ii. Describe the injury to the upper left lateral incisor (tooth 22) (2 marks)

- Extrusive luxation (partially extruded from socket), displaced posteriorly – also has an uncomplicated crown fracture with dentine visible (no pulp) [Ellis Class II]

- iii. Assuming a 12 hour delay to see a dentist, outline the Emergency Department treatment of this tooth injury (4 marks)

- Ideally need OPG to assess fracture of alveolar bone
- Local anaesthetic (see above), analgesia
- Reinsert tooth into normal position (mould alveolar bone if needed, check occlusion)
- Splint to adjacent teeth with Glass Ionomer Cement (GIC). If no GIC available need alternate splint – e.g. “blue tac” and a mouth guard
- Cover exposed fracture surface (dentine) with GIC
- If no GIC available needs relatively urgent (< 24h) f/u with dentist
- Will need splinting for 2-4 weeks

- iv. List 3 possible adverse dental sequelae of this tooth injury (3 marks)

- Pulpitis/Dental abscess
- Pulp necrosis
- Ankylosis
- Root resorption
- Need for root canal therapy
- Tooth colour change

Candidate number _____

Question 4

A 12 year old male presents after being kicked in the mouth whilst playing rugby at school.

- i. Describe the injuries in the photo (3 marks)

A CLINICAL IMAGE IS SHOWN IN THE PROPS BOOKLET, PAGE 9

- Subluxed 1:1 (R upper 1st incisor)
- Extruded or Lateral luxation 2:1 (Lt upper 1st incisor)
- Lip contusion
- Alveolar Fracture

- ii. Outline your stepwise approach to systemic analgesia in this child (3 marks)

Stepwise implies increasing strength / may allow for keeping NBM and skip oral agents
Drugs listed should include dose based on a weight estimation of about 35 kg

- Paracetamol 700mg (20mg/kg) or 525mg (15mg /kg)
- Ibuprofen 350mg (10mg/kg)
- IN Fentanyl 1.5-2mcg / kg (52.5-70mcg) Repeat after 5min
- IV Morphine 0.1mg/kg (3.5mg) repeated at 5min
- Ketamine IM/IV

- iii. What are the goals of treatment for this dental injury (3 marks)

- Stabilise the teeth (prevent aspiration risk)
- Approximate anatomical position to prevent further ligament injury/aid healing
- Provide advice on definitive management with Dentist

Candidate number _____

- Exclude associated injuries
- Analgesia

iv. You decide to use IV ketamine for procedural sedation. What are the significant adverse effects of ketamine (3 marks)

- Laryngospasm
- Emergence reactions
- Transient Apnea
- Emesis
- Allergy

v. The parents are not keen on ketamine. Describe your choice of regional anesthesia for this child (2 marks)

- Field block (Supraperiosteal) – 1% Lignocaine into mucobuccal fold above each tooth
- Bilateral Infraorbital nerve blocks

Question 5

1- List 2 abnormalities in the clinical photograph: (2 marks)

Right maxillary tooth (1,1) – intrusion luxation

Left maxillary tooth (2,1) – horizontal fracture involving pulp

2- List three (3) analgesic choices for this patient (3 marks)

Oral – Paracetamol 1g/ Ibuprofen 400mg

Intranasal – Fentanyl 1.5-2mcg/kg

Dental / alveolar nerve block, 1-2ml of 1-2% lignocaine

3- List the immediate management steps of this dental injury. (4 marks)

Repositioning and splinting of tooth 1,1

Calcium hydroxide to cap tooth 2,1

Urgent dental or max/fax referral

Update ADT if not completed

Antibiotics – amoxicillin/clavulanate

Question 6

A 53 year old female had a syncopal episode and collapsed onto an electric heater. She sustained a facial burn. She is now haemodynamically stable and GCS 15.

You are in a rural ED.

A CLINICAL IMAGE IS SHOWN IN THE PROPS BOOKLET, PAGE 13

- i. List 4 issues to consider in your assessment of this patient (4 marks)

- Cardiac monitoring/ECG/other investigations for **cause of syncope**
- Assess for **airway involvement**
- Assess for signs of head/neck/ other injury – e.g. fluctuant/altered GCS, lacerations, haematoma, haemotympanum
- Tetanus status?
- Other

- ii. How would you describe this burn to the burns registrar on call at the tertiary hospital (2 marks)

- Burn involves approx. 2% TBSA
- Central area of full thickness burn (approx. 1% TBSA) with white/leathery appearance of skin and no capillary refill
- Surrounded by partial thickness burn with evidence of deroofed blisters
- Area extends from the patients left ear (involving the inferior 2 thirds of their helix, antihelix and the tragus), the majority of the patients left maxillary, mandibular and zygomatic areas, to the patient's chin.
- Left eye, lips and airway appear to be spared

iii. Outline 4 issues in the management of this burn (4 marks)

- Administer first aid if not already received – cool running water for 20mins
- Tetanus booster
- Appropriate analgesia
- Apply appropriate dressing (ie Silver-based eg acticoat) or bactigras
- Refer to a burns centre as this is a full thickness facial burn that will require a skin graft – needs tertiary management

iv. List 2 possible adverse sequelae from this burn (2 marks)

- Infection (left ear particularly at risk given it is a cartilaginous structure)
- Involvement of facial nerve, resulting in facial droop on the left side
- Permanent scarring
- Others

Question 7

1.

Inferiorly displaced left orbital floor fracture

Fluid (blood) in left maxillary sinus

Inferior rectus is displaced in to fracture segment – will accept entrapped

2.

Examination component	Pathology
Visual acuity	Any significant eye pathology eg vitreous haemorrhage
Eye movements – diplopia on upward gaze	Inferior rectus entrapment
Sensation left midface	Infra-orbital nerve injury
Nasal septum inspection	Septal haematoma
Cervical spine assessment	C-spine fracture
Neurological assessment	Intracranial haemorrhage

Question 8

A 52 year old male is brought into your Emergency Department after being involved in an altercation at a pub on Friday night.

He sustained a single punch to his face, witnessed to not lose consciousness and complains of facial pain.

On your review he is GCS 15 with normal vitals.

1. What historical and examination features are important to elicit during assessment? (3 Marks)

Confirm mechanism of injury
Symptoms- pain, local tenderness, diplopia, crepitus after nose blowing
Epistaxis, ptosis and local tenderness
Restricted eye movements
Complete eye examination- ocular injury (hyphema, sub conjunct haem, retinal detachment)
Infraorbital n involvement
Other facial trauma

2. What three features on plain Xray suggest an inferior orbital wall fracture? (3 Marks)

Fluid in the maxillary sinus
Orbital emphysema
'Tear drop sign'- herniation of fat inferiorly

3. He undergoes a CT of his facial bones. Describe the major findings shown on the coronal slice below. (3 Marks)

Fracture and displacement of inferior wall of R orbit
Herniation of orbital contents into maxillary sinus
Fluid in maxillary sinus

4. With trauma, list the three (3) causes of optic neuropathy.

(3 Marks)

Compressive optic neuropathy (retrobulbar haemorrhage, orbital foreign body or orbital emphysema)
Optic n sheath haematoma
Optic n head avulsion
Optic n laceration

Question 9

A 25yo male is brought to ED following assault with a cricket bat one hour ago. He had a witnessed loss of consciousness for 5mins at the scene, with current GCS 14 (E4V4M6).

- i. Aside from intracranial haematoma, list three possible early complications of head trauma, and give two signs that would suggest the presence of each complication: (6 marks)

Complication	Sign
<i>Increased ICP</i>	<i>anisocoria altered mental state hypertension bradycardia papilloedema decorticate/decerebrate posturing</i>
<i>Base of skull fracture</i>	<i>Battle sign (postauricular haemorrhage) haemotympanum CSF otorrhoea/rhinorrhoea Subconjunctival haemorrhage</i>
<i>Cranial nerve injury</i>	<i>visual loss/defect reduced eye movements facial asymmetry</i>

Others:

Contusions – decreased GCS, seizure

Aspiration pneumonia – reduced air entry, hypoxia, tachycardia, fever, tachypnoea

Neurogenic cardiac dysfunction

Neurogenic pulmonary oedema – hypoxia, crepitations, tachypnoea

- ii. List the five high risk and the two medium risk features of the Canadian CT Head Rule (5 marks)

Canadian CT rules:

HIGH RISK

- GCS <15 at 2h after injury

- suspected open or depressed skull #

- any sign of basal skull #: haemotympanum, 'raccoon' eyes, CSF otorrhoea/rhinorrhoea, Battle's sign

- vomiting > or +2 episodes

- age >65yo

MEDIUM RISK

- *amnesia before impact >30min*
- *dangerous mechanism (pedestrian v. MVA, ejection from vehicle, fall from height >3ft or 5 stairs)*

iii. If a significant traumatic brain injury is detected in this patient, what measures should be taken to prevent secondary brain injury? (5 marks)

Maintaining cerebral oxygen supply:

- **Normoxia:** keep the PaO₂ above 60 mmHg
- **Low normocapnia:** keep the PaCO₂ between 35-40 mmHg
- **Normotension:** measure the MAP, and keep the systolic above 90mmHg
- Intracranial Pressure monitoring: keep it under 20mmHg
- Cerebral perfusion pressure: keep it 50-70mmHg
- Cerebral oxygenation monitoring: keep the SjO₂ >50%, and PbrO₂ >55mmHg
- Managing increased intracranial pressure for which there is a variety of strategies:
 - Draining the EVD (about 20ml/hr, max)
 - **Head up 30 degrees**
 - Positioning the head straight
 - **Removing the C-spine collar**
 - Sedation :
 - Propofol sedation to decrease distress and thus decrease ICP
 - Barbiturate coma if other methods of lowering ICP have failed
 - Analgesia to prevent increased ICP in response to suctioning and routine care
 - Paralysis
 - Osmotherapy
 - Controversial measures
 - Decompressive craniectomy
 - Hypothermia
 - Dexamethasone

Decreasing cerebral oxygen demand:

- Sedation
 - Propofol sedation to decrease distress and thus decrease ICP
 - Barbiturate coma if medical and surgical methods of lowering ICP have failed
- Analgesia - opioid selection is irrelevant, but opiate boluses increase ICP
- **Seizure prophylaxis** is infrequently indicated, and the course is 7 days only

Question 10

1.

Large extradural haematoma – high density bi convex lesion left temporal region

Hyperacute extradural with “swirl sign” mixed density

Large scalp haematoma left temporal region

Parietal cerebral contusion left

Significant midline shift to right

Loss of sulci and gyri consistent with raised intracranial pressure

Pass 3 of 5

2.

Immediate neurosurgical referral for surgical drainage of haematoma

Intubation for airway control and management of CO₂

Maintain MAP >80 (accept approx.) mmHg with IV N/S +/- noradrenaline infusion

Maintain oxygenation sats >95%

Ventilate for low normal CO₂ (35 – 40)

Other neuroprotective measures (max 4 marks)

Well sedated, paralysed

Slightly head-up position

Loosen ties / restriction to venous return

Na high normal range

Normothermia

normoglycaemia

pass 5 of 9

total pass 8 of 14 corrects to **5.5/10**

Question 11

1. Anything from CHALICE/PECARN or CATCH

CHALICE:

HISTORY: Witnessed LOC >5 mins, Amnesia >5mins, Abnormal Drowsiness, >2 vomits, Suspected NAI, Traumatic Seizure

EXAM: GCS <14, suspected Skull injury, Signs of BOS#, Focal Neurology, Bruise>5cm

MECHANISM: High Speed MVA, Fall >3m, Hit by projectile

PECARN:

CATCH: Similar – GCS <15 at 2hrs, Suspected Skull#, Worsening headache, Irritability are the HIGH risk features.

2. Identify yourself and role

Ensure that all relevant communication is clear to ensure no mismatch in understanding

Explain basis of clinical decision – NOT for CT – supported by decision rules

Identify their concerns re: no CT – explore their concerns; attempt reassurance

Offer alternate options – SSW for observation etc

Question 12**Q1**

Accept any of: CATCH CHALICE PECARN Nexus 2

Q2**CATCH**

CT head is only required if:

Minor head injury + Any of:

HIGH RISK

GCS <15 at 2 hrs/ Suspected open skull fracture/ Worsening Headache/ Irritability on exam

MEDIUM RISK

Suspected BOS fracture/ Large Haematoma (5cm)/ Dangerous Mechanism (Elevation >3ft, 5 stairs or bicycle without helmet)

CHALICE

CT is required if any of the following present:

The children's head injury algorithm for the prediction of important clinical events rule

A computed tomography scan is required if any of the following criteria are present.

• *History*

- Witnessed loss of consciousness of >5 min duration
- History of amnesia (either antegrade or retrograde) of >5 min duration
- Abnormal drowsiness (defined as drowsiness in excess of that expected by the examining doctor)
- ≥3 vomits after head injury (a vomit is defined as a single discrete episode of vomiting)
- Suspicion of non-accidental injury (NAI, defined as any suspicion of NAI by the examining doctor)
- Seizure after head injury in a patient who has no history of epilepsy

• *Examination*

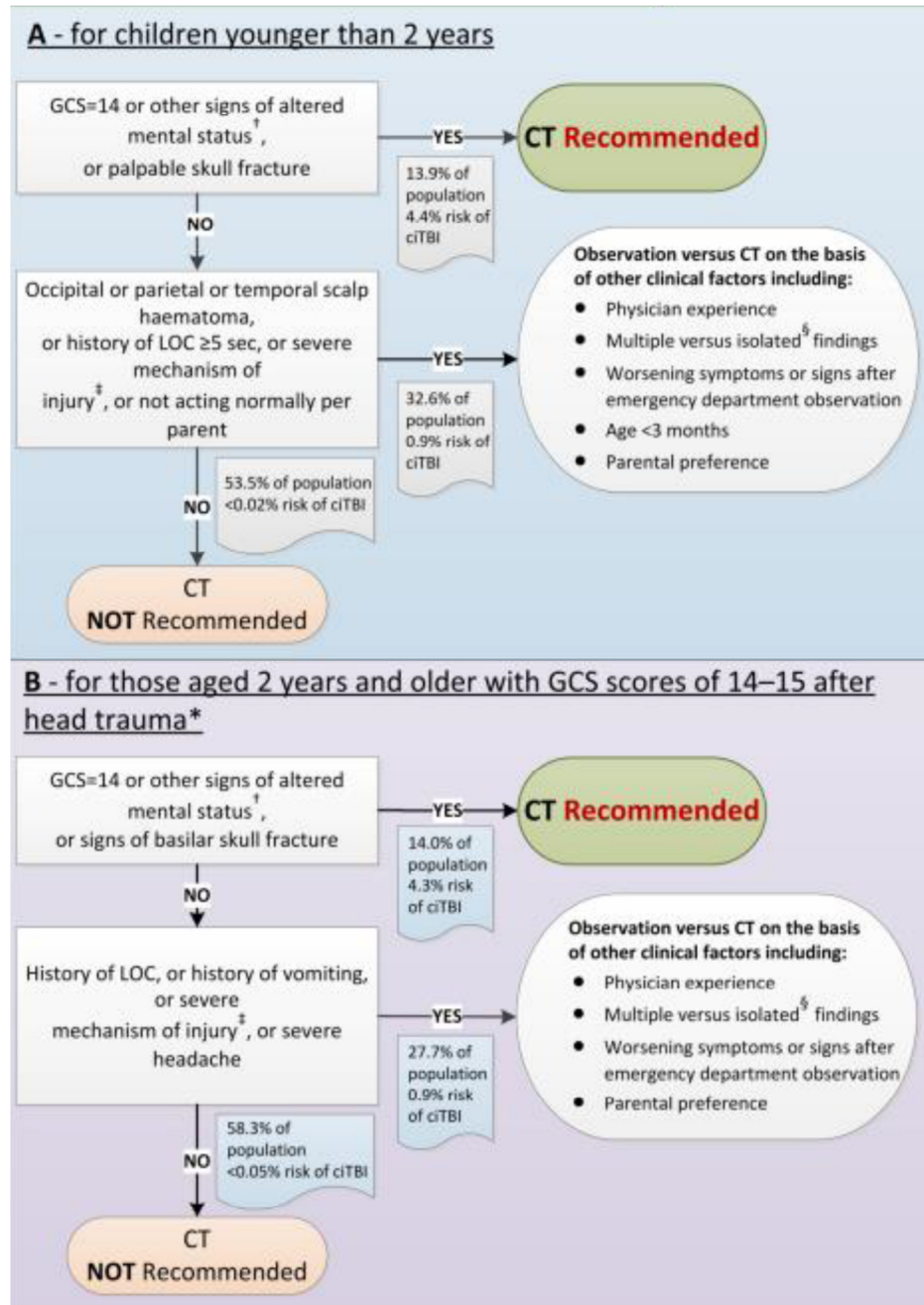
- Glasgow Coma Score (GCS) <14, or GCS <15 if <1 year old
- Suspicion of penetrating or depressed skull injury or tense fontanelle
- Signs of a basal skull fracture (defined as evidence of blood or cerebrospinal fluid from ear or nose, panda eyes, Battles sign, haemotympanum, facial crepitus or serious facial injury)
- Positive focal neurology (defined as any focal neurology, including motor, sensory, coordination or reflex abnormality)
- Presence of bruise, swelling or laceration >5 cm if <1 year old

• *Mechanism*

- High-speed road traffic accident either as pedestrian, cyclist or occupant (defined as accident with speed >40 m/h)
- Fall of >3 m in height
- High-speed injury from a projectile or an object

If none of the above variables are present, the patient is at low risk of intracranial pathology.

PECARN



Q3

Consent

Sedation/Access – IV: ketamine 0.5-1mg/kg or other suitable agent

Antiemesis – ondansetron 0.15mg/kg

Monitoring – at least Sats and Cardiac/NIBP

Question 13

1.

Reduced GCS

Focal neurological signs

On anti-coagulation

Signs BOS # or depressed skull fracture

Vomiting

amnesia

Anything else reasonable

2.

Acute on subacute subdural haematoma / haemorrhage

High attenuation anterior – acute blood

Iso-attenuation – subacute blood

Loss of sulci left hemisphere – raised ICP

3.

ECG – look for arrhythmogenic cause of fall

Coag – exclude coagulopathy which would require correction

Platelet count – exclude as exacerbating factor – correct if low

Accept other causes of fall – Na, urine

Accept other consequences of fall if justified – CXR, c-spine, pelvis

Question 14 (12 marks)

Your registrar asks your advice about the clinical decision rules for imaging in paediatric head injury management. They have just seen an 18-month old girl who has been brought in by her mother after she fell off a low couch and hit her head on the coffee table one hour ago. The mother is concerned because she seems quieter than normal and has vomited once on the way in to hospital. On assessment, the child is alert, and is happily playing with her Mum's phone. She has a small frontal haematoma, equal reactive pupils and no focal neurology.

a). Detail the main differences between research evidence behind the PECARN , CHALICE and CATCH clinical decision rules. (4 marks)

PECARN prospectively validated
CATCH , CHALICE uses 'rule in ' criteria (decides who NEEDS CT)
PECARN uses 'rule out' criteria (decides who NOT to CT)
PECARN has highest point sensitivity
CATCH , CHALICE more specific but less sensitive

After taking a detailed history and completing your assessment, you decide that the child does NOT require a CT brain.

b). The mother is asking for a CT scan of her daughter's head as she is worried about concussion. List the important facts that should be mentioned in this conversation (4 marks)

Not required as per best evidence
CTB performed to diagnose injury that requires neurosurgical intervention
Concussion managed conservatively
Risk of radiation: lifetime cancer mortality risk from a single head CT is about 1 in 1,500 in a 1 year old; 1 in 10,000 in a 10 year old
Risk related to sedation if required

d. State your management plan for this patient (4 marks)

Observation period- ED SSU with hourly neuro obs
--

If any deterioration- CT
If remains well, discharge
Discharge advice on ongoing management
Return to ED advice

References:

Babl et al. 2017, 'Accuracy of PECARN, CATCH, and CHALICE head injury decision rules in children: a prospective cohort study', Lancet, Volume 389, Issue 10087, P2393-2402.

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Question 15

A 60 year old man is brought by ambulance to your tertiary ED following a 'one punch' attack, where he was punched and fell, hitting his head. There was a brief (<5 minutes) loss of consciousness.

He has no prior medical history and is on no medications.

On arrival his vital signs are:

GCS	14/15 (E3, V5, M6)
Pupils equal and reactive	
P	85
BP	125/85
RR	18
O2 sats	98% room air

He has no injuries other than bruising and a large haematoma to the right parietal region of his head. He has a collar in place.

**I. A single slice from a CT of his head is shown. List four (4) key findings?
(4 Marks)**

Right parietal extradural haematoma (can describe bi-convex density and other features but need to say it is an EDH)
 Air within EDH
 Overlying scalp haematoma
 Sub-arachnoid haematoma left frontal, likely contre-coup injury
 Mass effect
 Effacement of sulci right parietal
 No appreciable mid-line shift

On return from CT he is poorly responsive. His GCS is now 7 (E1 V2 M4). His other vital signs do not change. He has an endotracheal tube placed for airway protection and commenced on ventilation without incident. The neurosurgical service is called to attend.

**II. List six (6) priorities in his care while waiting for neurosurgery,
(6 Marks)**

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Avoid hypotension, maintain cerebral perfusion

- aim MAP 70, using cautious fluid bolus 500ml NSaline, escalate to noradrenaline 5-20mcg/minute

Encourage cerebral venous drainage

- head up 30deg
- loosen cervical collar
- loosen ETT ties

Ventilation settings

- avoid hypoxia, titrate FiO2 for Sats >96%
- aim pCO2 35

General care of ventilated patient

- IDC and orogastric tube (not NGT)
- analgesia and sedation

Repeat neurological exam

- pupils

**III. His pupils are noted to be different sizes left 3mm, right 7mm.
List (2) additional interventions that you will perform?**

(2 Marks)

Osmotherapy - with 500ml 3% Saline IV

Facilitate urgent transfer to OT for neurosurgical intervention

Continue above measures

Question 16

A 25 year old male patient is to be retrieved from a remote property by your helicopter service. The nearest tertiary hospital is 1 hour flight time. He has fallen from his horse 30 minutes ago and has sustained a closed head injury and is now unresponsive. He also has a deformed L lower leg with an open wound. Local ambulance staff are on the scene and have obtained IV access and applied 15L O2 via NRB mask.

On your arrival he is GCS 5 (E1V1M3).

His vital signs are:

T 36 HR 55 BP 160/65 RR 8 O2 sats 96% 15L mask

1. What drugs would you use for RSI in this patient?

(2 marks)

Fentanyl/Midazolam or Ketamine (doses)

Suxamethonium or Rocuronium (doses)

2. Describe the measures you would take to minimise secondary brain injury in this patient enroute to the nearest neurosurgical centre

(6 marks)

Head up 30 degrees

Maintain oxygenation (Titrate O2 to maintain SpO2 > 95%)

Maintain normal CO2 (PCO2 35)

Avoid hypotension (Maintain MAP > 80 with fluids and vasopressors)

Maintain normothermia (Active cooling if temp > 39)

Sedation and paralysis to minimise rises in ICP with transfer

Hypertonic saline 3% 3mL/kg over 10 minutes

3. List 4 other management priorities for this patient other than those listed above.

(4 marks)

C spine immobilisation & spinal board

Secure IV access and invasive monitoring of BP prior to flight

FAST scan to assess for intra-abdominal bleeding (if possible pre-hospital)

Immobilisation of any limb fractures

Antibiotics cover for compound fractures (Cephazolin 2g IV)

Question 17

You are the consultant in charge of an urban district emergency department. You have just assessed a 42-year-old male who has sustained an isolated head injury from a bicycle accident.

a). List five (5) acute complications of head injuries (5 marks)

Impact apnoea
↑ICP
Intracranial h/toma (EDH/SDH/ICH /contusion)
Diffuse axonal injury
Skull fractures
Cranial nerve injury
CSF Leak
Neurogenic cardiac dysfunction/APO
Haemorrhagic shock (neonates)
Aspiration pneumonia
Seizures

You decide to electively intubate him.

b). List four (4) indications for intubation in the emergency department, for any patient. (4 marks)

Airway protection/maintenance
Ventilation support
Oxygenation support
Neuroprotection
Control of the combative patient

Facilitate safe transfer of a patient
Expected clinical course

You successfully intubate this patient. While securing the tube, you notice he has become hypotensive to 80/50mmHg.

c). Complete the following table for potential causes for post-intubation hypotension in ANY patient and state your immediate management for each cause listed. (5 marks)

Cause	Immediate Management
Acidosis	Hyperventilation, bicarbonate administration
Anaphylaxis	Adrenaline iv
Pericardial tamponade	Decompress
Breath stacking	Disconnect tube, compress chest, alter ventilator settings, bronchodilators
Hypovolaemia	IV fluid bolus
Induction agent effect	Supportive management – fluid, pressors
Tension PTX	Finger thoracostomy
Electrolyte abnormalities	Identify and correct

Post-intubation, he is taken to CT for trauma imaging. CT brain shows an acute subdural haematoma.

d). List the indications for surgery in patients with acute subdural haematomas (4 marks)

- haematoma thickness >10 mm
- > 5mm midline shift regardless of GCS
- GSC < 8
- drop in GCS $\geq$ 2 points
- development of papillary inequality

Question 18

A 74 year old man presents after a fall the night before. He is now complaining of reduced mobility. Past medical history includes atrial fibrillation and hypertension. His medications are dabigatran, metoprolol and aspirin. GCS is 15.

- i. Outline the findings on the CT image (4 marks)

A CT BRAIN IS SHOWN IN THE PROPS BOOKLET, PAGE 7

- Acute on chronic left subdural haemorrhage overlying the left cerebral convexity, tentorium and parafalcine location. Maximal thickness of this SDH is 23mm
- Mass effect with 5mm shift of midline structures to the right and early hydrocephalus

- ii. List 4 possible treatments you would consider using and your rationale for each (8marks)

- Blood products if required – Packed RBC, Platelets
 - PRBC for severe anaemia/ongoing blood loss
 - Platelet transfusion for thrombocytopenia and/or severe platelet dysfunction
- Tranexamic Acid (antifibrinolytic agent)
 - Low cost and risk (of thrombosis, adverse reaction), therefore should be considered
- Desmopressin
 - Low cost and risk as above
- Idarucizumab – only specific reversal agent available for DOACs at present
 - Currently the only FDA approved agent for reversal of DOACs; only works for dabigatran. Shown to reverse the anticoagulant effect in lab testing and within minutes. Homeostasis without significant thrombosis risk
- Prothrombin Complex Concentrates (PCC) :
 - Three Factor PCCs (factors II, IX, X) - prothrombinex
 - Four Factor PCCs (II, VII, IX, X) – which can be inactive (octaplex) or active (FEIBA (Factor Eight Inhibitor Bypassing Activity))
 - Generally would not give if Idarucizumab has been given. Would consult Haematology.
 - Controversial results in in vitro and animal studies. I would discuss with Haematology before prescribing – need to balance risk of thrombosis.

Other points:

- Recombinant Factor VIIa (Novoseven) - Not recommended in treatment of DOACs due to high doses required and therefore concern for possibility of thrombotic sequelae.
- FFP is not recommended for reversal of DOAC unless no other agent is available

- iii. List 2 important additional features on assessment that are required to assist your treatment decision (2 marks)

- Time of ingestion of last DOAC dose
- Assessment of renal and hepatic function

- iv. List one other option for the management of NOAC associated bleeding (1 mark)

- Haemodialysis – Dabigatran is 80-85% renally excreted. (Not useful in Direct Factor Xa oral Inhibitors eg rivaroxaban, apixaban as only 25-35% renal excretion; they are mostly protein bound)
- Charcoal if ingested <2hrs prior – reduces absorption

Question 19

1.

Left scalp haematoma

Left extradural haematoma (2 marks for the details)

- Acute (hyperdense)
- Swirl sign (decreased density in dense area indicative of rapid bleeding)

Left parietal contusion

Midline shift to right

Loss of sulci due to mass effect

2.

Intubate (1 mark)

- With appropriate doses (1 mark)

Facilitate urgent neurosurgery (1 mark)

End points (3 marks)

- MAP >75mmHg
- O2 sats >90%
- CO2 35-40mmHg

Secondary measures (max 3 marks this group)

- Normothermia
- Normoglycaemia
- Head up
- Na high normal

Question 20

A 33 yo man presents following a single punch knocking him to the ground. He had a GCS of 7 on arrival and has been intubated prior to CT scan.

He has returned to the ED following CT of his brain and cervical spine.

CT of the cervical spine is normal and he has no other injuries.

His current observations are pulse 60/min and BP 155/85 mmHg. His pupils are equal and reactive.

A single image from his brain CT is attached

Describe 3 abnormalities on the CT image (2 marks)

- 1.1. acute right subdural haematoma.....
- 1.2. midline shift to the left.....
- 1.3 effacement of R lateral ventricle.....

The neurosurgical team is en route to hospital and the patient will be going to the operating theatre in approximately 1 hour.

Assuming his clinical status remain unchanged, describe 8 treatments and their therapeutic target which should be performed in the ED prior to transferring this patient to theatre (8 marks)

	Treatment	Therapeutic target
1	Maintain low end normocarbia	Adjust TV and RR to achieve pCO ₂ 35-45
2	Position 30 degrees head up	Prevent further raised ICP from venous pressure
3	Ensure ETT ties and cervical collar not tight	ditto
4	Maintain normoglycaemia – dextrose or insulin as needed	Keep by BSL between 6-10mmol/L
5	Maintain normothermia	Keep core temperature between 35-37 degrees with Bair Hugger, warm fluids or antipyretics
6	Maintain optimal BP with fluids (N saline 500ml boluses) or vasopressors as indicated.	Keep MAP between 70-85mmHg

	Avoid hypertension (see below)	
7	Ensure adequate sedation and paralysis eg propofol 5-10mg/hr and vecuronium 10mg	Avoid/treat hypertension, agitated, coughing, gagging due to under sedation/paralysis, all of which will further increase ICP
8	Decompress bladder with IDC	Avoid hypertension due to bladder distension
9	Decompress stomach	Minimise risk of aspiration, optimise ventilation
10	Maintain adequate oxygenation	Adjust FiO ₂ to achieve sats >95% and avoid hyperoxia (<99%)
11	Treat anaemia	Keep Hb >10g/dl to ensure adequate O ₂ delivery, transfuse blood as needed
12	Treat seizures - midaz 5mg if seizing, then phenytoin 20mg/kg	Avoid further brain injury from seizure activity - no evidence to support prophylactic anti-epileptics

Must name at least 2 methods to avoid raised ICP (CO₂, ETT ties, collar), must name BP control, any 5 others

30 minutes later his left pupil becomes fixed and dilated, his pulse rate is 50/min and his BP 160/100 (2 marks)

Describe two additional treatments, with dosage where relevant, that you would immediately institute

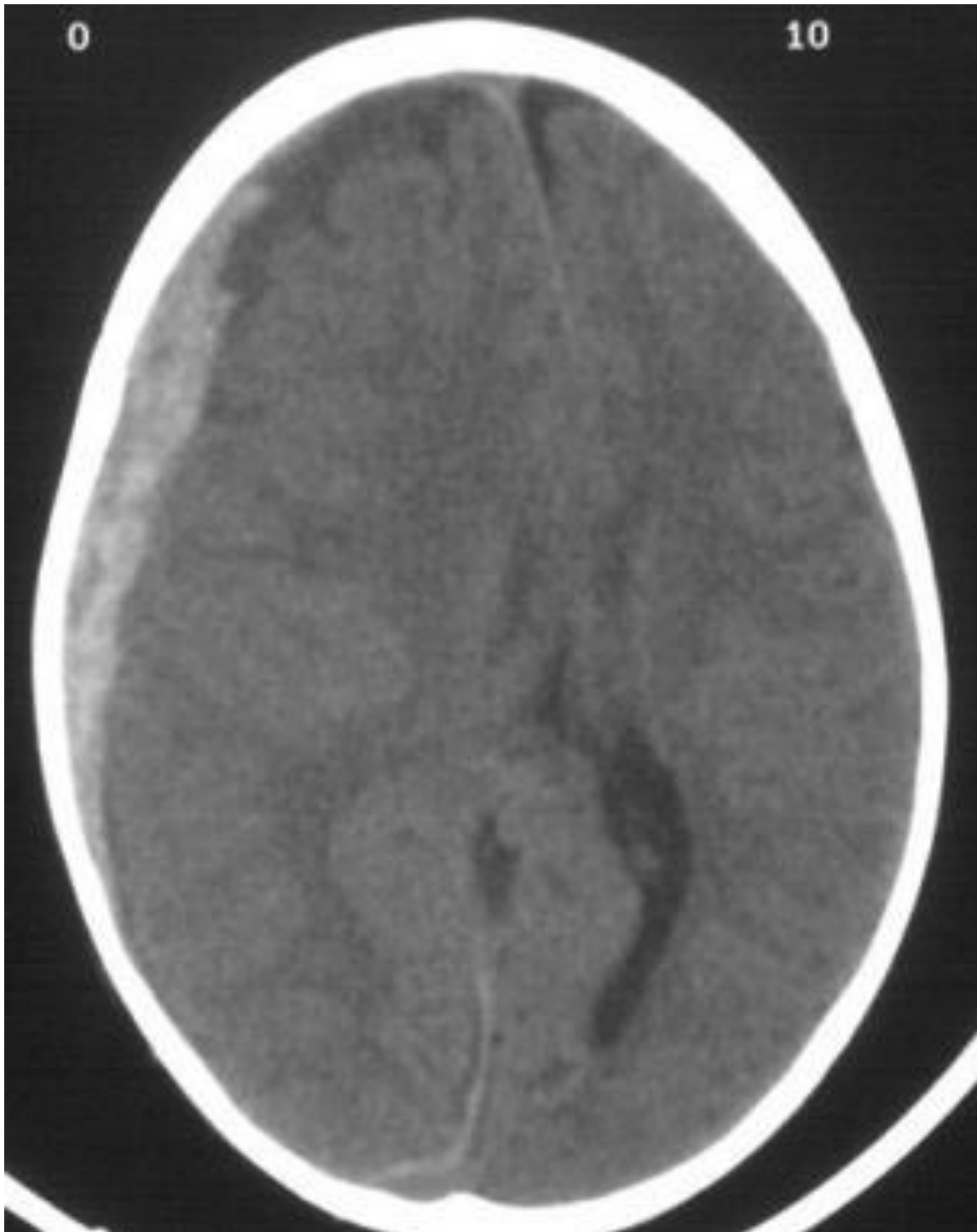
3.1 Hyperventilate to pCO₂ 30-35

3. 2 Give mannitol 20% 0.5-1g/kg

3.3 Give hypertonic saline e.g. 250ml of 3% saline

Either 3.1 (1 mark) and 3.2 or 3.3 (1 mark) –including strength and dose/kg

SAQ 13 image



Question 21

A 5 year old male presents to your regional Emergency Department 1 hour following a minor trauma. He has a history of severe Haemophilia A.

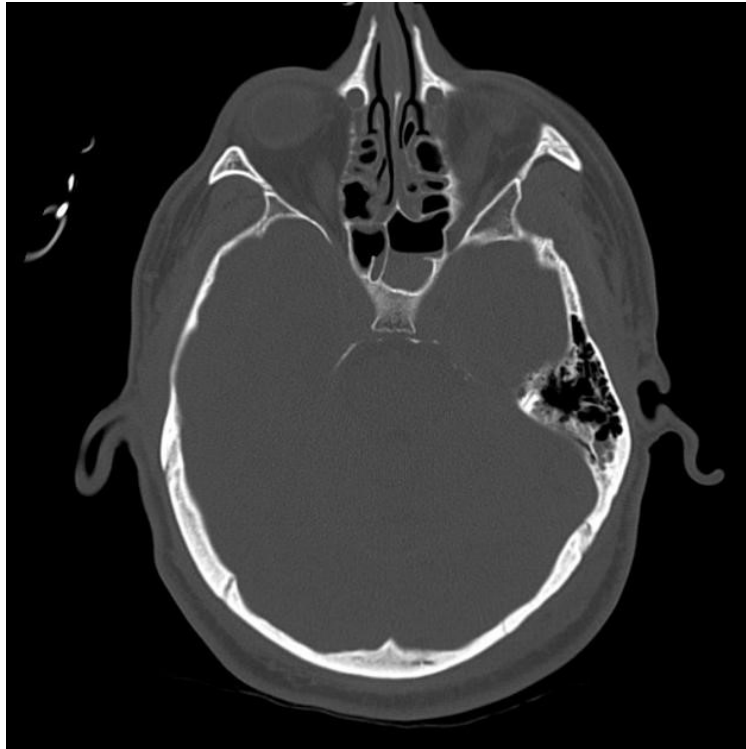
1. List four features on examination you would try to identify for this patient? (4 marks)

- CNS/ head trauma
- Deep muscle haematoma
- Traumatic haemarthrosis
- Intrabdominal- visceral injury
- Other: Compartment syndrome/Epistaxis/ haematuria/ intraorbital bleeding

The patient has evidence of an isolated small haematoma to his occiput. He complains of a headache and has had two vomits. You decide to undertake neuroimaging.

A non-contrast CT Brain was performed. There are two (2) axial slices below.





2. From the imaging above, please state the diagnosis, with three (3) supporting CT findings. (4 marks)

- **Diagnosis: Contre-coup injury**
- **CT findings:**
 - **Right fronto-temporal cerebral contusion**
 - **Small associated SDH**
 - **Left parietal-occipital soft tissue haematoma**
 - **Underlying skull fracture (left parietal) without EDH**

3. Outline your key management priorities for this patient. (4 marks)

- **Factor VIIIa**
- **Analgesia (Paracetamol 15mg/kg, IN Fentanyl 1.5mcg/kg AVOID NSAIDS)**
- **Urgent discussion with Haematology**
- **Arrange retrieval to a Neurosurgical referral**

Question 22:

A 17 year old man presents after an assault he has jaw pain.

a. List 3 abnormalities seen on the OPG (3 marks)

1. ____ right para-symphaseal # - mildly displaced
2. ____ # body mandible left-displaced
3. malocclusion teeth



b. List 6 important physical findings that you should document (3 marks, 0.5 marks each)

1. degree of mouth opening
2. occlusion of teeth/ loose or missing teeth
3. ? open fracture into mouth
4. haematoma floor mouth
5. swelling/bruising
6. evidence other facial fractures clinically
7. inferior alveolar nerve parasthesia

c. List 4 aspects of your initial ED management (with specifics) (4 marks)

1. Antibiotics –benzylpenicillin 1.2g QID + metronidazole 500mg BD IV
2. ADT if not up to date
3. Analgesia- IV titrated opiates (name one)
4. mouthwashes- QID hydrogen peroxide
5. NBM + IV fluids

Question 23

1.

No midline tenderness

No neurological abnormalities

No distracting injury

Not intoxicated

No altered consciousness

2.

Soft tissue swelling in front of C6/7

Antero-superior corner fracture C7

Disruption of posterior spinal line

Widening between spinous processes C6 – C7

3.

Unstable fracture cervical spine with posterior ligamentous disruption

4.

Upper limb action	Nerve root supply
Elbow flexion	C5/6
Elbow extension	C7/8
Wrist extension	C6/7
Finger abduction	T1

Question 24

1.

dislocation C4 on 5

Anterolisthesis C4 on 5 approx 25%

Widening of interspinous space (or loss of continuity at ligamentum flavum)

Loss of any of the spinal 'lines'

Significant Anterior soft tissue swelling at C4/5

2.

Respiratory status (accept oxygenation or ventilation or testing (spirometry, FEV1) → respiratory insufficiency secondary to loss of diaphragmatic innervation)

Neurologic status - * - conscious state, signs of anterior or posterior cerebral ischaemia carotid or vertebral dissection

Neurologic status - UL neurologic exam weakness from cord injury/haematoma

Cardiovascular status – risk of neurogenic shock – hypotension with vasodilation

Priapism – evidence of major cord injury

Bulbocavernosus reflex – absence suggests spinal shock. Presence allows classification of cord injury severity (ie ASIA status – complete vs incomplete)

3.

Elbow flexors – C5

Elbow extensors – C7

Knee extensors – L 3

Ankle plantar flexors: - S1

Question 25

A 62 year-old man is brought to your ED after an assault during a home invasion. He has been stabbed in the anterior right side of neck and was pushed down a steep flight of stairs with possible head and neck injuries due to the fall.

Initial assessment:

GCS	10; combative
HR	125 per minute
BP	105/65 mmHg
Head:	Right parietal large boggy swelling
Neck:	Wound at right side of anterior neck, extends from medial aspect of clavicle to level of cricoid, extensive haemorrhage

- i. List 5 immediate management priorities? (5 marks)

-Haemorrhage control with direct pressure, care not to obstruct airway due to compression
 -IV access x2 large bore; resuscitation with O negative PRBC
 -Airway control; high risk/difficult airway; most experienced airway practitioner with use of VL; Consider intubating trachea directly if visible through wound; performed with care as possible to convert to complete transection
 -RSI with neuroprotective strategies
 -MILS given potential c-spine injury
 -Management of combative behaviour to enable overall assessment (and to achieve above safely); ketamine for analgesia and dissociative effects

- ii. List 3 potential harmful effects of hard collar use in this patient (3 marks)

- Obscuring of neck wound during assessment/management
- Potentially exacerbate airway compromise
- Potentially increase ICP due to impedance of venous return

- iii. List 4 clinical features which would suggest this patient has a critical vascular injury (4 marks)

- Pulsatile bleeding
- Expanding haematoma
- Palpable thrill
- Bruit on auscultation

- iv. Given his mechanism of injury you are concerned he may have sustained an acute cord injury. List 2 possible acute spinal cord syndromes in this case and identify 2 associated clinical findings (4 marks)

Acute Cord Syndrome	Clinical Finding
Complete Transection	• Complete loss of sensation below level • Complete motor loss/ flaccid paralysis below level
Right Hemisection (Brown-Sequard)	• Right sided loss of motor (loss of biceps flexion) and proprioception (ipsilateral) • Left sided loss of pain and temperature (contralateral)
Anterior Cord Syndrome	• Motor function impairment below level • Pain and temperature loss below level • Proprioception and fine touch spared below level
Central Cord Syndrome	• Impairment Motor > Sensory • Upper Limb > Lower Limb • Distal > Proximal

Question 26

1.

*Hoarse voice / change in voice
stridor
Pain on swallowing
Haemoptysis
Subcutaneous emphysema*

2.

*expanding haematoma
Carotid bruits
Focal neurological signs
Horner's syndrome
Decreased consciousness*

3.

*CTA neck
Fibre-optic nasendoscopy*

4.

In ability to intubate - due to loss of usual landmarks / changes to anatomy

Conversion of partial to complete laryngo-tracheal disruption by blind passage of ETT and

5.

*Arrest
Hypoxia
Tiring
Loss consciousness*

6.

*Pre-oxygenate sitting up
Have surgical airway kit ready
Have a dedicated person for surgical airway eg surgeon
Use of video laryngoscope
Would accept avoidance of paralysis as well*

Several other possibilities

Question 27

1. Describe the key features on the photo. (2 marks) 1/2

Significant bruising/abrasions to anterior aspect of neck and upper sternum.
Assymetrical swelling/fullness of R side of neck

(No cervical spine immobilization)
(No definitive airway)

2. List 5 major injuries you would be concerned about in this patient. (5 marks) 3/5

Laryngeal fracture/trauma (1 mark)

Cervical spine fracture with neurogenic shock (1 mark)

Any of the following for up to 3 marks:

Carotid artery dissection/haematoma

Thoracic aorta/Great vessel injury

Traumatic brain injury

Pneumothorax/Haemothorax

Intrabdominal injury

3. List 5 indications for intubation in this patient. (5 marks) 3/5

Worsening signs of airway obstruction, eg: from laryngeal oedema or expanding haematoma

Falling GCS and inability to protect airway

Threatened airway with vomiting++ or blood++

To definitively protect airway in light of predicted clinical deterioration

Respiratory failure from C-spine injury

To safely facilitate C-spine imaging/further management

4. List 3 possible difficulties you would anticipate may occur during intubation of this patient and your planned solution to each. (6 marks) 4/6

Anticipated Difficulties	Planned solution
Difficult intubation/Distorted anatomy	Ideally intubate in OT by Anesthetics (fibre-optic, gas induction)
Haemodynamic instability	Preload with fluids +/- pressors Induction drugs – use Ketamine
Possible C spine fracture	Manual in-line stabilization Videolaryngoscope

Passmark 11/18 Adjust to ../10 please

Question 28

Answers:

1. Compare the clinical features of neurogenic vs. spinal shock? (6 marks) 3/6

Neurogenic shock	Spinal shock
Paralysis of sympathetic nervous system	Transient cessation of cord activity below the level of injury
Progressive hypotension	Lasts hours- weeks
Initially bradycardia from unopposed vagal stimulation then pseudo or relative tachycardia to oppose brainstem hypoperfusion	Cessation is heralded by the return of Babinski reflexes
Peripheral vasodilation	Loss of somatic and autonomic reflexes below injury level
Cessation of sweating below level of injury	

Cameron pg 84-89

2. He has a GCS 15 and no motor function below C5. Outline your management priorities: (5 marks) 3/5

Manage ventilatory failure - (Control of airway with intubation using MILS as ventilatory failure likely given phrenic nerve involvement at this spinal level)
BP management - high risk of hypotension from neurogenic shock - initially iv fluids +/- pressors - consider concurrent hypovolaemia from bleeding and Ix as required
Maintain spinal immobilisation
Assess and manage concurrent injuries (eg chest, abdo, pelvis, limb fractures)
Temperature control
Methylprednisolone controversial- discuss with local spinal team
Refer to spinal team for definitive management once other injuries excluded

Tinitalli pg 1723-1727

3. The patient is found to have an isolated 3 column injury on CT at the C4/5 level with a burst fracture and suggestion of cord injury. He has no other injuries on extensive and complete imaging.

List 3 options for cervical spine immobilisation in the Emergency Department and their pros and cons: (9 marks) 6/9

1. Soft collar	Pros
	Cons
2. Hard collar	Pros
	Cons
3. Philadelphia collar/Aspen collar	Pros
	Cons

(any combination is acceptable if adequate pros/cons discussed)

Passmark = 12/20 Adjust to ../10 please

Question 29

A 28 year old male patient is brought to your ED following an injury in a tackle during a rugby match. There is concern for a C spine injury as he been unable to move his upper or lower limbs after the injury.

On arrival he is being managed in appropriate spinal immobilisation.

His vitals signs are:

GCS 15/15

Temp 36.0

HR 60 regular

BP 90/60

SpO2 93% RA

Questions:**I. Complete the following table with 4 indications for intubation that may occur**

in a patient with a spinal injury and state the supporting features you would look for on assessment. (8 Marks)

Model answers:

Any of the following acceptable:

Indication for intubation	Supporting Features on Assessment
Hypoventilation	Rising pCO ₂ >50 Shallow respirations Weak & ineffective cough Paradoxical breathing TV < 3.5mL/kg
Hypoxia	PO ₂ <60 or SpO ₂ <93% despite high flow O ₂ supplementation
Agitation/Concurrent head injury or ALOC	Non-compliance with spinal precautions GCS <13 or deterioration
Airway compromise or protection	Vomit or blood soiled airway with risk of aspiration Expanding haematoma in posterior pharynx due to fracture
To facilitate transport or further management	Need for prolonged transfer to tertiary spinal centre Need for prolonged imaging such as MRI

II. List 4 modifications would you make to your standard RSI in this patient if you were to proceed with intubation in the ED? (4 marks)

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Model answers: Any of the following for 1 mark each. Only 1 mark for intubation technique as candidate needs to mention other parameters.

Preload with fluid prior to induction to prevent hypotension (eg N/saline 500mL bolus) and prepare push dose pressors (eg Metaraminol, Ephedrine) to maintain MAP >70
Pretreat with Atropine 600mcg to minimise bradycardia with intubation
Inductions drugs to ensure haemodynamic stability (eg Ketamine 102mg/kg)
Use of Video laryngoscope to minimise neck movements during intubation Anticipate difficult view on laryngoscopy and prepare adjuncts such as bougie, VL Consider awake fiberoptic intubation in theatre if necessary resources & expertise available
Maintain manual inline stabilisation during intubation to minimise neck movement

N.B Suxamethonium is not contraindicated in first 72 hrs after spinal injury so no mark given for this answer

Question 30

An 87 year old lady from home presents after slipping and falling down her stairs. She has neck pain, and no other injuries.

You are concerned about possible spinal cord injury.

Complete the following table detailing signs and mechanism of various spinal cord syndromes (8 marks)

Syndrome	Signs	Mechanism
Central Cord Syndrome	Incomplete paralysis, distal > proximal , arms > legs. Variable reflexes (transmission in central cord is injured, transmission in outer rim is intact but impaired)	Usually hyperextension injury in older patients with cervical spondylosis, cord compressed between osteophytes and intervertebral disc in front and ligamentum flavum behind.
Anterior Cord Syndrome	Loss anterior spinothalamic function (pain and temp), motor impaired. Motor loss or paralysis below level of injury. Dorsal columns relatively intact therefore some joint position, fine touch.	Hyperflexion injury causing bony impaction into cord
Brown Sequard Syndrome	Ipsilateral motor/proprioception loss Contralateral pain and sensation loss Reflexes variable	Penetrating injury

Posterior Cord Syndrome	Uncommon Loss of dorsal column function only	Usually due to penetrating injury
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She has a CT scan performed of her cervical spine

Describe the CT findings (see image in separate book) (2 marks)

Teardrop fracture of C6 , degenerative changes , spinous process fracture c6

On examination you find an incomplete cord injury

List 4 things you can do (apart from spinal immobilisation) as secondary prevention of further injury
(4 marks)

Monitoring of respiratory function, as cervical spine injury

NG tube insertion

IDC placement

Skin protection (air mattress bed)

Thermal protection (keep pt warm)

Seek and treat other spinal injury

SAQ 1 image 1



SAQ 1 image 2



SAQ 2 (9 marks)