# Best Aid to Orthopedics

Pramod TK



JAYPEE

# Contents


1. Orthopedic Trauma: An Introduction ..... 1
2. Anatomy of Bone and Fracture Healing ..... 15
3. General Principles in the Treatment of Fractures ..... 24
4. Splints and Traction ..... 35
5. Recent Advances in the Treatment of Fractures ..... 42
6. Complications of Fracture ..... 49
7. Peripheral Nerve Injuries ..... 67
8. A General Review of Treatment of Orthopedic Disorders ..... 95
9. Injuries Around Shoulder ..... 105
10. Injuries Around Elbow ..... 119
11. Injuries of Forearm and Wrist ..... 136
12. Hand Injuries ..... 151
13. Pelvic Fracture ..... 154
14. Injuries Around the Hip ..... 160
15. Fracture Shaft of Femur ..... 183
16. Injuries Around the Knee ..... 189
17. Injuries Around Ankle ..... 200

18. Spinal Injuries ..... 215
19. Traumatic Paraplegia ..... 228
20. Infections of the Bone and Joints ..... 232
21. Tuberculosis of Bones and Joints ..... 260
22. Infections of the Hand ..... 291
23. Congenital Talipes Equinovarus ..... 301
24. Congenital Dislocation of Hip and other Malformations ..... 317
25. Polio and Musculoskeletal Disorders ..... 332
26. Bone Tumors ..... 346
27. Prolapsed Intervertebral Disk ..... 377
28. Scoliosis and other Spinal Deformities ..... 386
29. Back Pain ..... 394
30. Arthritis and Related Diseases ..... 399
31. Degenerative Diseases ..... 417
32. Affections of the Soft Tissue ..... 427
33. Metabolic Bone Diseases ..... 446
34. Miscellaneous Affection of the Bone ..... 467
35. Miscellaneous Regional Diseases ..... 486
36. Amputations, Prosthesis and Orthotics ..... 506

37. Sports Surgery and Arthroscopic Surgery ..... 518
38. Joint Replacement Surgery ..... 523
39. Instruments and Implants ..... 528
40. Important Clinical Tests ..... 547

*Index* ..... *557*

# 3

# General Principles in the Treatment of Fractures

**Q. Discuss the management of open fractures.**

A fracture is said to be open when there is a break in the overlying skin and soft tissue, thus establishing the communication in between the fracture and the external environment.

Three specific complications may result:

1. ***Infection of the bone***
2. ***Inability to use the traditional methods***:
   - A small wound can be managed by a small hole in the window of the plaster of Paris, but it may not be possible to manage the big wound in this way.
   - The presence of wound may also be a deterrent to the operative fixation of the fracture.
3. ***Problems related to union***:

Nonunion and malunion can happen in the case of open fracture. This is because of one or more of the following reasons:

- Gap created due to loss of a bony fragment from the wound at the time of injury
- The fracture hematoma which has osteogenic potential is lost from the open wound

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- The vascular cover by the overlying soft tissue, which is so important in fracture union may be missing
- The bone may get secondarily infected.

***Classification of open fracture (Gustilo and Andreson, 1976)***

Gustilo and Andreson classification is based on:

- Size of the wound
- Degree of contamination
- Periosteal and soft tissue coverage
- Neurovascular status.

| | |
|---|---|
| Type 1 | Open fracture with clean wound less than 1 cm long |
| Type 2 | Open fracture with laceration more than 1 cm long usually up to 10 cm, with extensive soft tissue damage, flaps and avulsions |
| Type 3 | Open segmental fractures, open fractures with extensive soft tissue damage and traumatic avulsions |
| Category Special | Open fracture with gunshot wounds, farm injury or vascular injury requiring repair |

***Treatment:***

***Principles of treatment:***

To convert the open fracture into a closed one following which the treatment of an open fracture is similar to that of a closed one.

***Phase 1: Emergency care***

At the site of accident

In the emergency department

***Phase 2: Definitive care***

***Phase 3: Rehabilitation.***

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***Phase 1: Emergency care***

*At the site of accident:*

- Apply pressure in order to stop the bleeding
- Wash the wound with tap water if it is dirty
- The fracture is splinted.

*In the emergency department:*

- Wound care: Aseptic dressing of the wound
- Analgesics
- Splintage
- Prophylactic antibiotics
- Tetanus and gas gangrene prophylaxis
- X-ray to be taken to evaluate the fracture.

***Phase 2: Definitive care***

Requires well-equipped operation theater with lot of instruments, implants and competent orthopedic surgeon.

***Wound care***

a. Wound debridement:
   - Small punctured wounds: Leave as it is
   - Clean lacerate wound followed by primary closure
   - Doubtful lacerated wounds observed for 2 to 3 days
     - If there is no infection: Delayed primary suturing
     - In presence of infection: Secondary closure
   - Infected wound: Healing by secondary intention.

b. Definitive wound care: Decision regarding suturing is made as above.

***Fracture management*** by one or more of the following methods:

- External skeletal fixation
- Immobilization in plaster

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- Pins and plaster
- Skeletal traction
- Internal fixation.

***Phase 3: Rehabilitation:*** Consists of the following

- Exercise during the immobilization of the fracture
- Advise following mobilization: Consists of graduated weight bearing, muscle re-education and gait training.

***Open reduction: Indications***

**(Remember as NO CAST)**

**N**onunion
**O**pen fracture
**C**ompromise (Neurovascular)
**A**rticular fracture
**S**alter Harris Type 3, 4, 5
**T**rauma.

**Q. Give the chemical formula and list the uses and complications of a cast of Plaster of Paris.**

**Q. List the fundamental principles to be followed while applying a plaster cast.**

- Is $CaSO_4.½ H_2O$ in dry form which becomes $CaSO_4 2H_2O$ on wetting, this conversion is an exothermic reaction (that is releases heat) and is irreversible
- The setting time of the plaster varies with quality and the temperature of water.

***Types of plaster bandage:***

- One prepared by impregnating rolls of starched cotton bandage with plaster powder (homemade bandages)
- Readymade bandages.

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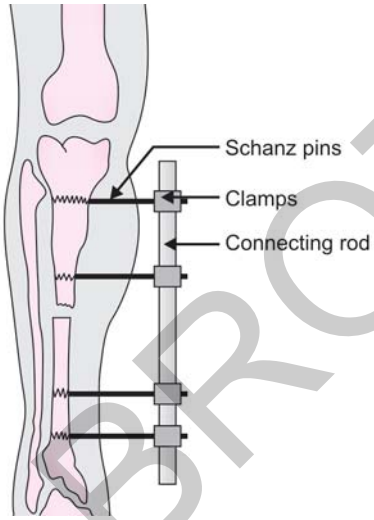


**Fig. 3.1: External fixation**

***Uses:***

It may be used as a slab or as a cast.

***Slab:***

- A plaster slab covers only a part of the circumference of the limb
  - It is made by unrolling a plaster bandage to-and-fro on a table
  - An average slab is about twelve such thicknesses.
- Uses:
  - For immobilization of the soft tissue injuries
  - Reinforcing plaster casts.

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***Cast:***

- A plaster cast covers the whole of the circumference of the limb
- Its thickness varies with the type and location of the fracture.

***Fundamental principles to be remembered while applying a plaster cast:***

- Immobilize the joint above and below the fracture
- Immobilize the joint in the functional position
- Pad the limb adequately especially on the bony prominences
- Mobilize the joints not included in the plaster.

***Complications of the plaster treatment:***

- Impairment of circulation
- Plaster sores
- Excessive pain
- Fretfulness
- Disturbed sleep
- Recurrent swelling over toes and fingers
- Low grade fever
- Dry skin
- Dermatitis
- Compartment syndrome.

**Q. Define cementation. Describe its mechanism of action, indications and contraindications and uses.**

***Definition:*** Cementation is a technique in which a pathological lesion is curetted from the bone and the resulting cavity is filled with polymethylmethacrylate (bone cement).

Complete removal of the bone is required before cementing.

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***Mechanism of action:*** *Bone cement has an antineoplastic influence by the following:*

- Through the heat released during polymerization that is setting
- Direct toxic effect of the monomer on the tumor cells
- The mass of the cement also prevents diffusion of the nutrients to the tumor and tends to lower the oxygen tension by decreasing the blood supply.

***Indication:***

Absolute mainly used for joint replacement.

***Relative:***

- Aneurysmal bone cyst
- Giant cell tumor
- Simple bone cyst
- Fibrous dysplasia
- Chondroblastoma.

***Advantages and Disadvantages and complication:***

| ***Advantages*** | ***Disadvantages and complication*** |
|---|---|
| Normal contour of the bone retained<br>Devitalizes adjacent tumor cells<br>Indistinguishable from the adjacent bone and will not cause any restriction of the joint movement<br>Easy radiological contrast with bone<br>As there is no metal prosthesis, CT/MRI can still be used | Pulmonary embolism<br>Hypotension<br>Early osteoarthritic changes<br>Chronic serous effusion in the nearby joint<br>Secondary fracture in slender bones |

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**Q. Define external fixation. Mention its indications, advantages and disadvantages.**

***Definition:*** External fixator is a device by which the fracture is stabilized in the frame outside the limb. This has process is called internal fixation.

***Indication:*** This method is useful in the treatment of open fractures where internal fixation cannot be carried out due to the risk of infection. They are as follows:

1. ***Diaphyseal and Metaphyseal area***
   - Fracture requiring plastic surgery
   - Compound fracture
   - Closed fracture with severe soft tissue injury
   - Fracture with compartment syndrome
   - Polytrauma
   - Infected nonunions
   - Bone lengthening
   - Deformity correction.
2. ***Articular area***
   - Degenerative and post-traumatic adhesions
   - Septic arthritis.
3. ***Selected fracture of pelvis***

***Types:*** Tubular, ring and hybrid

| *Advantages* | *Disadvantages* |
|---|---|
| • Emergency wound stabilization<br>• Easy technique<br>• Less time consuming<br>• Minimal invasion | • Pin loosening<br>• Pin-track infection<br>• Interference with soft tissue envelop reconstruction |

*Contd...*

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*Contd...*

| *Advantages* | *Disadvantages* |
|---|---|
| • Allows early mobilization<br>• Better stabilization<br>• Regular dressing of the open wound can be done, without disturbing the alignment of the fractured bone and hence promotes healing<br>• Can be adjusted later | • Loss of reduction with deformity<br>• Late deformity after removal of frame<br>• Delayed union<br>• Nonunion |

In case of open fracture, better stabilization of the fracture is possible with external fixation which consists of the use of two to three pins passed across the proximal and distal fragment and held rigidly by a frame external to the limb.

### *Choice of fracture fixation*

| *External fixation* | *Internal fixation* |
|---|---|
| • Bone comminuted<br>• Severe contamination<br>• Unable to achieve wound closure in a timely fashion if second look debridement is required<br>• Bone and soft tissue is devascularized<br>• Major soft tissue defect | • Fracture accessible with minimum stripping<br>• Clean wounds<br>• Closure possible<br>• Intra-articular injury is absolute<br>• Intact soft tissue |

**Q. What is polytrauma? Write the management of the same.**

Any patient who fulfills any one of the following criteria is considered to have polytrauma

- Two major system injury plus one major limb injury
- One major system injury plus two major limb injury

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- Unstable pelvis plus associated visceral injury
- One major system injury plus one open grade three skeletal injury.

***Management:***

The **ABCDEF** of polytrauma management are as follows:

***A. Airway maintainance*** with cervical spine control
- The cervical spine should be carefully protected at all times and not to be hyperextended, hyperflexed or rotated to obtain a patent airway.
- A chin lift or jaw thrush maneuver, should be used to establish the airway.

***B. Breathing*** with special emphasis on:
- Tension pneumothorax
- Open pneumothorax
- Massive hemothorax
- Flail chest with lung contusion.

***C. Circulation.***

***D. Disability*** (neurological status) by Glasgow coma scale.

***E. Exposure and environment control,*** undress the patient but prevent hypothermia.

***F. Fracture splintage or fixation***, as a rule the following steps are to be followed:
- Adequate immobilization of the cervical spine, proper handling of the patient in order to prevent further damage to neurovascular elements
- Immobilization does not need to be absolutely rigid
- The joint above and below the fractured site should be immobilized. Splints can be improvized by pillows, clothing.

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- Overbleeding should be temponaded with dressing and firm pressure
- Tourniquet should be avoided, unless it is obvious that the patient's life is in danger.

***Pitfalls and their solution in the phases of resuscitation:***

| *Phase* | *Pitfalls* | *Solution* |
|---|---|---|
| **A** | Tracheal injury | Jaw thrush to realign |
| **B** | Tension pneumothorax | Large bore needle/ flutter valve chest tube |
| **C** | Pericardial tamponade | Subxiphoid aspiration under USG guidance |
| **D** | Expanding intracranial hematoma | Trephination<br>Craniotomy |

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# Best Aid to Orthopedics

***Salient Features***

- It is a book by a student and for a student
- It is a preparatory manual for examination
- The topics are written in question and answer format
- The answers are given in a point-wise fashion
- Mnemonics are really of great aid to memory
- Tables and flow charts are really of great help in learning
- Diagrams make understanding easy and are made simple so that they can be reproduced in the examinations
- Student-friendly fashion for maximum grasping in limited time available for the subject.



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ISBN 978-93-5025-588-9