Chapter - III

Musculoskeletal Injury
CHAPTER – III
MUSCULOSKELETAL INJURY

3.1. Introduction

Injury is damage or harm caused to the structure or function of the body caused by an outside agent or force, which may be physical or chemical. Injury may also refer to injured feelings or resentment rather than injuries to the body.

➢ Burns are injuries caused by excess heat or sometimes cold (frostbite).

➢ Fractures are injuries to bones.

➢ Wound cuts and grazes are injuries to the skin that can cause bleeding (i.e. a laceration)

➢ A bruise is a haemorrhage under the skin caused by contusion.

➢ Damage to a person's sense of self-worth can be considered an emotional injury. An example is harm to one's perception of her or his gender resulting from sexual harassment.

Serious bodily injury is any injury to the body that involves a substantial risk of death to the victim. In the United States, the legal definition of malicious injury is any injury committed with malice, hatred or one committed spitefully or wantonly. Such an action must be willfully committed with the knowledge that it is liable to cause injury. Injury involving element of fraud, violence, wantonness and willfulness, or criminality. An injury that
is intentional, wrongful and without just cause or excuse, even in the absence of hatred, spite or ill will.

- Australian rules football injuries
- Back injury
- First aid
- Micro trauma
- Physical trauma
- Self-harm.

3.2. Detailed examination of muscle injuries

Muscle injuries occasionally also look for muscle strength, muscle strain, muscle steroids, muscle skeletal, muscle relaxants, muscle recovery, muscle pulled, muscle mustangs and fast fords, muscle media, muscle layer.

Fig. 3.1. Examination of muscle injuries

<table>
<thead>
<tr>
<th>Signs and Symptoms in Knee Injuries</th>
<th>Swelling</th>
<th>Pain</th>
<th>Limitation of Movement</th>
<th>Instability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Moderate</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>++ / +++</td>
</tr>
<tr>
<td>Severe</td>
<td>+++</td>
<td>++++</td>
<td>++++</td>
<td>+++++</td>
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piriformis, muscle, needle stick, injuries neck muscles, wrestling muscle, weakness muscle toning, muscle therapy. Discover why we believe that natural medicine treatments are the best way to treat a sacroiliac joint injury. When considering injuries to the knee and their patterns of healing, it is appropriate to recognize that knee injuries can vary in their severity (mild, moderate and severe), and that the severity often dictates the time required to for complete recovery from injury.

Increasing degrees of force applied to the knee joint result in increasing severity of injury. Mild force applied to the knee results in stretching of the ligaments and tendons supporting the knee, while moderate or intense forces can result in partial tearing or complete rupture of the ligaments or/and tendons, often accompanied by varying degrees of damage to the semi-lunette cartilages. The severity of the injury sustained then has a direct impact on the time needed to rehabilitate the knee joint and recover full function. For mild ligament or tendon injuries, days to weeks of rest and minimal use of the injured knee are needed to achieve full healing, while for moderate or severe injuries, complete healing may require months to years, with accompanying reconstructive surgery to reattach or repair damaged ligaments, tendons or cartilage.

Fig. 3.2. The recovery time in knee injuries

The rehabilitation measures applied to knee injuries depend largely upon the severity of injury and the knee structures involved.

Fig. 3.3. Rehabilitation in knee injuries

<table>
<thead>
<tr>
<th>SEVERITY</th>
<th>REHABILITATION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILD</td>
<td>IMMEDIATE ICE TO MINIMIZE SWELLING</td>
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<tr>
<td></td>
<td>LOCAL HEAT ONCE SWELLING STOPS</td>
</tr>
<tr>
<td></td>
<td>PASSIVE MOTION EXERCISE ➔ ACTIVE MOTION EXERCISE</td>
</tr>
<tr>
<td>MODERATE</td>
<td>IMMEDIATE ICE TO MINIMIZE SWELLING</td>
</tr>
<tr>
<td></td>
<td>IMMobilization until extent of injury evaluated</td>
</tr>
<tr>
<td></td>
<td>LOCAL HEAT ONCE SWELLING STOPS</td>
</tr>
<tr>
<td></td>
<td>CORRECTIVE / REPARATIVE SURGERY IF INDICATED</td>
</tr>
<tr>
<td></td>
<td>PASSIVE MOTION EXERCISE TO MAINTAIN JOINT MOTION</td>
</tr>
<tr>
<td></td>
<td>GRADED ACTIVE MOTION EXERCISE TO REGAIN STRENGTH</td>
</tr>
<tr>
<td>SEVERE</td>
<td>IMMEDIATE ICE TO MINIMIZE SWELLING</td>
</tr>
<tr>
<td></td>
<td>IMMobilization until extent of injury evaluated</td>
</tr>
<tr>
<td></td>
<td>LOCAL HEAT ONCE SWELLING STOPS</td>
</tr>
<tr>
<td></td>
<td>CORRECTIVE / REPARATIVE SURGERY IF INDICATED</td>
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<tr>
<td></td>
<td>PASSIVE MOTION EXERCISE TO MAINTAIN JOINT MOTION</td>
</tr>
<tr>
<td></td>
<td>GRADED ACTIVE MOTION EXERCISE TO REGAIN STRENGTH</td>
</tr>
</tbody>
</table>


Regardless of the injury severity, initial care should always involve putting the knee joint to rest, stabilizing the joint and local application of ice to the joint for analgesic and vasoconstrictive effects. Once the extent of knee injury has been properly evaluated and the tendency toward swelling has stopped (usually 12-24 hours), local application of heat will enhance blood flow to the area, usually aiding healing, and in the absence of injury requiring surgical intervention, passive movements of the joint can be used to prevent stiffening and decreased range of movement while the joint heals. As joint rehabilitation progresses, it is important to appreciate that new pain and/or swelling in the area of the joint likely represent extension of injury, which
will further prolong the rehabilitative process and may result in further or permanent damage to the joint. Therefore, rehabilitation should not be pushed - it should be allowed to progress at a rate that enhances recovery of joint function without increasing joint injury.

3.3. Definitions of fracture

It is a break in the surface of a bone, either across its cortex or through its articular surface.

3.3.1. Dislocation

It is a complete and persistent displacement of a joint in which at least part of the supporting joint capsule and some of its ligaments are disrupted.

3.3.2. Subluxation

It is a partial dislocation of a joint.

3.3.3. Sprain

It is the temporary subluxation of joint due to ligament injury and the articular surfaces return to normal alignment.

3.3.4. Strain

It is a tear in the muscle.

3.4. Types of fractures

3.4.1 Complete fracture

It involves a break across the entire cross section of the bone and is frequently displaced (removed from normal position).
3.4.2. **Incomplete fracture**

In an incomplete fracture, the break occurs through only part of the cross section of the bone.

3.4.3. **Closed fracture**

A closed fracture (simple fracture) does not produce a break in the skin.

3.4.4. **Open fracture**

An open fracture (compound/complex fracture) is one in which the skin or mucous membrane wound extends to the fractured bone. Fractures may also be described according to anatomic placement of fragments-displaced / nondisplaced fracture. The following are specific types of fractures.

**Fig. 3.4 Types of fractures**

Source: Dirksen. Medical-Surgical Nursing (1996)

3.4.5. **Greenstick**

A fracture in which one side of a bone is broken and the other side is bent.

3.4.6. **Transverse**

Fracture occurring at an angle across the bone.
3.4.7. **Oblique**

A fracture occurring at an angle across the bone (less stable than transverse).

3.4.8. **Spiral**

A fracture twisting around the shaft of the bone.

3.4.9 **Comminuted**

A fracture in which bone has splintered into several fragments. Here the fracture fragments are more than two in number. They are further sub classified into 50% communication or more than 50% communication. Butterfly-shaped fractures are also included in this group.

3.4.10. **Depressed**

A fracture in which fragments are driven inward (seen frequently in fractures of skull and facial bones).

3.4.11. **Compression**

A fracture in which bone has been compressed (seen in vertebral fractures).

3.4.12. **Pathologic**

A fracture that occurs through an area of diseased bone (bone cyst, Paget’s disease, bony metastasis, tumor).

3.4.13 **Avulsion**

A pulling away of fragment of bone by a ligament or tendon and its attachment.
3.4.14. Epiphysis
A fracture though the epiphysis.

3.4.15. Impacted
A fracture, a bone fragment is driven into another bone fragment.

3.4.16. Linear fracture
These could be transverse, oblique or spiral. Any fracture which forms an angle less than 30° with the horizontal line is called transverse. Angle equal to or more than 30° is termed oblique.

3.4.17. Segmental fractures
A fracture can break into segments and the segment could be two-level, three-level, and a longitudinal split or comminuted.

3.4.18. Bone loss
This could be < 50 per cent bone loss or more than 50 per cent bone loss or a complete bone loss.

3.5. Typical fractures

Fig.3.5. Typical fractures

![Diagram of various types of fractures](image)

Source: Lewis. Medical-Surgical Nursing. (1996)
3.6. Displacement of fractures

A complete fracture usually gets displaced due to various factors already mentioned. Depending on the direction of force, mode of injury, pull of the muscles, a fracture can show any one of the following displacement or angulations.

3.7. Upper extremity fractures

3.7.1. Fractures of the humeral neck

Fractures of the proximal humerus may occur through there the anatomic or the surgical neck of the humerus. The anatomic neck is located just below the humeral head. The surgical neck is the region below the tubercles. Impacted fractures of the surgical neck of the humerus are seen most frequently in older women after a fall on an outstretched arm. These are essentially nondisplaced fractures. Active middle-aged patients may suffer severely displaced humeral neck fractures with associated rotator cuff damage. The patient presents with the affected arm hanging limp at the side and supported by the uninjured hand. Neurovascular assessment of the involved extremity is essential to fully evaluate the extent of injury and possible involvement of the neurovascular bundle (nerves and blood vessels) of the arm.
Fig. 3.6. The types of immobilizing dressings used for proximal humeral fractures. (A) A commercial sling and swath that permits easy removal of the arm for hygiene and is comfortable on the neck. (B) A conventional sling and swath. (C) A stockinette Velpeau and swath are used when there is an unstable surgical neck component, because this position relaxes the pectoralis major.

![Images of dressings]

Source: Lewis, Medical-Surgical Nursing (1996)

When a humeral neck fracture is displaced, treatment consists of closed reduction with X-ray visualization, open reduction, or replacement of the humeral head with prosthesis. In this type of fracture, exercises are started only after a prescribed period of immobilization.

3.7.2. Fractures of the shaft of the humerus

Fractures of the shaft of the humerus are most frequently caused by (1) Direct trauma that results in a transverse, oblique, or comminuted fracture, or (2) An indirect twisting force that results in a spiral fracture. The nerves and brachial blood vessels may be injured with these fractures. Wrist drop is indicative of radial nerve injury. Initial neurovascular assessment is essential
to differentiate between trauma from the injury and complications from treatment.

The patient is advised to sleep in an upright position so that traction from the weight of the cast is maintained constantly. Complications encountered with this mode of therapy are fracture distraction (pulling fracture fragments too far apart) due to the weight of the cast and fracture angulations due to excessive fracture motion.

After the cast is removed, a sling is applied and exercises of the shoulder, elbow, and wrist are begun. Humeral fractures require about 10 weeks to heal when treated with hanging casts. Elderly patients may not tolerate a cast. A sling and swathe may provide adequate comfort and immobilization. Shoulder exercises are begun in about 3 weeks. Functional bracing is another form of treatment being used for these fractures. A hanging cast is applied for about 1 week, and then a contoured thermoplastic sleeve is secured in place with Velcro closures around the upper arm.

Fig. 3.7 Over-the-face traction for supracondylar fracture reduces swelling by creating a very effective evaluation of the extremity.

Source: Lewis, Medical Surgical Nursing, (1996)
Fig. 3.8 Over-the-face traction for supracondylar fracture reduces swelling by creating a very effective evaluation of the extremity.

Source: Lewis, Medical-Surgical Nursing, (1996)

Open fractures of the humeral shaft are frequently treated by external fixations. Open reduction of a humerus fracture is necessary with nerve palsy, pathologic fractures, or when other systemic or neurologic disease (e.g., Parkinson’s disease) would make management with a hanging cast inappropriate.

3.7.3. Fractures at the elbow

Fractures of the distal humerus result from motor vehicle crashes, falls on the elbow (in the extended or flexed position), or a direct blow. These fractures may result in nerve damage from injury to the median, radial or ulnar compromised circulation in the forearm and hand. The most serious complication of a supracondylar fracture of the humerus is Volkmann’s ischemic contracture, which results from antecubital swelling or damage to the brachial artery.
The nurse must

- Observe the hand for swelling, skin color, nailbed capillary refill, and temperature. The affected and unaffected hands are compared.
- Assess radial pulse.
- Assess for paresthesias (tingling and burning sensations) in the hand, because they may indicate nerve injury or impending ischemia.
- Assess for ability to move fingers.
- Assess intensity and character of pain.
- Directly measure tissues pressure as prescribed.
- Report indications of diminished nerve function or diminished circulatory perfusion promptly before irreparable damage occurs. Fasciotomy may become necessary.

3.7.4. **Radial and ulnar fractures**

Fractures of the radial head. Radial head fractures are common and are usually produced by a fall on the out-stretched hand with the elbow extended. If blood has collected in the elbow joint (hemarthrosis), it is aspirated to relieve pain and allow early range of motion. Immobilization for these undisplaced fractures is accomplished by a splint.

3.7.5. **Fractures of the shafts of the radius and ulna**

Fractures of the shaft of the bones of the forearm occur most frequently in children. Either the radius or the ulna, or both, may be fractured at any level. Frequently, displacement occurs when both bones are broken. The forearm’s unique functions of pronation and supination must be
preserved by maintaining good anatomic position and alignment. If the fragments are not displaced, the fracture is treated by closed reduction with a long arm cast applied from the upper arm to the proximal palmer crease. A loop may be in-corporate in the cast near the elbow and a sling pulled through it to prevent the cast from sagging against the forearm.

3.7.6. Fractures of the wrist

Fractures of the distal radius (Collis’s fracture) are common and are usually the result of a fall on an open dorsiflexed hand. This fracture is frequently seen in children and in elderly women with osteoporotic bones and weak soft tissues that do not dissipate the energy of the fall. Active motion of the fingers and shoulder in begun promptly. The patient is taught to do the following finger exercises to reduce swelling and prevent stiffness.

1. Hold the hand at the level of the heart.

2. Move the fingers from full extension to flexion. Hold and release. (Repeat at least 10 times every half hour when awake).

3. Use the hand in functional activities.

4. Activity exercises the shoulder and elbows.

3.7.7. Fracture of the hand

Trauma to the hand often requires extensive reconstructive surgery. The objective of treatment is always to regain maximum function of the hand. For an undisplaced fracture of the distal phalanx (finger bone), the finger is splinted for 3 to 4 weeks to relieve pain and protect the fingertip from further
trauma. Displaced fractures and open fractures may require open reduction with internal fixation, using wires or pins. The neurovascular status of the injured hand is evaluated. Swelling is controlled by elevation of the hand. Functional use of the uninvolved portions of the hand is encouraged.

3.8. Lower extremity fractures

The objectives of management of a fracture of the lower extremity are

1. To obtain adequate bony union with full length and normal alignment and without rotational or angular deformity.
2. To restore muscle power and joint motion
3. To restore the preinjury ambulatory status of the patient.

Practically all fractures of the lower extremity necessitate the use of crutches, walker, or cane during convalescence. The safe use of these assistive devices.

3.8.1. Fracture of femur

Fractures of the femur can occur at several sites when the head, neck, or trochanteric region of the femur is involved, a hip fracture results. Fractures also occur in the femoral shaft and in the region of the knee (supracondylar and condylar fractures).

Fig. 3.9. Fracture of femur

Source: Suddarth, Medical-Surgical Nursing, (2004)
3.8.2. Fracture of the tibia and fibula

The most common fracture below the knee is one of the tibia (and fibula) that results from a direct blow, falls with the foot in a flexed position, or a violent twisting motion. Fractures of the tibia and fibula often occur in association with each other. The patient presents with pain, deformity obvious hematoma, and considerable edema. Frequent these fractures involve severe soft-tissue damage because there is little subcutaneous tissue in the area. Personnel nerve functioning is assessed to provide baseline data. If nerve function is impaired, the patient is unable to dorsiflex the great toe and has diminished sensation in the first web space. Tibial artery damage is assessed by testing the capillary refill response. The patient is monitored for an anterior compartment syndrome. Symptoms include pain unrelieved by medications and increasing with plantar flexion, ense and tender muscle lateral to tibia crest, and aresthesia. Fracture near the joint may be complicated by hemarthroses or ligament damage.

Fig. 3.10
Fracture of the tibia and fibula

Source: Lippincott, Medical-Surgical Nursing. (2006)
3.8.3. Fractures of the patella

Like most other fractures, patellar fractures result from disectimpact. The surgeon typically repairs the fracture by closed reduction and casting or internal fixation with screws.

3.8.4. Fractures of the ankle and foot

Ankle fractures are described by their anatomic place of injury. For example, a bimalleolar (pott's) fracture involves the medial malleolus of the tibia and the lateral malleolus of the fibula. Because of the instability of the ankle joint, the fracture can result from supination and eversion, pronation and abduction, or pronation and eversion. These forces generally create spiral, transverse, or oblique breaks, which are often difficult to treat and present problems in healing. A combination of closed and open techniques may be used, depending on the severity and extent of the fracture. An arthrodesis (fusion) may be needed if the bone does not heal.

Treatment of fractures of the foot or phalanges is similar to that of other fractured, with either closed or open reduction. Phalangeal fracture are more painful then, but not as serious as, most other types of fracture.

3.8.5. Fractures of the ribs and sternum

Chest trauma may cause fractures of the ribs or sternum: the most commonly fracture ribs are numbers 4 through 8. The major concern with rib and sternal fractures is the potential for the lungs, heart, or arteries by bone fragments or ends. Fracture of the lower ribs may damage underlying organs.
such as the liver, spleen, or kidneys. These fractures tend to heal spontaneously without surgical intervention. The client is often uncomfortable during the healing process and requires analgesia.

3.9. Fractures pelvis

Because the pelvis very vascular and close to major organs and blood vessels, associated internal damage is the chief concern in fracture management. After head injuries, pelvic fractures are the second most common cause of death from trauma. In young adults, pelvic fractures typically result from motor vehicle accidents or falls from buildings; falls are the most common cause in older adults. The major concern related to pelvic injury is venous oozing or arterial bleeding. Loss of blood volume leads to hypovolemic shock. Internal abdominal trauma is assessed by checking for the presence of blood in the urine and by watching the abdomen for the development of rigidity or swelling. The trauma team may use peritoneal lavage, computed tomography scanning, or ultrasound (the newest diagnostic modality) for assessment of hemorrhage. Ultrasound is noninvasive, rapid, reliable, and cast-effective, and it can be done at the bedside in real time.

There are many classification systems for pelvic fractures. A system that is particularly useful for nurses divides fracture of the pelvis into two broad categories: non-weight-bearing fracture and weight-bearing fractures.

When a non-weight-bearing part of the pelvis is fractured, such as one of the pubic rami or the iliac crest, treatment can be as minimal as bed rest on a firm mattress or bed board. This type of fracture can be quite painful,
and the client may need stool softeners to facilitate defecation because of hesitancy to move. Well-stabilized fractures usually heal in two months.

A weight-bearing fracture, such as multiple fractures of the pelvic ring creating instability or a fractured acetabulum, necessitate external fixation. Less commonly used now are skeletal traction or double-hip spica casts. Progress to weight bearing depends on the stability of the fracture following fixation. Some clients may fully bear weight within days of surgery, whereas other managed with traction may not bear weight for as long as 12 weeks.

3.10. Hip fractures

There is a high incidence of hip fractures among elderly people, whose bones are frequently brittle from osteoporosis (particularly women) and who tend to fall frequently. Weak quadriceps muscles, general frailty due to age, and conditions that produce decreased cerebral arterial perfusion (transient ischemic attacks, anemia, emboli, cardiovascular disease, and effects of medications) contribute to the incidence of falls. The patient who has sustained a hip fracture frequently has associated medical (i.e., cardiovascular pulmonary, renal, endocrine) disorders. A hip fracture is viewed by the patient and the family as a catastrophic event that will have a negative impact on the patient’s life-style and quality of life.
3.11. General clinical features of fracture

- Pain.
- Pallor.
- Paraesthesia.
- Pulselessness.
- Paralysis.

3.12. Investigations on orthotrauma

It is an important diagnostic tool for fractures. Minimum two views, anteroposterior and lateral are required as bone is a cylinder. Sometimes an oblique view and other special view are required depending upon the clinical situations and bone under study.

- Bone scan
- Needle aspiration
- Bone marrow Biopsy

3.12.1. Vital facts

Radiological clues one should look for on plain X-rays for diagnosis of fractures.

- Where is the fracture?
- Situations: Whether it is in the diaphysis, metaphysis, epiphysis and the articular surface.
- Anatomy: Look for the fracture line, whether it is transverse, oblique, spiral, segmental, comminuted, etc.
Also, look for the alignment, angulations, displacement, rotation, etc.

Number: How many fragments are seen?

Bone condition: Identify whether the bone is normal or pathological.

Joint involvement: Look for the extension of the fracture line into the joint, joint swelling and for evidence of dislocation.

Soft tissue swelling: the extent of the soft tissue swelling indicates the severity of the injury.

Helps confirm the clinical diagnosis.

Helps study the fracture anatomy.

Helps study the fracture displacement.

Helps to detect crack and stress fractures.

Helps to plan the treatment.

Helps to detect fracture dislocation combinations, e.g. Monteggia.

Helps to ascertain post-reduction status of fractures.

Helps in medico legal study.
### Table 3.1
**Complications of fractures**

<table>
<thead>
<tr>
<th>Acute</th>
<th>Chronic</th>
<th>Complications peculiar to open fractures</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Shock (Hypovolaemic or neurogenic).</td>
<td>➢ Delayed union.</td>
<td>➢ Infection.</td>
</tr>
<tr>
<td>➢ Acute respiratory distress syndrome</td>
<td>➢ Nonunion.</td>
<td>➢ Chronic osteomyelitis.</td>
</tr>
<tr>
<td>➢ Acute Volkmann's ischaemia.</td>
<td>➢ Post-traumatic arthritis.</td>
<td>➢ Reflex sympathetic dystrophy, etc.</td>
</tr>
<tr>
<td>➢ Crush syndrome.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ Deep vein thrombosis.</td>
<td>Myositis ossificans</td>
<td></td>
</tr>
</tbody>
</table>

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3.13 Comprehensive care of the injured

3.13.1. First aid and emergency management

Goals of first aid treatment are aptly described by three Ps.

➤ Preserve life by carrying out appropriate resuscitative measures.

➤ Prevent further injuries by careful handling.

➤ Promote recovery.

3.13.2. Initial care of the injured

At the scene of accident

➤ Remove the victim from the accident spot.

➤ Check his or her vital parameters quickly (pulse, BP, consciousness, etc).

➤ Seek the help of bystanders if trained in first aid.

➤ Ensure that police and ambulance have been informed.

➤ Remember to carry out first aid according to Mac Murthy’s A to F regimen.

➤ Ensure personal safety.

3.13.3. Modus operandi in first aid

Airway

First clear the airway as follows:

➤ Clear the mouth of clots, dentures, loose teeth, etc.

➤ Extend the neck slightly as this opens up the pharynx.
If the patient is not breathing, begin artificial respiration. First keep a thin cloth over the patient's mouth, blow into the patient's mouth keeping his or her nostrils closed. Blow at the rate of 16 per minute and see for the chest rise. Mouth to nose respiration is carried out if there is extensive injury to the mouth. If the patient has suffered extensive facial injuries, put the patient prone, turn the face towards one side and apply pressure over the lower aspect of the chest (Holier-Nelson method).

**Cardiac**

Examine the radial pulse and the carotid pulse for the function of cardiac. If the pulse is absent, initiate cardiac resuscitative measures as follows:

- Ensure that the patient is lying on a hard surface.
- Then pressure is applied with the heel of the palm at the lower end of sternum.
- Optimum pressure should be applied and the depth of each pressure should be 1¼ inch.
- Perform external cardiac massage at the rate of 72 per minute. It is preferable to carry out both external cardiac massage and artificial respiration simultaneously by two persons trained in first aid. But if there is no assistance available the
nardiopulmonary resuscitation should be carried out by a single person as follows. First artificial respiration is given once and then the same person should quickly change position and carry out external cardiac massage 5 times. So, this 1:5 ratio should be maintained throughout.

➢ The cardiopulmonary resuscitation (CPR) should be carried out till the patient recovers or at least for half an hour.

**Bleeding**

It is advisable to arrest the bleeding by elevation or direct application of pressure over the bleeding points. Tourniquet should be avoided and used only as a last resort.

3.13.4. *Pelvic fractures*

Suspect pelvic fracture if the patient complains of pain during compression test or distraction test which is performed by applying pressure over the iliac bones. Tenderness over the symphysis pubis is also suggestive.

3.13.5. *Care of patient with a closed fracture*

Patients with closed (simple) fractures are encouraged to return to their usual activities as rapidly as possible. Fracture healing and restoration of full strength and mobility may take months. Patients are taught how to control swelling and pain associated with the fracture and soft-tissue trauma. They are encouraged to be active within the limits of the fracture immobilization. Bed rest is kept to a minimum. Exercises are begun to maintain the health of
unaffected muscles and to increase strength of muscles needed for transferring and for using assistive devices (e.g., crutches, walker). Patients are taught how to use these devices safely.

Planning is done to help patients modify their home environment as needed and secure personal assistance if necessary. Patient teaching includes self-care, medication information, monitoring for potential problems, and the need for continuing health care supervision.

3.13.6. Care of the patient with an open fracture

In an open fracture (one associated with an open wound extending through the skin surface and down to the area of bone injury) there is risk of infection — osteomyelitis, gas gangrene, and tetanus. The objectives of management are to minimize the chance of infection of the wound, soft tissue, and bone and to promote healing of soft tissue and bone.
3.14. The treatment of fractures

3.14.1. Medical management

- Restore fracture fragments to their normal anatomic position (reduction).

<table>
<thead>
<tr>
<th>Fracture</th>
<th>Number of weeks</th>
</tr>
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<tbody>
<tr>
<td>Phalanx (finger)</td>
<td>3 - 5</td>
</tr>
<tr>
<td>Metacarpal</td>
<td>6</td>
</tr>
<tr>
<td>Carpal</td>
<td>6</td>
</tr>
<tr>
<td>Scaphoid</td>
<td>10 (or until X-ray shows union)</td>
</tr>
<tr>
<td>Radius and ulna</td>
<td>6</td>
</tr>
<tr>
<td>Humerus:</td>
<td></td>
</tr>
<tr>
<td>Supracondylar</td>
<td>8</td>
</tr>
<tr>
<td>Midshaft</td>
<td>8 - 12</td>
</tr>
<tr>
<td>Proximal (impacted)</td>
<td>3</td>
</tr>
<tr>
<td>Proximal (displaced)</td>
<td>6 - 8</td>
</tr>
<tr>
<td>Clavicle</td>
<td>6 - 10</td>
</tr>
<tr>
<td>Vertebra</td>
<td>16</td>
</tr>
<tr>
<td>Pelvis</td>
<td>6</td>
</tr>
<tr>
<td>Femur:</td>
<td></td>
</tr>
<tr>
<td>Intracapsular</td>
<td>24</td>
</tr>
<tr>
<td>Intratrochanteric</td>
<td>10 - 12</td>
</tr>
<tr>
<td>Shaft</td>
<td>18</td>
</tr>
<tr>
<td>Supracondylar</td>
<td>12 - 15</td>
</tr>
<tr>
<td>Tibia:</td>
<td></td>
</tr>
<tr>
<td>Proximal</td>
<td>8 - 10</td>
</tr>
<tr>
<td>Shaft</td>
<td>14 - 20</td>
</tr>
<tr>
<td>Malleolus</td>
<td>6</td>
</tr>
</tbody>
</table>
Maintain reduction in place until healing occurs (immobilization).

Promote regaining or normal function and strength of the affected part (rehabilitation).

3.14.2. Surgical Management

Methods for obtaining fracture reduction

➢ Traction
➢ Closed reduction.
➢ Open reduction.

Methods for maintaining immobilization

➢ External devices
➢ Splint
➢ Brace
➢ Case
➢ Pins in plaster

External fixator

➢ Traction
➢ Bandage

Internal devices

➢ Nails
➢ Plates
➢ Screws
➢ Wires
➢ Rods
Maintaining and restoring function

- Maintain reduction and immobilization.
- Elevate to minimize swelling.
- Monitor neurovascular status.
- Control anxiety and pain.
- Isometric and muscle-setting exercises.
- Participation in activities of daily living.
- Gradual resumption of activities.

3.14.3. Exercise

It is important that the patient exercise as much as possible by means of the overhead trapeze. This helps strengthen the triceps and shoulders in preparation for ambulation. On the first postoperative day, the patient is generally fairly comfortable and can transfer to a chair with assistance. The following day, assisted ambulation can begin. The amount of weight-bearing that can be permitted depends on the stability of the fracture reduction. The physician will prescribe the amount of weight-bearing permitted and the rate at which the patient can progress to full weight-bearing. Physical therapists will work with the patient on transfers, ambulation, and the safe use of walker and crutches. The patient who has experienced a fractured hip can anticipate discharge with the use of an assistive device. Some modifications in the home may be needed to permit safe use of walkers and crutches and for the patient's continuing care.
Intramedullary nailing devices or interlocking nail, plate, and screws provide adequate internal fixation, which allows for early mobilization. Active muscle movement is important for increasing blood supply and electrical potentials at the fracture site, which enhances healing. A thigh cuff may be used for external support. Intramedullary implant and compression plates may be removed after 18 months. When plates are being removed, the resultant osteoporosis needs to be considered. A thigh cuff orthosis is used for several months after the removal of plates to provide support while bone remodeling occurs.

Fig. 3.11. Two-wire skeletal traction for fracture of the femur in distal third. (Top) Deformity on admission to hospital. (Bottom) Adequate reduction when additional wire is inserted in lower femoral fragment and vertical lift is secured.

Source: Hampton OP, Medical-Surgical Nursing. (1996)

A cast brace may be used for fractures of the mid-and distal shaft (supracondylar). Two to four weeks after the injury, when pain and swelling have subsided, the patient is removed from skeletal traction and placed in a cast brace. The cast (fracture) brace is a total contact device that holds the
reduced fracture. The muscle, through hydrodynamic compression, stabilizes the bone and stimulates healing. Minimal partial weight-bearing is begun and is progressed to full weight-bearing as tolerated. Functional ambulation stimulates fracture healing. The cast brace is worn for 12 to 14 weeks. In management of femoral shaft fractures, a major goal is rapid functional healing with sufficient strength to support the multiple stresses placed on the femur. To preserve muscle strength, the patient should exercise the lower leg, foot and toes on a regular basis. A common complication after fracture of the femoral shaft is restriction of knee motion. Active and passive knee exercises are performed as soon as possible, depending on the stability of the fracture and knee ligaments. Progressive strengthening exercises for the upper extremities are needed to prepare for ambulation.

3.15. Prevention and management

Immediate immobilization of fractures, minimal fracture manipulation, and adequate support for fractured bones during turning and positioning are measures that may reduce the incidence of fat emboli. Monitoring high-risk patients (e.g., adult males between 20 and 30 years of age, those with altered mental status) assists in the early identification of this problem. Prompt initiation of respiratory support is essential. The objectives of management are to support the respiratory system and to correct homeostatic disturbances. Arterial blood gas analysis is performed to determine the degree of respiratory impairment, as respiratory failure is the most common cause of death. Respiratory support is provided with oxygen
given in high concentrations. Controlled volume ventilation with positive end-expiratory pressure may be employed to prevent or treat pulmonary edema.

Corticosteroids may be given to treat the inflammatory lung reaction and to control cerebral edema. Vasoactive medications to support cardiovascular function are given to prevent hypotension, shock, and interstitial pulmonary edema. Accurate intake and output records facilitate adequate fluid replacement therapy. Morphine may be prescribed for pain and anxiety for the patient on a ventilator. In addition, to allay apprehension, calm reassurance is provided. The patient’s response to therapy is closely monitored. Because fat emboli are a major cause of death in patients with fractures, respiratory support must be instituted early. The nurse must recognize early indications of fat embolism syndrome and report them to the physician for medical management.

3.15.1. Amputations

An amputation is the removal of a part of the body. The nurse recognizes that the psychosocial ramifications of the procedure are often more devastating than the physical impairment that result. The loss experienced is complete and permanent and causes a change in body image and often in self-esteem. As with other types of loss, the client can be expected to progress through phases of the grieving process.
3.15.2. Traumatic amputation

Not all amputations are surgically planned. Some, classified as traumatic amputation, occur when a body part is severed unexpectedly (e.g., by chain saw). Because the amputated part in these clients is usually healthy, attempts to replant it may be made.

One of the most likely replantation involves one or more digits. The current recommendation for prehospital care is that the severed digit be wrapped in a cool, dry cloth and moistened with normal saline, if possible, or bottled water. The digit should then be placed in a sealed plastic bag. The bag is placed in ice water, never directly on ice. Contact between the digit and the water is avoided to prevent tissues damage. Any semidetached part of the digit should not be removed.

3.16. Other forms of fracture immobilization

1. Pins and plasters – limited use can be tried in type I fractures.
2. Limited internal fixation – in grade I and some grade II, grade IIIc fractures.
4. Plaster of Paris casts practically have no role.