Trauma and Burns Session

Feb 20th 2018

HOT TOPICS

 -Description of intracerebral trauma on CT

- Management of traumatic PTX/HTX/Flail

- Splenic and liver lacs – grades

- Straddle injury and urethral rupture

- Pelvic injury patterns – Young and Burgess classification

- Eponymous spinal fractures – hangmans, chance, jefferson

- Spinal Cord Injury Patterns –central cord, hemisection, anterior cord

- Le Fort Fractures

- Penetrating Neck Trauma - zones of neck, investigative pathways

- Pregnancy trauma/wedging/perimortem CSection

- Paediatric trauma – NAI patterns of injury

- Burns – Rule of 9’s and Parkland Calcs

- Airway burns  -an airway plan

- Complications of severe burns – (inhalation/cyanide/CO/circumferential/rhabdo/hypothermia)

- Hydrofluoric Acid Burn Management

**1.**

**(11 marks)**

**A 45 year old man has been found at the side of the road on a country lane. He is intoxicated and unable to recall how he got there. The last thing he remembers is arguing in a local pub with another man. He has severe pelvic pain. He has been given 15mg morphine and methoxyfluorane en route via ambulance.**

**Observations**

**P 120**

**BP 90/60**

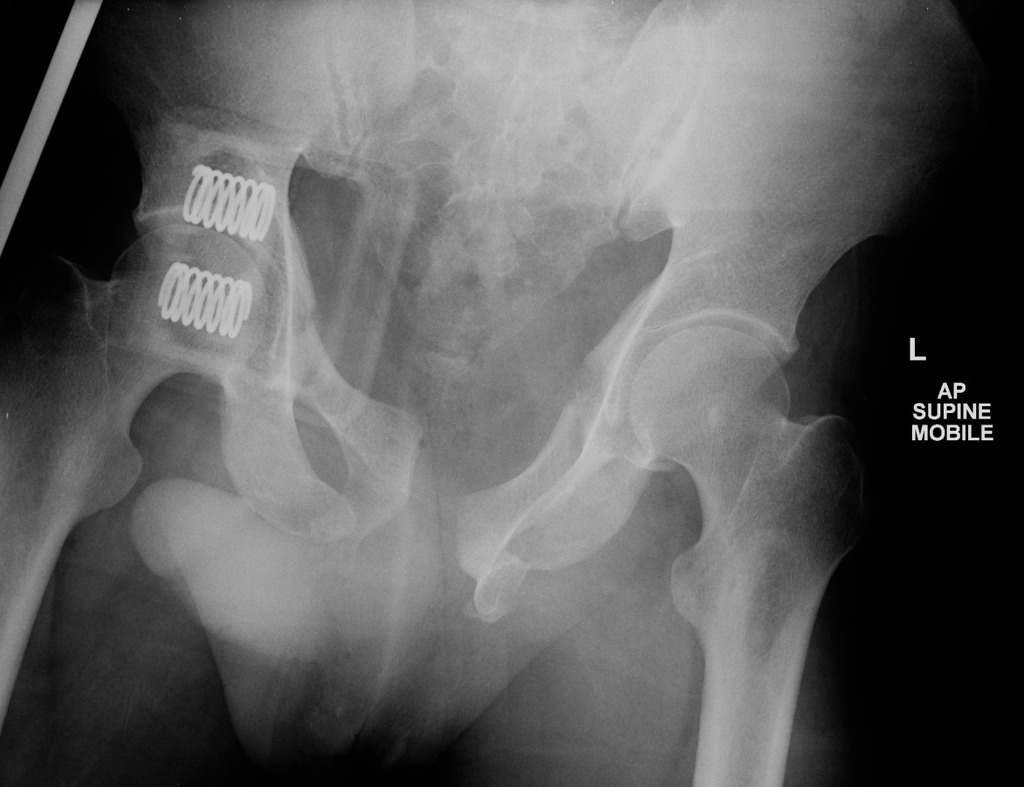
**Sats 97% NRB**

**RR 30**

**Temp 35.1**

**GCS 15**

**His pelvic XRay is shown below**



i. Describe five (5) most important findings on the XRay

(3 marks)

Bilateral Ischial #

Wide Pubic Symphysis

Inferior Pubic Rami Fractures

Widening on the Left SIJ

Binder in Situ

ii. Which mechanism of injury pattern (Young and Burgess) does this injury represent (1 mark)

AP Compression

ii. List four (4) potential immediate complications from this pelvic injury in this man (4 marks)

Uretheral rupture

Bladder injury/disruption if seminal vesicles

Venous plexus bleeding

Disruption of common iliac artery at SIJ/int iliac/gluteal

Lumbar or Sacral plexus injury

Rectal injury

**He remains hypotensive at 80/50 despite 2L crystalloid and 2 units of PRC.**

iii. List the two (2) most important factors that will determine whether the patient receives surgical or angiographic management of the injury

(2 marks)

Availability of each service and in what time frame

Whether free fluid is present in the abdomen on FAST/CT \*\*REQUIRED ANSWER\*\*\*

Rapidy of deterioration – safety for TF to angiography suite

**2.**

**(16 marks)**

**A 40kg 12 years old female has been involved in a house fire that started on an old sofa in the living room. She was trapped in an upstairs bedroom for 20 mins and was pulled from the building through a burning room 30 minutes ago. She has burns to her face, neck, anterior Left arm, entire right arm, anterior legs and anterior torso that total approximately 50% partial and full thickness. She had a three minute tonic clonic seizure en route to hospital which has now terminated after 5 mg of midazolam.**

**P 130**

**BP 90/60**

**Sats 88% 15L NRB**

**RR 34**

**Temp 37.3**

**GCS 7**

**VBG**

**pH 7.09**

**pO2 16**

**pCO2 76**

**HCO3 14**

**Lact 16**

**HbCO 25%**

i. List four (4) **immediate** threats to life

(4 marks)

Airway Burns/ obstruction

Inhalational Injury - pneumonitis

Cyanide Poisoning

Carbon Monoxide Poisoning

ii. List four (4) other complications that you will seek in your assessment over the next 2 hours

(4 marks)

Hypovolaemia

Hypothermia

Rhabdomyolysis/AKI

Compartment Syndrome secondary to circumerential burns

Electrolyte disturbances (K/Phos)

Arrhythmias/neurological disturbance secondary to COHb

iii. List four (4) priority management steps for this patient with brief details of each intervention

(8 marks)

Airway protection – VL, Size 7 ETT, Ketamine+sux or roc, anticipate difficulty, utilise anaesthetics help +/- fibreoptic, apnoeic oxygenation

Circulation – Parkland formula 4 x 50 x 40 = 8L, 4L in first 8 hrs, 4L in subsequent 16h

IDC

Management of cyanide poisoning – consider hydroxycobalamin and sodium thiosulphate. Consult poisons specialist

Management of CO poisoning – 100% O2, consider hyperbaric if very high levels

Escharotomy for circumferential arm burns

Analgesia with fentanyl/ketamine infusion

**3.**

**(13 marks)**

**A 54 years old man was found in the garden lying on concrete after cleaning leaves from a gutter. His wife last saw him 3 hours ago when she left the house to go shopping. He has obvious signs of external head trauma, bleeding from his left ear and has epistaxis. His GCS is 7 and he has unequal pupils. He is on warfarin for AF, but takes no other medications. He has 2 IV lines.**

**The rest of his trauma CT pan-scan shows only 2 fractured lower ribs on the left. There are no other significant injuries.**

**BP 220/120**

**P 55**

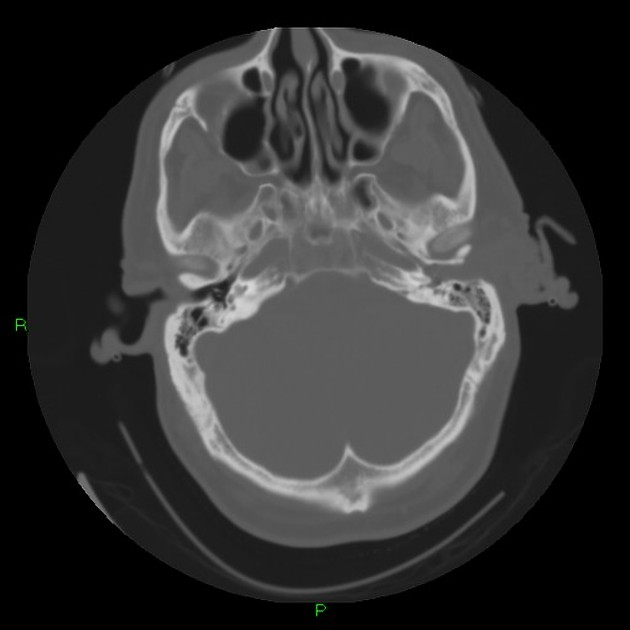
**Sats 95% on 15L NRB**

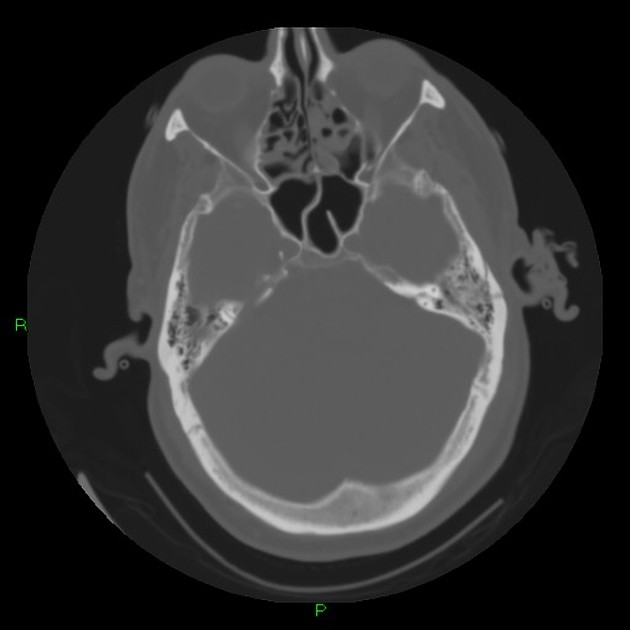
**RR 12**

**Temp 34.1**

**Several slices of his CT are shown below**







i. List four (4) important positive findings on this head CT

(4 marks)

Bilateral frontal subdural haemorrhages

Multiple well defined hyerdensities in the frontal and temporal regions (contusions)

Frontal subfalcine displacement/midline shift

Subarachnoid blood

Effacement of Right lateral ventricle

Temoral bone fracture involving mastoid and external auditory canal

Pneumocephaly Left temporoccipital lobe

ii. In the table below list your three (3) priority clinical endpoints and brief details of the treatments you will deliver to achieve these. Assume that the neurosurgery team are already aware and will be ready to receive the patient in OT in 30 minutes.

(9 marks)

|  |  |
| --- | --- |
| Clinical Priorities | Actions |
| Airway Protection/Oxygenation/Control of CO2 | Intubate  Appropriate induction agent – ketamine or lower dose agent that can c |
| Reduce Intracerebral Pressure/Treat Coning | Mannitol 1g/kg  3% saline 3mls/kg  Hyperventilate  30% head up/tape not tie  Heavily sedate and paralyse |
| Reversal of Anticoagulation | Prothrombinex – 25ml/kg  FFP  Vit K 5-10mg Iv |
| BP Management  <160/100?? | No more than 10% reduction with an appropriate agent  Fentanyl titrates  Any titrateable IV antihypertensive  Aim <160/100  Avoid hypotension |

**4.**

**(19 marks)**

**A 27 years old male has been involved in a gangland fight. He has presented with stab wounds to the neck. He has rapid shallow breathing and is intermittently agitated and swearing.**



i. In the table below list the two (2) zones likely involved in this injury, the boundaries of each zone and three (3) structures most likely involved in the injury

(10 marks)

|  |  |  |
| --- | --- | --- |
| **Zone** | **Boundary** | **3 Structures** |
| 1 | Clavicles to cricoid | -vertebral and proximal carotid arteries  -major thoracic vessels  -lungs  -oesophagus  -trachea  -thoracic duct  -spinal cord  -superior mediastinum |
| 2 | Cricoid to Angle of Mandible | carotid and vertebral arteries  jugular veins  oesophagus  trachea  larynx  spinal cord |

ii. List five (5) physical signs that will guide your immediate management of this patient.

(5 marks)

Unstable vital signs – tachycardia/hypotension/desaturation

Signs of tension PTX – unequal chest expansion, deviated tachea, hypotension,

Breach of Platysma – warrants mandatory exploration IN THEATRE

Suggestion of Aurodigestive tract injury - Gas from wound/bubbling/subcutaneous emphysema/voice change

Pulsatile haematoma/large expanding haematoma

Haematemesis/Haemoptysis

Thrill OR Bruit

Neurological deficit

**The patient gets off the bed and states that he is going to leave and that he is *“going to kill the person that did this”***

iii. State four (4) elements that MUST be present to determine that he has capacity to consent to, or refuse, treatment.

(4 marks)

Decision-Making Capacity:

1. recognises that there is a decision to be made,
2. understands the relevant risks,
3. understands the treatment options,
4. understands the likely consequences of each option (i.e. risks, burdens, and benefits),
5. can rationally manipulate the information to come up with a decision consistent with his or her values.

**Question 5**

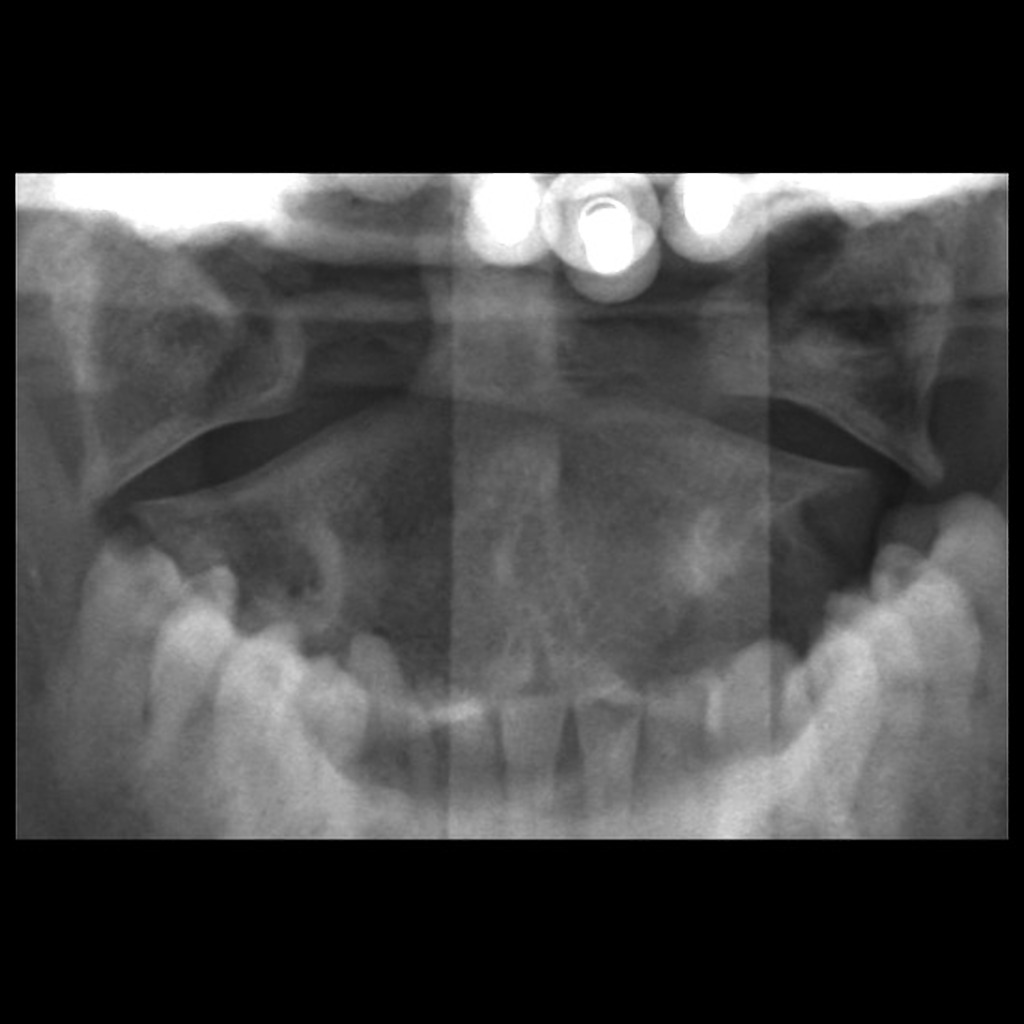
**(7 marks)**

**As the receiving tertiary centre you have been called by a small rural hospital 50km away regarding a 50kg 24 years old female who has dived into a backyard pool and presented with neck pain. She is now adequately analgesed. She has had plain radiographs of the C Spine as there is no CT availability at the smaller hospital.**

**The rural GP has asked for advice on interpreting the cervical spine XRays.**







i. List three (3) abnormal features seen on these radiographs

(4 marks)

Widening of the atlanto-dens interval >3mm

Displacement of lat masses of C2 with respect to to C1 on PEG view

Lucency traversing posterior arch of C2

ii. What is the eponymous name for this abnormality

(1 mark)

Jefferson Fracture

ii. List the three (3) MOST important pieces of information that you will seek from the rural GP in order that you can arrange an appropriate transfer and provide appropriate advice to the GP

(3 marks)

Current positioning/spinal immobilisation/collar type

Other injuries e.g. head injury/other spinal injuries

Neurological defecits – motor/sensory level/bladder emptying

Any resp compromise suggesting high spinal injury that will require intubation pre transfer

**6.**

**(21 marks)**

**You receive pre hospital notification of a patient who will be arriving in 15 minutes. A pregnant female who is 25 weeks gestation has been involved in a head on collision with another vehicle. She was the restrained driver. She was trapped in the car for 45 minutes before being extricated by the fire service. She has had tourniquets applied to bilateral legs, bilateral humeral IO insertions and 15L O2 via non-rebreather mask applied. The paramedic reports at least 1500 mls of blood loss and 2L of crystalloid given.**

**GCS 7**

**BP 70/40**

**Sats 83% 15L NRB**

**RR 30**

**Temp 36.5**

i. List the four (4) pregnancy specific investigations and treatments that you will consider in this patient, that differ from the non-pregnant patient

(4 marks)

Wedge to prevent aortocaval compression or manual displacement of uterus

Kleihauer test

Administration of Anti D if Rhesus D negative

Ultrasound and CTG to detect fetal distress

Consideration of caesarean section in fetal distress or maternal peri arrest/cardiac arrest

The patient has a cardiac arrest 2 minutes after arrival to the resus bay

iii. In the table, list the four (4) immediate lifesaving interventions that you will perform with brief details of each intervention

(12 marks)

|  |  |
| --- | --- |
| **Intervention** | **Brief Details** |
| Bilateral Thoracostomies | **5th ICS Ant Axillary**  In safe triangle  Incision through space  Finger to confirm in pleural space  Convert to ICC later |
| Perimortem CSection | **Vertical Inscision from xiphi to PS**  Blunt dissect down to peritoneum  Vertically incise peritoneum  Deliver uterus  Vertical incision through uterus  Deliver fetus  Pack uterus |
| Blood Products | **Via Rapid Infuser**  Through humeral IO  **O Neg initially**  Then per MTP with FFP/Plt/Cryo  TXA |
| Intubation | **Cold – no drugs**  **Size 7.0 ETT or smaller**  Mac 3-4 or VL  Bougie or stylet  Confirm with capnography |

**After your interventions the patient has ROSC and is found to have a severe trauma induced coagulopathy**

ii. List five (5) measures you will take to address this coagulopathy

(5 marks)

Direct cessation of any bleeding e.g. direct pressure/tourniquets/surgical intervention

Replacement of products in 1:1:1 ratio PRC:FFP:Platelets with MTP

TXA 1g stat, 1g over 8 hrs

Cryoprecipitate administration aiming for Fibrinogen >1.0

Prothrombin Complex Concentrate (II,IX,X)

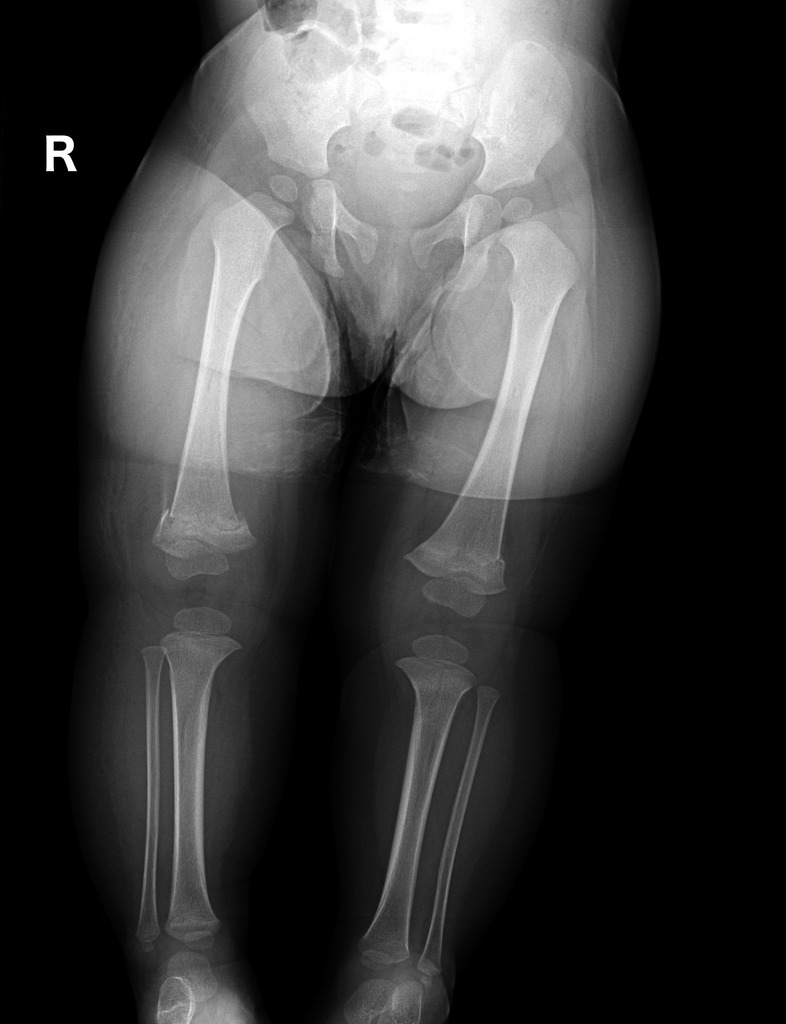
Consider other factor replacement e.g. NovoSeven

**Question 7**

**(11 marks)**

**A 10kg 12 month old child has been brought to your tertiary department by his father with distress and swelling or bilateral knees. The child is inconsolable. There are multiple bruises to both legs from ankles to hips. The father states that he “probably fell down” but nothing was witnessed.**

**X Rays of the lower limbs are shown**



i. Describe the abnormality on the XRay and its relevance to this case (2 mark)

Bilateral metaphyseal corner fractures

Highly suspicious for NAI

ii. List the nine (9) next MOST IMPORTANT assessment and management steps for this child (9 marks)

DEAL WITH CURRENT INJURY

Analgesia – titrated opiates plus panadol and nurofen

Above knee backslabs for bilateral legs with sedation if required for distress

Consult Ortho

IDENTIFY OTHER MARKERS OF NAI

Full body examination to look for injuries suggestive of NAI e.g torn frenulum/retinal haemorrhages/bruises of different ages/cig burns/buttock bruising/evidence of sexual assault

Gather collateral from other sources – parents/GP/hospital presentations

Skelatal Survey/other Ix as indicated by examination findings

CHILD PROTECTION ISSUES

Report to FACS

Involve Social worker

Refer to paeds for admission

**Question 8**

**(18 marks)**

**You are working in an urban district hospital that has no access to radiology overnight. The nearest tertiary hospital is 20km by road. A 17 year old male has been assaulted by another male during a nightclub brawl at 2am. He was punched and kicked to the face and head. He has a swollen left eye and cannot open his eye. He is heavily intoxicated and becomes agitated when you try to examine him. He has no injuries to the trunk or limbs.**

**P 110**

**BP 100/50**

**Sats 93% RA**

**RR 14**

**Temp 37.1**

**GCS 11**

**You are suspicious that he has facial bone fractures and wish to transfer him to the local tertiary hospital in order to get a CT scan**

i. List six (6) other significant injuries or complications do you wish to exclude in this man

(6 marks)

ICH/subdural/SAH/extradural

Skull fracture/BOS #

CSpine injury/#

Globe Rupture

Orbital Compartment Syndrome/Retroorbital haematoma

Injury to infraorbital nerve

Tympanic Membrane rupture

Laryngeal fracture and assoc neck injuries e.g. haematoma

ii. In the table below compare intubation with Propofol and Rocuronium versus Ketamine sedation without intubation for the transfer of this patient. List 3 pros and 3 cons for each.

(12 marks)

|  |  |  |
| --- | --- | --- |
|  | **Intubation With Propofol and Rocuronium** | **Ketamine Sedation Without Intubation** |
| Pros | Airway protected  Less Aspiration Risk  Less likely hypoxia/hypercapnia  High risk of deterioration  Less risk to staff of aggression | Less technical skill/equipment required (however still should be able to intubate in case of spasm)  Easy to achieve – can give IM if patient agitated  Lower risk of hypotension  Analgesic properties  Can detect if seizures |
| Cons | Risk of hypotension on induction  Requires skilled operator/expertise  CSpine Immobilised – difficult airway with MILS  Will need doctor transfer/retrieval team  Require ongoing infusions | More aspiration risk  Risk of increasing IOP in eye injury  Laryngospasm Risk  Vomiting risk  Emergence phenomena  Will require re-dosing or infusion en route  Patient still moves/less control |

**Question 9**

**(20 marks)**

**A 38 years old man presents to Emergency with painful hands after using industrial glass etching solution that contains Hydrofluoric Acid.**

**P 120**

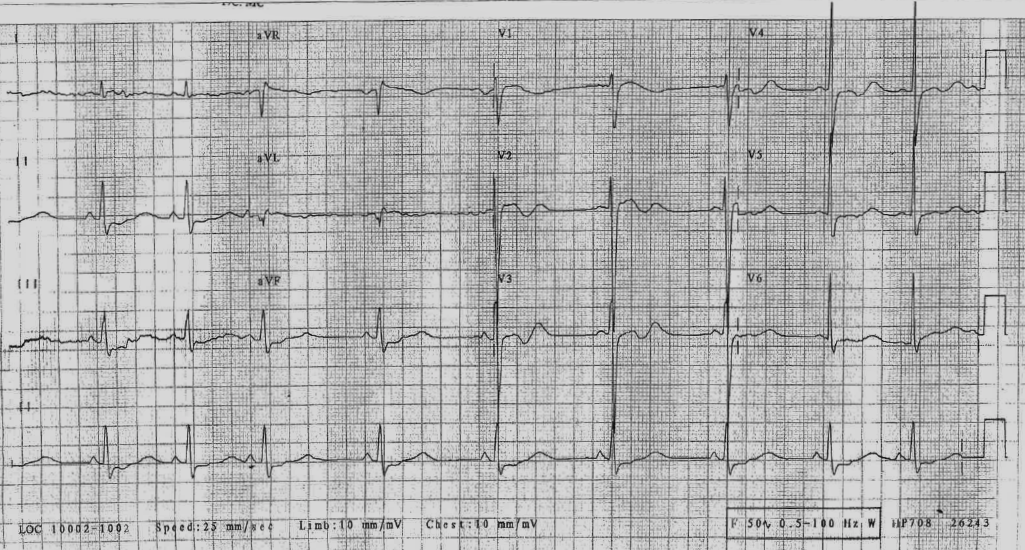
**BP 110/80**

**Sats 96% RA**

**RR 25**

**Temp 37.2**

**His ECG is shown below**



i. List the eight (8) assessment factors that you will consider in the risk assessment of this patient

(8 marks)

% solution

Duration of contact

BSA exposed

Decontamination to date ?washed for 15 mins

Comorbid conditions

Skin changes - Presence of blanching, vesiculation, necrosis of tissue suggests severe

Clinical features of hypoK – tetany, musc spasms, long Qtc, perioral tingling

Levels of Ca/Mg on blood testing

Systemic signs of Fluorosis – abnormal obs

ii. List three (3) ECG findings

(3 marks)

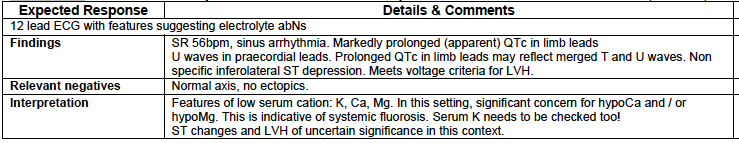
SR 56

Sinus Arrhythmia

Long QTc

Non specific lateral/inferior STD

Voltage Criteria for LVH



iii. What are the three (3) likely causes for the ECG findings

(3 marks)

Low Ca

Low K

Low Mg

(ALL due to fluorosis)

iii. List six (6) specific management and supportive care options for this patient

(6 marks)

Decontamination with water for 15 mins

Analgesia – titrated opiates – avoid local anaesthetic as pain is an endpoint of Ca therapy

**Calcium Gluconate Paste – poorly penetrates skin**

**Calcium Gluconate Infiltration 5%, max 1ml per cm sq**

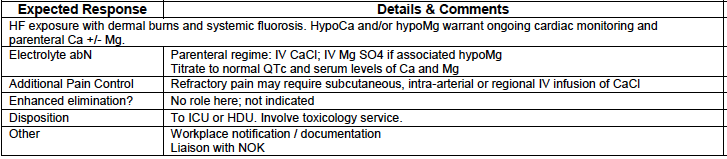
**Calcium Gluconate Biers Block**

**Intra-arterial Calcium Gluconate**

**(MUST HAVE 2 OPTIONS FOR CaGl to score full marks)**

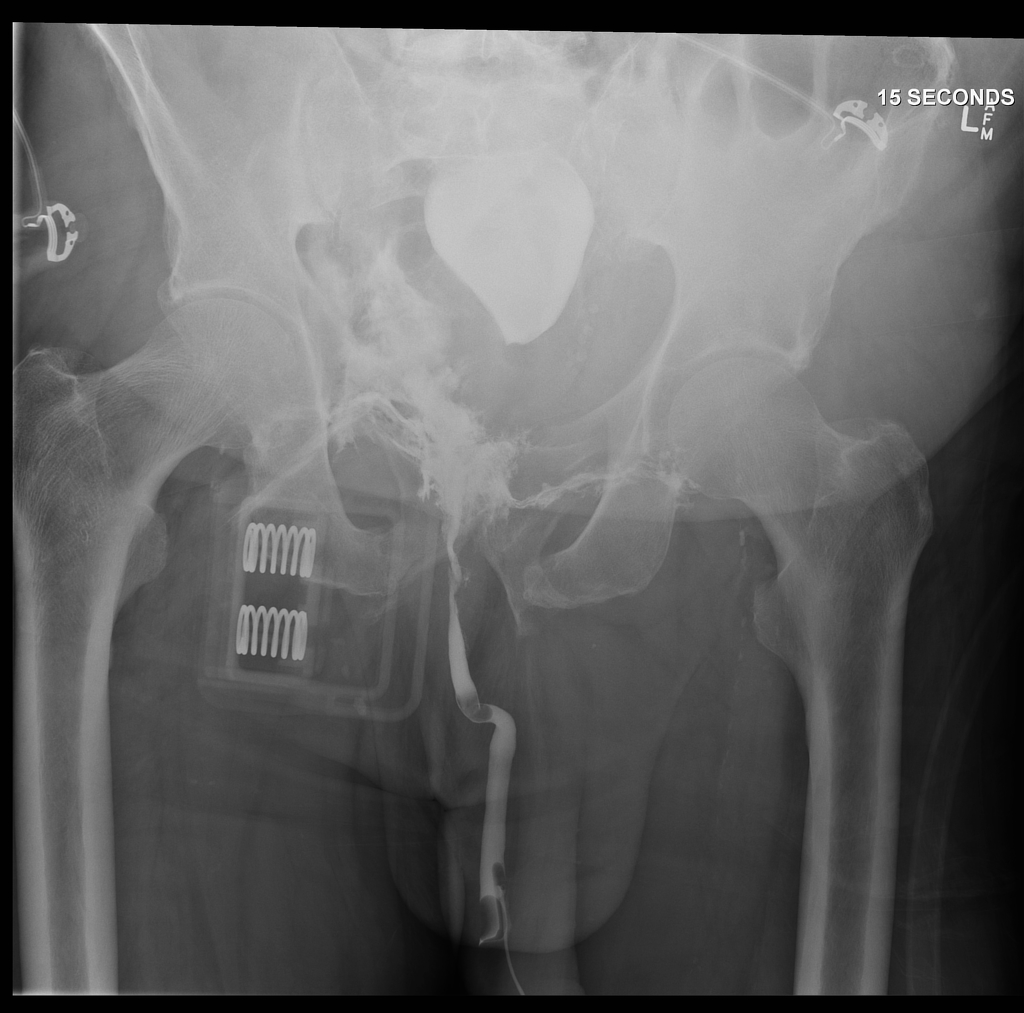
Replace Calcium with IV Calc Gluc or CaCl – titrate to normal QTc

Replace K and Mg



**SUPPLEMENTARY QS**

A. Mechm: Straddle Injury onto a metal pole after falling on a building site



What study is this?

Retrograde Urethrogram

What does it show

Transction of the bulbous urethra with contrast extravasation

Bilateral inferior PR#

Pelvic Binder in Situ

What clinical findings might you expect to see?

Blood at meatus

Perineal bleeding

Testicular swelling/hydrocele

Evidence of shock from pelvic venous or arterial bleeding (int iliac/common iliac/gluteal As)

Evidence of neurological injury – lumbar and sacral plexus

Rectal bleeding

High riding or boggy prostate