***TRAUMATOLOGY 1***

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1. **Course name and code**

**TRM 203 TRAUMATOLOGY 1**

1. **Course overview**

**This module is designed to enable the learner identify and manage various trauma conditions.**

1. **Course Learning Outcomes**

By the end of the module you should be able to:

1.Demonstrate understanding of trauma.

2.Classify fractures.

3.Apply principles of fracture management.

4.Understand general complications of fractures.

MODULE UNITS:

1. Introduction to trauma.
2. Classification of fractures.
3. Clinical and radiological features of fractures.
4. Principles of fracture management.
5. Complications of fractures

MODULE CONTENTS:

*Introduction to traumatology, Historical background, present trends and terminologies, mechanism of injury and fracture healing. Classification of fractures; aetiology, patterns, displacement. Clinical and Radiological features of fractures; signs and symptoms.*

*Principles of fracture management; first aid, reduction immobilization and rehabilitation. Complications of fractures; immediate, early and late.*

*INTRODUCTION TO TRAUMATOLOGY.*

*Aetiology of major trauma,*

*Trauma is the commonest cause of death in people from 1 to 44 years of age throughout the developed world.*

* *The largest proportion of deaths 1.2m result from road accidents.*
* *The world health organization(WHO) predicts that by 2020 road traffic injuries will rank third in the causes of premature death and loss of health from disability.*
* *For every death from trauma three victims suffer from permanent disability.*
* *As well as causing personal tragedy, this represents an enormous drain on nations health care economy.*
* *Timely and effective management of major injuries can reduce both morbidity and mortality.*

**MODE OF DEATH.**

* **The overall mortality rate, including pre-hospital and in hospital deaths,35% in high income nations but rises to 55% in middle income economics and 63% in low income economics.**
* **The initial mortality peak is usually due to non-survival central nervous system or cardiovascular disruption.**
* **The severe nature of the injuries, the immediate nature of the deaths and the usual location in the pre-hospital environment means that very few of these casualties can be saved.**
* **However, a small proportion die as a result of early airway obstruction and external haemorrhage and these deaths can be prevented by immediate first aid measures.**
* **The second peak of deaths during the first few hours after injury is often due to hypoxia and hypovolaemic shock. A significant proportion of these deaths can be avoided with an effective emergency medical service(EMS) HENCE THIS PERIOD HAS BEEN CALLED THE GOLDEN HOUR. {EQUIPED CASUALITY WITH COMPETENT STAFF>YOU.**
* **The third peak in the cumulative mortality rate within the 6 weeks following injury is largely due to multisystem failure and sepsis. These complications of trauma need a high level of intensive care, but can be reduced by early and effective treatment during the preceding phases of casuality management.**

**SEQUENCE OF MANAGEMENT:**

**Depends on:**

**Health systems>Levels of care; L1to L6 COUNTIES and NATIONAL GOVERNMENTS.**

**Scene of accident.**

**Emergency medical services(EMS).**

**Trained personnel.**

* **Centered on evaluation, resuscitation and stabilization.**
* **Operating theatre.**
* **Control of airway.**
* **Ventilation and surgical management of haemorrhage.**
* **Musculoskeletal injuries are initially stabilized followed by definitive treatment.**

**PRE-HOSPITAL MANAGEMENT:**

**Essential elements include:**

1. **Organization**
2. **Safety at scene of accident**
3. **Immediate actions and triage.**
4. **Assessment and initial management.**
5. **Process of removal of victims and immobilization.**
6. **Transfer to hospital.**
7. **Air ambulance.**
8. **NOTE. (A, B, C, D, E)-AIRWAY, BREATHING, CIRCULATION, DISABILITIES AND EXPOSER.**

**HOSPITAL MANAGEMENT:**

 **Most important in hospital set up include;**

**a. Organization.**

 **b. trauma teams.**

 **c. assessment and management. The ATLS concept.**

**d. Initial management.**

**e. Systemic management.**

**Further illustration of ABCDE.**

**A-Airway with cervical spine protection.**

**B-Breathing**

**C- Circulation with haemorrhage control.**

**D-Disability or neurological status.**

**E-Exposer and Environment>remove clothing, keep warm.**

**PRINCIPLES OF FRACTURES.**

**A fracture is a break in the structural continuity of bone. It may be more than a crack, a crumpling or a splintering of the cortex, more often the break is complete and the bone fragments are displaced. If the overlying skin remains intact it is closed or simple fracture. If the skin or one of the body cavities is breached, it is open or compound fracture, reliable to contamination and infection.**

**HOW FRACTURES HAPPEN.**

**Bone is relatively brittle, yet it has sufficient strength and resilience to withstand stress. Can be caused by(causes):**

 **1.Injury**

 **2.Repetitive stress**

 **3.Abnornomal weakening of the bone (pathological fracture).**

**FRACTURES DUE TO INJURY.**

* **Most fractures are caused by sudden and excessive force which may be direct or indirect.**
* **Most fractures are due to a combination of forces (twisting, bending, compressing or tension), the x-ray pattern reveals the dominant mechanism.**
* **Twisting causes a spiral fracture.**
* **Compression causes a short oblique fracture.**
* **Bending results in a fracture with triangular butterfly fragment.**
* **Tension tends to break the bone transversely-avulse a small fragment or tendon insertion.**

**NOTE.**

**The above description applies mainly to the long bones. A cancellous bone, such as a vertebra or calcaneum, when subjected to sufficient force ill split or be crushed into an abnormal shape.**

**FATIGUE OR STRESS FRACTURES:**

**Repeated heavy loading, Athletes, dancers or military personnel who have grueling exercise programmes.**

**Medication with steroids or methotrexate alters normal balance of bone. Causes bone resorption.**

**PATHOLOGICAL FRACTURES:**

**These fractures are caused by bone diseases like; Osteoporosis, Osteogenesis imperfecta, Paget’s disease, Bone cysts and metastasis.**

**TYPES OF FRACTURES:**

**They are divided into a few well defined groups:**

1. **Complete fracture>Bone split into two or more fragments.**

**Transverse fracture, oblique or spiral, impacted. More than 2 fragments, comminuted which is unstable fracture.**

1. **Incomplete fractures.**

 **Examples are-Greenstick fracture-like snapping a green twig, buckled or bent. Common in children whose bones are more spongy than those of adults.**

 **Compression fractures-cancellous bone is crumpled.Eg. vertebra bodies, calcaneum, tibia plateau.**

**CLASSIFICATION OF FRACTURES:**

**Classification is based on the anatomical site of the fractured bone.**

**HOW FRACTURES ARE DISPLACED.**

**After a complete fracture the fragments usually become displaced, partly by the force of the injury, partly by gravity and partly by the pull of muscles attached to them.**

**Displacement is usually described in terms of translation, alignment, rotation and altered length.**

* **Translation-the fragments may be shifted, sideways, backward or forward in rotation to each other, such that the fracture surfaces lose contact.**
* **Angulation(tilt)-Fragments may be tilted or angulated in relation to each other. Malalignment if uncorrected, may lead to deformity of the limb.**
* **Rotation(twist)-one of the fragments may be twisted on its longitudinal axis; the bone looks straight but the limb ends up with a rotational deformity.**
* **Length-The fragments may be distracted and separated or they may overlap, due to muscle spasm causing shortening of the bone.**

**HOW FRACTURES HEAL:**

* **For bone union to take place a fracture must be immobilized. Healing takes place by formation of callus. This is called bone union.**
* **Most fractures are splinted, not to ensure union but to: A). alleviate pain. B). ensure that union takes place in good position. C). permit early movement of the limb and return of function.**
* **The process of fracture repair varies according to the type of bone involved and the amount of movement at the fracture site.**

**HEALING BY CALLUS:**

**This is the natural form of healing in tubular bones, in the absence of rigid fixation. It proceeds in five stages>**

1. **Tissue destruction and Haematoma formation.**
2. **Inflammation and cellular proliferation 8hrs.**
3. **Callus formation e.g. woven bone takes 4weeks for union to take place.**
4. **Consolidation>osteoclastic and osteoblastic activity and the woven bone is transformed into lamellar bone.**
5. **Remodeling>solid bone.**

 **UNION, CONSOLIDATUNION AND NON UNION:**

**Union>process of healing. Incomplete and it is not safe to subject to bone to stress. Fracture still tender.**

**Consolidation>complete repair, the calcified callus is ossified. Fracture site not tender.**

**TIMETABLE.**

**How long does a fracture take to unite and consolidate? No precise answer is possible because age, constitution, blood supply, type of fracture and other factors influence the time taken. (3weeks,4weeks,6-8 weeks).**

**There must be clinical and radiological evidence of consolidation before full stress is permitted without splintage.**

**NON-UNION**

**Sometimes the normal process of fracture repair is thwarted and the bone fails to unite. Causes are:**

**1.Distraction and separation of fragments (soft tissue between the fragments).**

**2.Excessive movement at the fracture line.**

**3.Severe injury>renders local tissues non- viable or nearly so.**

**4.Poor local blood supply.**

**5.Infection-of course surgical intervention if ill-judged is another cause.**

**CLINICAL FEATURES:**

* **History**
* **General signs**
* **Local signs**
* **Look**
* **Feel**
* **Move**
* **X-ray**
* **Special imaging**
* **Description>shape od fracture, displacement etc.**

**SECONDARY INJURIES:**

**Certain fractures are apt (having a tendency) to cause secondary injuries and these should always be assumed to have occurred until proven otherwise.**

* **Thoracic injuries>injury to lungs or heart. Check cardiorespiratory function.**
* **Spinal cord injury>Neurological examination is necessary.**
* **Pelvic and abdominal injuries>visceral injury-urinary function review (urethra, bladder, rectum and vagina).**
* **Pectoral girdle injury>damage to the brachial plexus or large vessels at the base of the neck. Neurogical and vascular examination is necessary.**

**TREATMENT OF CLOSED FRACTURES:**

**Treatment of the fracture consists of manipulation.to improve the position of the fragments, splintage to hold them together until they unite, meanwhile joint movement and function must be preserved. Fracture healing is promoted by physiological loading of the bone so muscle activity and early weight bearing are encouraged.**

**3 simple strategies include:**

**>Reduce**

**>Hold**

**>Exercise.**

**Tscherne [Oestern and Tscherne,1984] has devised a helpful classification of closed injuries.**

**Grade 0---- a simple fracture with little or no soft tissue injury.**

**Grade 1-----fracture with superficial abrasion or bruising of the skin and subcutaneous tissue.**

**Grade 2-----a more severe fracture with deep soft tissue contusion and swelling.**

**Grade 3------A severe injury with marked soft tissue damage and a threatened compartment syndrome. (a painful and dangerous condition caused by pressure build up from internal bleeding or selling of tissue).**

**The more severe grades of injury are more likely to require some form of mechanical fixation, good skeletal stability aids and soft tissue recovery.**

**REDUCTION**

 **Should be done during the first 12 hours.**

 **2 methods closed and open.**

 **Closed reduction---under GA, Manipulate, alignment is adjusted in each plane.**

**Open reduction.**

 **When closed reduction fails---Operation to reposition the fragments of the fracture and internal fixation is done.**

**HOLD REDUCTION**

 **The available methods of holding reduction are:**

* **Continuous Traction>Gravity, Skin, and skeletal.**
* **Cast splintage.**
* **Functional bracing.**
* **Internal fixation.**
* **External fixation.**

**COMPLICATIONS OF TRACTION:**

**Circulatory embarrassment> Gullows traction should not be used in children over 12kg in weight.**

**Nerve injury> peroneal nerve injury can cause a drop foot.**

**Pin site infection> keep clean and checked daily.**

**INDICATIONS FOR INTERNAL FIXATION:**

**1.Fractures that cannot be reduced except by operation.**

**2.Fractures that are unstable and prone to re-displace after reduction.**

**3.Fractures that unite poorly and slowly (femoral neck)**

**4.Pathological fractures in which bone disease may prevent healing.**

**5.Multiple fractures**

**6. Fractures in patients who present nursing difficulties (paraplegics, multiple injuries and elderly).**

**COMPLICATIONS:**

 **> Infection**

 **>Non-union**

 **> Implant failure**

 **>Refracture.**

**EXTERNAL FIXATION INDICATIONS:**

**1.Fractures associated with severe soft tissue damage.**

**2. Fractures around joints with swollen soft tissues.**

**3.Patients with severe multiple injuries.**

 **-bilateral femoral fractures.**

 **-pelvic fractures with bleeding**

 **-chest or head injuries.**

**4.Ununited fractures**

**5. Infected fractures**

**COMPLICATIONS:**

**>Damage to soft tissue structures**

**>Overdistruction**

**>Pin-track infection.**

**EXERCISE:**

**Important to restore functionality.**

**Early movement for discharge.**

**Avoid loss of function of joints.**

**Embolism.**

**Pneumonia**

**Bed sores**

**COMPLICATIONS OF FRACTURES**

**General complications include, blood loss, shock, Fat embolism, cardiorespiratory failure etc.**

**Local complications can be divided into early and late.**

 **Early.**

**Local visceral injury.**

**Vascular injury**

**Nerve injury**

**Compartment syndrome**

**Haemarthrosis**

**Infection**

**Gas gangrene**

**Late.**

**Delayed union**

**Malunion**

**Non-union**

**Avascular necrosis**

**Muscle contracture**

**Joint instability**

**Osteoarthritis**