**Question 25 – Electrical injury (12 marks total)**

Reference made to

LITFL information on electrical injury

Dunn

Cameron et al

Answer supplied by exam organisers

Answers are in **bold** with explanation for the answer in *italics*

**A 24 year old apprentice electrician has been brought to the emergency department having suffered an industrial electrocution, while working in the rain. He has burns to both his hands and he complains of some dizziness and severe pain in his arms.**

**Q1 List four factors that can influence the severity of injury in this man**

**(4 marks)**

**1. Amount of electricity that flows (current)**

*flow of electrons, which is dependent on V = IR*

*Therefore I (current) is proportional to voltage and inversely proportional to resistance*

*Therefore, the greater the voltage, the greater the current*

*However, the greater the resistance, the lesser the current*

*In order of highes to lowest, the resistance of tissues is:*

*Bone > fat > tendon > skin > muscle > blood vessels > nerves*

*In addition, wet skin decreases the resistance*

*Therefore in this man, the fact that the skin is wet means that a greater amount of current would have travelled through*

**2. Current path and density**

*However, prediction of injuries from knowledge of the pathway is unreliable. Some resources state that hand to hand is particularly severe given that the current traverses the heart but others state that only about 5% traverses the heart in this pathway*

**3. Type of current (AC or DC)**

*AC@ 50 Hz is most dangerous (approx.. three times as dangerous as DC). AC can produce tetanic contraction such that victims cannot let go of the source.*

**4. Duration**

*the shorter the duration the higher the current flow must be before the damange is done. Usually in DC, the duration is shorter as victim is thrown from the source*

**Q2 Apart from his hand wounds, list the four most likely tissues to be injured in this man, giving the type of injury for each, that may explain his symptoms**

**(8 marks)**

|  |  |
| --- | --- |
| **Tissue** | **Injuries** |
| **Heart** | **Direct myocardial necrosis**  **Arrhythmias**  *- VF more common after low voltage AC*  *- Asystole more common after DC or high voltage AC* |
| **Vasculature** | **Large and small vessel arterial and venous thrombosis**  - leads to tissue damage  - can lead to ischaemic pain  - can have immediate and delayed major vessel haemorrhage, arterial thrombosis and DVT |
| **Skeletal muscle** | **Rhabdomyolysis** |
| **Bone** | **Compression fractures of vertebral bodies**  **Long bone fractures**  **Dislocations eg shoulder (posterior)**  *- can be due to tetanic contractions but may also result from secondary fall rather than the electrical injury itself* |
| **Renal** | **ARF**  *- secondary to myoglobinuria*  *- similar to crush injury where myoglobin and creatine phosphokinase are released* |
| **Nervous system** | **Acute**  **- respiratory arrest**  **- seizures**  **- altered mental state**  **- amnesia**  **- coma**  **Delayed**  **- spinal cord injury**    **Peripheral nerve injury** |